

## Comparison of Hemoglobin Concentration Before and After Trichuriasis Treatment with Albendazole among Primary School Children

Novreka P Sipayung<sup>1)</sup>, Nurfida Arrasyid<sup>2)</sup>, Ayodhia P Pasaribu<sup>3)</sup>

<sup>1)</sup>Department Parasitology, Faculty of Medicine, HKBP Nommensen University, Medan

<sup>2)</sup>Department Parasitology, Faculty of Medicine, Sumatera Utara University, Medan

<sup>3)</sup>Department of Pediatrics, Sumatera Utara University, Haji Adam Malik Hospital, Medan

### ABSTRACT

**Background:** Trichuriasis is a soil transmitted helminth that causes anemia and growth disturbance in children. This study aimed to compare hemoglobin concentration before and after Trichuriasis treatment with albendazole among primary school children.

**Subjects and Method:** This was an experimental study with before and after quasi experiment design. This study was conducted at Medan Tembung Primary School, Medan, North Sumatera, from March to June, 2015. A total of 63 children were selected for this study. Blood sample was taken for hemoglobin concentration examination before and after the administration of albendazole. The treatment consisted of 400 mg albendazole that was administered in single dose once a day for 3 days, both for single and mixed infection.

**Results:** The prevalence of Trichuriasis among the school children under study was 33.3% (126/378), which was consisted of 37 children with single infection and 26 children with mixed infection. Albendazole increased hemoglobin concentration with mean= 11.88 g/dl; SD=1.26 before treatment and mean=12.53 g/dl; SD= 1.37 after treatment, among children with single infection, and it was statistically significant ( $p= 0.002$ ). Albendazole increased hemoglobin concentration with mean= 11.69 g/dl; SD=1.04 before treatment and mean=12.36 g/dl; SD= 1.06 after treatment, among children with mixed infection, and it was statistically significant ( $p= 0.001$ ).

**Conclusion:** Albendazole is effective in increasing hemoglobin concentration among school children with anemia that is caused by Trichuriasis infection.

**Keywords:** helminthiasis, trichuriasis, hemoglobin, anemia, albendazole, school children

### Correspondence:

Novreka Pratiwi Sipayung. Department Parasitology, Faculty of Medicine, HKBP Nommensen University, Medan. Email: eqa\_efq@yahoo.com. Mobile: 085261145049.

### BACKGROUND

WHO records that there are more than 1,5 billion people worldwide are infected by *Soil Transmitted Helminth*, 270 million of them are pre-school aged children and 600 million are school aged (Tekeste, 2013). Infection of roundworms type *Ascaris lumbricoides* is on the 1<sup>st</sup> place with 1,2 billion people, whipworms *Trichuris trichiura* infects 795 million people, hook worm *Necator americanus* and *Ancylostoma duodenale* infect 740 million people worldwide

(Kirwan, 2009). In South East Asia, about 500 million people are infected, and school aged children are at the highest risk from getting infected (Vercruysse et al., 2011).

Approximately there are 70% children in Indonesia who suffer from worm infestation (Sutanto, 2008). Based on the data of Health Office of North Sumatera Province 2013 about 32% of North Sumatera population suffered from worm infestation, out of the data around 87% students of one of primary school in Deli Serdang suffered

from worm infestation, in which the prevalence of *Trichuris trichiura* was as much as 78.6%.

*Trichuris trichiura* infection is one of the *Soil Transmitted Helminth* infection which endanger children's health by interfering iron status, growth, cognitive development, and disturbing immune response of the infected children (Keiser, 2008).

Losing too much iron during hemorrhage as the result of worm infestation may disturb the balance of iron, in which the more released iron compared to the incoming iron lead to anemia. Therefore the prevention and countermeasures effort is not only addressed the anemia but also should treat the disease that generates it. Albendazole is proven to be effective in treating various worm infestation diseases one of them is *Trichuris trichiura* that may lead to bleeding on intestinal mucosa and if it is ignored will cause anemia on children (Bamban, 2006; Janic, 2014)

It is important to give drug intervention first to avoid bias in this study and also the technique used in examining blood hemoglobin plays a very important role to obtain accurate result. Based on the facts, it is necessary to investigate further the comparison of hemoglobin concentration before and after trichuriasis treatment with albendazole on primary school students.

