MINISTRY OF EDUCATION MIMISTRY OF HEALTH
NATIONAL INSTITUTE OF MALARIOLOGY, PARASITOLOGY AND ENTOMOLOGY

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THE SITUATION OF SOIL-TRANSMITTED HELMINTHS AND EFFECTIVENESS OF ALBENDAZOLE, MEBENDAZOLE IN DEWORMING FOR CHILDREN FROM 12-23 MONTHS IN 3 DISTRICTS OF DIEN BIEN, YEN BAI, HA GIANG (2015-2016)

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INTRODUCTION

Soil-transmitted helminths (STH) refer to the intestinal worms infecting humans that are transmitted through contaminated soil which including roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura)* and hookworm (*Anclostoma duodenale* and *Necator americanus*). Heavy infection of STH can cause a range of symptoms including intestinal manifestations (diarrhoea and abdominal pain), malnutrition, general malaise and weakness, and impaired growth and physical development. Infection of very high intensity can cause intestinal obstruction that should be treated by surgically.

In 2010, approximately 1.5 billion people are infected with soil-transmitted helminths worldwide concentrated in Africa, Latin America and Asia including Vietnam.

Dien Bien, Yen Bai, Ha Giang are three mountainous provinces of Vietnam with low economic and hygienic conditions, which lead to develop parasitic diseases. There were some surveys about STH in these provinces but most of them focused on school age children, preschool-age children…Besides, data about STH in children from 12-23 months is still limited. More importantly, no guideline for STH treatment in children of this age group leads to many difficulties in STH control and reduce the burden cause by parasitic diseases in children. Therefore, assessing the situation of STH and the efficacy and safety of deworming drugs in order to help development a deworming guideline for chidren from 12-23 months is very important. We conducted research "**The situation of soil-transmitted helminths and effectiveness of albendazole, mebendazole in deworming for children from 12-23 months in 3 districts of Dien Bien, Yen Bai, Ha Giang (2015-2016)"** with the following objectives:

1. *To determine the prevalence, intensity and some factors related to soil-transmitted helminths infection in children*

from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015.

2. *To evaluate the effectiveness and safety of albendazole 200 mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months in survey sites (2015 - 2016).*

NOVELTY, SCIENTIFICITY AND PRACTICALITY

1. Novelty

- Provide data about STH infection and related factors among children from 12-23 months in some mountainous districts of Vietnam

2. Scientificity

The study uses standard scientific research methods such as:

- Cross sectional survey to identify STH infection and related factors in children from 12-23 months (Objective 1).
- Intervention study and evaluation the efficacy and safety of albendazole and mebendazole in STH treatment if this age group (Objective 2).

3. Practicability

The results from this study provides the National Parasite Control Programme of Ministry of Health with evidence on the situation of STH in children 12-23 months and on the efficacy and safety of albendazole, mebendazole in STH treatment. Base on those evidences, the Ministry of Health had issued the dicision 1932/QD-BYT date 19th May, 2016, namely "Deworming guideline for intestinal parasites in community" which included the age group from 12-23 months.

THESIS STRUCTURE

Thesis consists of 109 pages, including: Introduction (2 pages), Chapter 1. Litterature review (27 pages), Chapter 2. Subject and methodology (22 pages), Chapter 3. Results (26

pages), Chapter 4. Discussion (29 page), Conclusion (2 pages), Suggestion (1 page), 44 tables, 15 figures and 118 references.

Chapter 1: LITTERATURE REVIEW

1.1. Soil-transmitted helminths overview

Soil-transmitted helminths (STH) ìnections are caused by different species of parasitic worms. They are infected by eggs present in human faeces which contaminates the soil. The main species that's infect people are roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura)* and hookworm (*Anclostoma duodenale* and *Necator americanus*).

1.2. Soil-transmitted helminths situation in children and burden disease.

1.2.1. Soil-transmitted helminths situation in children

Soil-transmitted helminths worldwide

In 2010, more than 1.5 billion people of the world are infected with STH. There are about 819 million people infected with roundworm, of which 519 people living in Asia account for 71.9%, 142.2 million in Africa accounted for 17.4%. Of total 464.6 million people habouring whipworm, 282.3 billion located in Asia accouted for 60.8% and 109.5 million living in Africa with the rate of 23.6%

Similarly, Asia and Africa accounted for 92.1% number of hookworm cases globally in which Asia with 281.8 million cases (64.2%) and Africa 122.3 million (27.9%).

Prevalence and intensity of STH differ from age group, occupation, endemicity…The older people the higher prevalence and density of STH. According to De Silva (2003), the prevalence of STH in children from 0-4 years was about 8.6% while children from 5-9 was aroud 19.2%.

Soil-transmitted helminths in Vietnam

According to Van der Hoek, in 2003 there were about 33.9 million people nation-wide infected with roundworm accouted for 44.4%, 17.6 million people infected with whipworm, general

prevalence was 21.2% and 21.8 million people habouring hookworm (28.6%). Roundworm and whipworm have the wide range of infection and higher in the North especially in mountainous areas. On the contrary, the prevalence of hookworm tends to higher in the South than in the North.

Recently, there were some survey on STH in children from 12-23 months revealed that the prevalence was quite high and differed from province to province.

Nguyen Phuong Huyen (2016) conduted a survey in 2 suburb districts for children 12-24 months showed that STH prevalence in Phuc Tho district was 5.67%, Ba Vi district was 10.63%. Nguyen Thu Huong carried out researche in Thanh Hoa and Ha Giang 2015 for children 12-23 months. The results revealed that the STH prevalence in Ha Giang was 23.3%, and Thanh Hoa was 20.3%. In 2013, Tran Thi Lan in Dakrong district, Quang Tri province, STH prevalence in children under 24 months was 27%.

1.2.2. Burden disease caused by soil helminthiasis.

People with light soil-transmitted helminth infections usually have no symptoms. Heavy infections can cause a range of health problems, including abdominal pain, diarrhea, blood and protein loss, rectal prolapse, and physical and cognitive growth retardation. Infection of very high intensity can cause intestinal obstruction