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## SUBJECTS AND METHOD

The study used clinical trial study in randomized open, conducted from March up to June 2015 in 067240 State Primary School, Village of Tembung, Medan Tembung Sub District, City of Medan. The study had been approved by Health Research Ethics Committee of Faculty of Medicine North Sumatera University and Haji Adam Malik Central General Hospital Medan.

As many as 378 children collected feces pots, and they were examined using Kato method in Parasitology Laboratory of North Sumatera University, Medan. Data on social demography and behavior were collected by using questionnaires, filled out by parents as well as interview and observation. Examination of hemoglobin concentration was directly conducted in the research location.

Sample of the study was the accessible population that met the inclusive criteria which were the entire students of class 1-6 who suffered from trichuriasis either mono infection or mixed followed by good nutrition status. Exclusive criteria were students who did not return their feces pot, were absent, refused to provide blood sample, suffered from chronic illnesses, consumed medication/ supplement that might interfere hemoglobin concentration. As many as 63 students who met the inclusive criteria and provided blood sample for hemoglobin concentration examination, afterward treatment with 400 mg albendazole was given for 3 consecutive days and monitored for 90 days, continued with hemoglobin concentration examination all over again.

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## RESULTS

The result of feces examination found that 256 students (67.7%) suffered from worm infestation among others were 124 students who positively suffered from mono infection of *A. lumbricoides*, 51 students positively suffered from mono infection of *T. trichiura*, 75 students were positive with *A. lumbricoides* and *T. trichiura*, 2 students were positive with *A. lumbricoides* and hook worm, 4 students were positive with *T. trichiura* and hook worm. Students who became research sample were those who suffered from mono infection of *T. trichiura* and mixed infection of *T. trichiura* and *A.*

*lumbricoides*. There were only 63 students who met the inclusive criteria in which 37 students suffered from *T. trichiura* and 26 suffered from mixed infection (*A. lumbricoides* and *T. trichiura*). The entire respondents were treated with single dose of 400 mg albendazole 3 consecutive days. After the treatment, the whole respondents of the

**Table 1. Data of basic characteristics**

| Characteristics            | Mono Trichuriasis(n=37) | Mixed Trichuriasis(n=26) |
|----------------------------|-------------------------|--------------------------|
| Gender Types               |                         |                          |
| Male, n (%)                | 17 (45.9)               | 14 (53.8)                |
| Female, n (%)              | 20 (54.1)               | 12 (46.2)                |
| Age (years), mean(SD)      | 9.9 (1.5)               | 9.4 (1.9)                |
| Weight (kg), mean(SD)      | 27 (6.0)                | 25.6 (6.9)               |
| Infection intensity, n (%) |                         |                          |
| Mild                       | 37 (100)                | 19 (76.0)                |
| Moderate                   | 0 (0.0)                 | 7 (24.0)                 |
| Severe                     | 0 (0.0)                 | 0 (0.0)                  |
| Fathers' occupation, n (%) |                         |                          |
| Labors                     | 5 (13.5)                | 4 (15.4)                 |
| Pedicab drivers            | 4 (10.8)                | 1 (3.8)                  |
| Farmers                    | 2 (5.4)                 | 3 (11.5)                 |
| Civil servants             | 3 (8.1)                 | 3 (11.5)                 |
| Self employed              | 18 (48.6)               | 10 (38.5)                |
| Others                     | 5 (13.5)                | 5 (19.2)                 |
| Mothers' occupation, n (%) |                         |                          |
| Labor                      | 7 (18.9)                | 3 (11.5)                 |
| Pedicab drivers            | 0 (0.0)                 | 0 (0.0)                  |
| Farmers                    | 0 (0.0)                 | 1 (3.8)                  |
| Civil Servants             | 1 (2.7)                 | 1 (3.8)                  |
| Self employed              | 15 (40.5)               | 14 (53.8)                |
| Others                     | 14 (37.8)               | 7 (26.9)                 |
| Fathers' education, n (%)  |                         |                          |
| Uneducated                 | 1 (2.7)                 | 2 (7.7)                  |
| Primary                    | 6 (16.2)                | 5 (19.2)                 |
| Junior High School         | 4 (10.8)                | 4 (15.4)                 |
| High School                | 22 (59.5)               | 13 (50.0)                |
| University                 | 4 (10.8)                | 2 (7.7)                  |
| Mothers' education, n (%)  |                         |                          |
| Uneducated                 | 2 (5.4)                 | 0 (0.0)                  |
| Primary                    | 4 (10.8)                | 7 (26.9)                 |
| Junior High School         | 8 (21.6)                | 4 (15.4)                 |
| High School                | 21 (56.8)               | 15 (57.7)                |
| University                 | 2 (5.4)                 | 0 (0.0)                  |

From the basic characteristics of research respondents in table 1 that trichuriasis was likely suffered more by female that was 22 children (31.7%), whereas mixed tri-

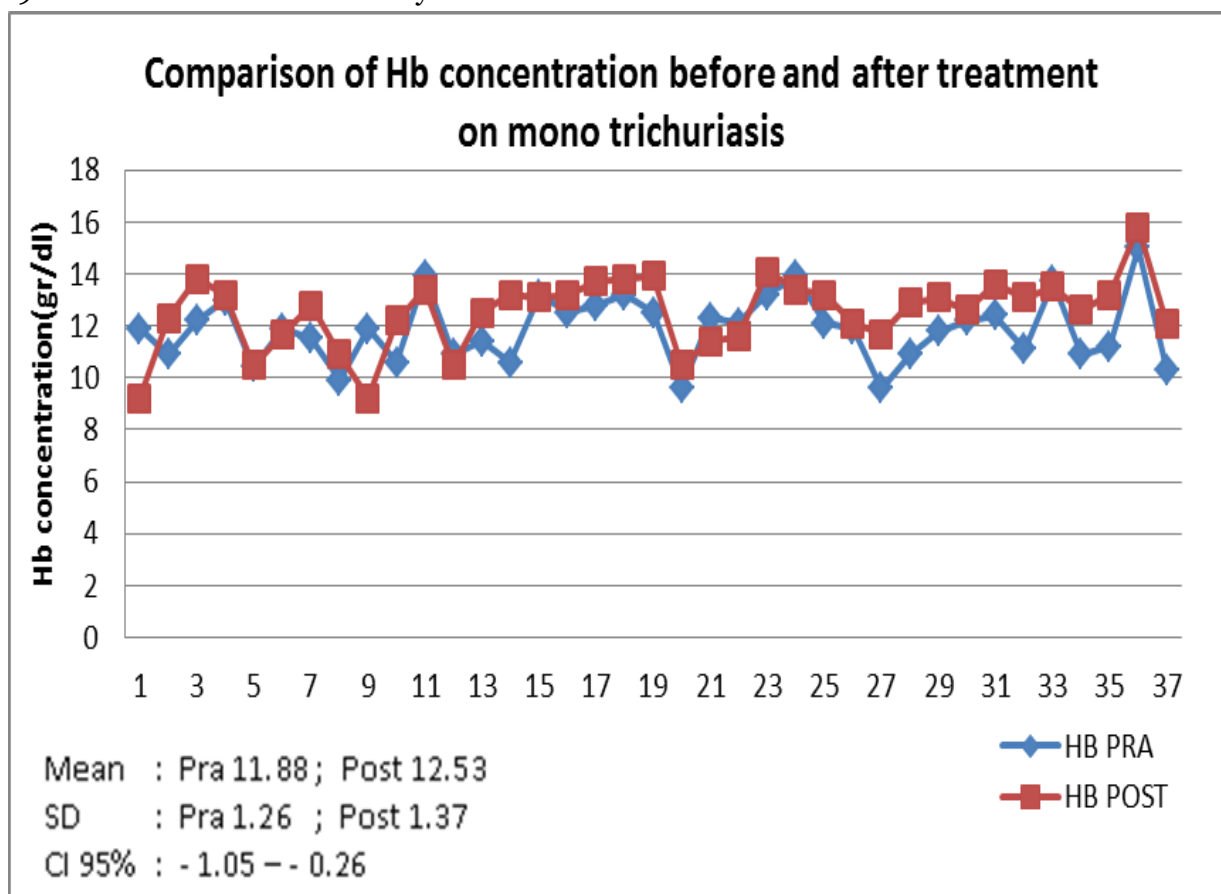
study were followed up for 90 days and underwent hemoglobin concentration examination once again. Prevalence of worm infestation in Medan Tembung sub district was 67.7%, with ascariasis prevalence was 48.44 %, mono trichuriasis prevalence was 19.92 %, and mixed trichuriasis prevalence was 29.3%.

churiasis was likely suffered more by male that was 14 children (22.2%). From respondents who suffered from mono trichuriasis and mixed trichuriasis it was obtained that

the mean of children's age was 9.89 and 9.43 years, with the range of the age was 5-12 years. From the table it was also seen that the mean of children's weight who suffered from mono trichuriasis and mixed trichuriasis was 27 kg and 25.56 kg

Intensity of infection of the entire sample was dominated by mild intensity that was 88.9% whereas moderate intensity was 11.1%.

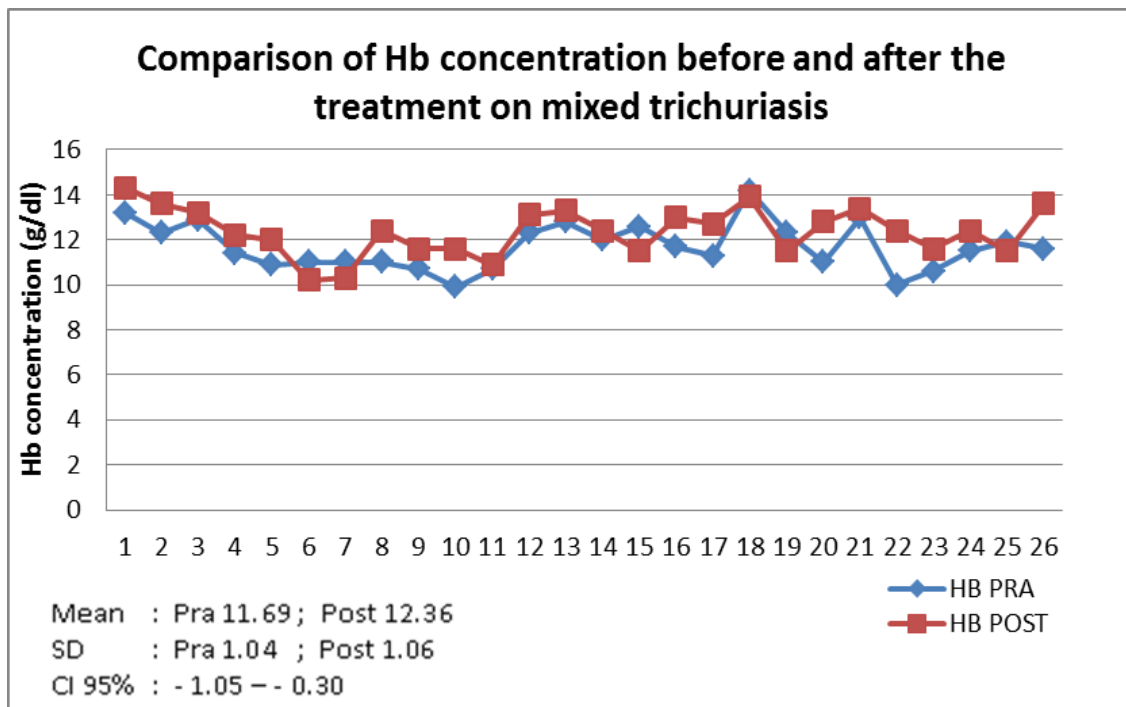
There was no severe intensity of infection degree found either on mono trichuriasis or mixed trichuriasis. Most of parents were self employed in which Father was 44.4% whereas Mother was 46%, meanwhile the most dominant parents education was High School Level in which Father was 55.6% whereas Mother was 57.1%.



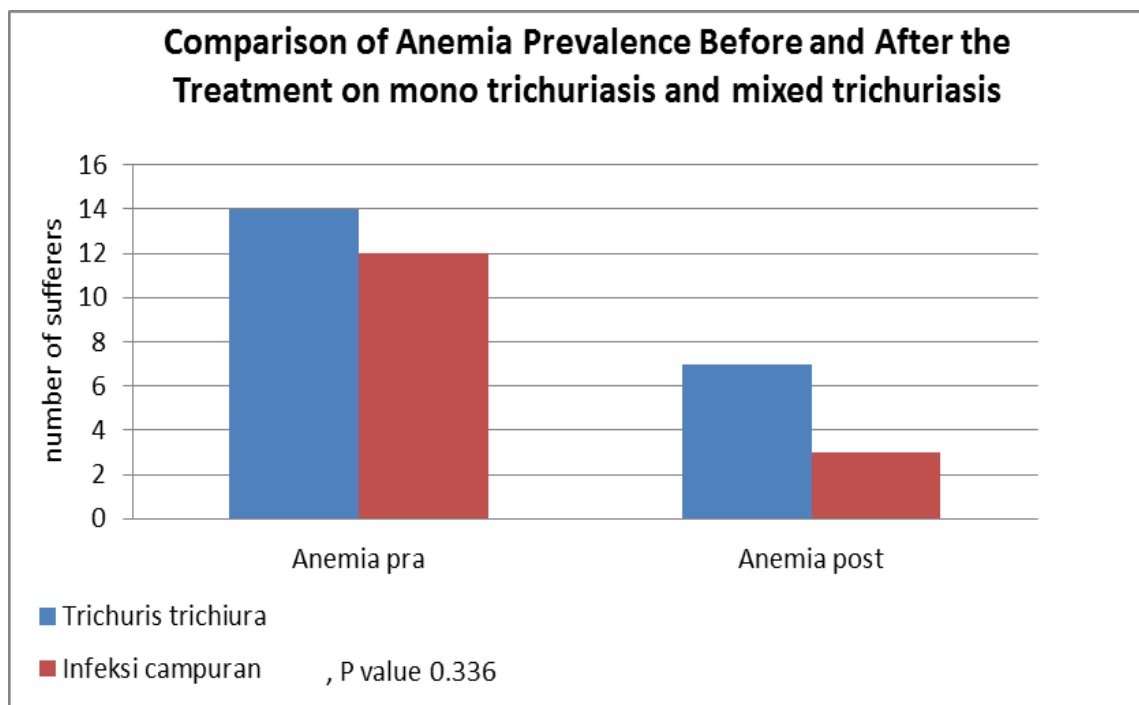
**Picture 1. Chart on hemoglobin concentration comparison before and after the treatment on the sufferers of mono trichuriasis**

In Picture 1 it can be seen that the means of hemoglobin concentration before and after treatment on children with mono trichuriasis are 11.88g/dl and 12.53 g/dl ( $p=0.002$ ). It shows meaningful difference between the mean of hemoglobin concentration before and after treatment on mono trichuriasis.

In Picture 2 the means of hemoglobin concentration before and after treatment on children with mixed trichuriasis are 11.69 and 12.36 g/dl ( $p=0.001$ ). It shows meaningful difference between the mean of hemoglobin concentration before and after treatment on mixed trichuriasis (*A.lumbricoides* and *T.trichiura*).



**Picture 2. Chart on hemoglobin concentration comparison before and after the treatment on the sufferers of mixed trichuriasis**



**Picture 3. Chart on anemia prevalence comparison before and after the treatment on mono trichuriasis and mixed trichuriasis**

In Picture 3 above it is observed that anemia prevalence on mono trichuriasis before treatment is 22.2% (14 people) however after the treatment was administered, prevalence is reducing to 11.1% (7 people). Meanwhile anemia prevalence on mixed trichuriasis before treatment was 19% (12 people) however after the treatment was administered, prevalence is reducing to 4.8 % (3 people). From the result of analysis test it is observed that there is difference between anemia prevalence before and after trichuriasis treatment with albendazole however it is insignificant both on mono trichuriasis ( $p=0.344$ ) as well as mixed trichuriasis ( $p=0.336$ )

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## DISCUSSION

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Prevalence of children who suffered worm infestation in this study was found as much as 67.7%. It had reduced compared to the study in 2008 by Yunus that was 73%. Prevalence of single *Trichuris trichiura* was as much as 19.92%, lower than what Yunus found in 2008 that was 25.94%. For worm infestation *Trichuris trichiura* and *Ascaris lumbricoides* as much as 29.3%, was also lower than the result obtained in 2008 as much as 36.33%. In broad outline researchers obtained the lower prevalence of intestinal worm infestation compared to the previous study by Yunus in 2008 that was 73%. It is possible since from time to time society's knowledge is improving, and also because of worm infestation treatment on school students (Yunus, 2008).

However even though there was a prevalence reduction from 2008 -2015, the numbers of incident was still quite high that was above 50%. The remaining high prevalence of worm infestation on school aged children was lead by low health standard and high frequency of outdoor activities that made children are prone of worm infestat-

ion transmission. Students of 067240 State Primary School, Medan Tembung Sub District often did not put on shoes during classes and even they did activities outside the class barefoot. The environment in the schools surroundings were mostly soil and sand, that became places to proliferate the intestinal worms that might cause infection. Children's less awareness to wash their hands before eating also became one of the ways for those worms to get into their bodies. Chaudhry et al (2004) reports that high prevalence of worm infestation is related to poverty, personal hygiene, bad environment, insufficient healthcare service, insufficient sanitation facilities or latrine and clean water source.

Meanwhile a study conducted by Ang-raini et al., in 2005 found that the prevalence of mixed worm infestation is quite high. In her study it is found that mono infection of *Ascaris lumbricoides* has prevalence which is almost as high as mixed infection of *Ascaris lumbricoides* and *Trichuris trichiura*. Smith et al (2001) obtains in his study that the prevalence of *Ascaris lumbricoides* and *Trichuris trichiura* is respectively 45% and 38%. About a quarter (25.8%) of the research respondents are infected by mixed infection of *Ascaris lumbricoides* and *Trichuris trichiura*. In South India, Nallam et al (1998) finds the same result in his study. Whereas the study shows the prevalence of mixed infection of *Ascaris lumbricoides* and *Trichuris trichiura* is about one third (29%) of the numbers of research respondents. It shows that there is a positive association between infection of *Ascaris lumbricoides* and *Trichuris trichiura*. The large number of *Ascaris lumbricoides* infestation has significant association with *Trichuris trichiura*. The high prevalence of mixed infection is generated by the same

transmission pathways toward human that is through feces and oral.

In the study there was significant difference between hemoglobin concentration before and after the treatment on each type of worm infestation. Greenberg et al., finds that there is an association between infection of *Trichuris trichiura* with the low hemoglobin concentration however there is no association with iron deficiency. Nallam (1998) finds that *Ascaris lumbricoides* infection does not contribute in generating anemia, however Blumenthal (1976) in Louisiana reports that ascariasis affects nutrition status on children and almost 50% of his research subjects suffer from anemia and 40% of them have less sufficient transferrin saturation. Robertson et al (1992) finds that children who are infected with severe trichuriasis or mixed infection of *Trichuris trichiura* and hook worm have low hemoglobin concentration. Stoltzfus et al., reports that infection of *Ascaris lumbricoides* is related to anemia however it is not related to intestinal hemorrhage.

The study showed that the administration of single dose of 400 mg albendazole was beneficial in healing the infection of *T. trichiura* so that the hemoglobin concentration was increasing. It was proven in which there are significant statistics difference in the concentration of hemoglobin ( $p < 0.005$ ). Meanwhile there was difference in anemia prevalence before and after the treatment however it was statistically insignificant. The study was similar with Robertson. In the study conducted by Oguntibeju (2003) it is elaborated that worm infestation has an association with the hematology index alteration. The study still had a lot of drawbacks therefore it needs further hematology examination which is more comprehensive to determine other possible causes of anemia. Con-

sequently, researcher assumed that mono trichuriasis and mixed trichuriasis were the only causes of anemia happen to the research subjects although other factors can't be disregarded.

The research showed that there was significant difference in the hemoglobin concentration before and after 400 mg albendazole treatment in single dose once in every day for 3 days in a row on children who suffered from mono as well as mixed trichuriasis, whereas there was no significant association between anemia prevalence and the type of worms infestation. The administration of single dose of 400 mg albendazole for 3 consecutive days was beneficial in suppressing the incidents percentage of trichuriasis so that children are prevented from anemia and children's cognitive will be increasing.

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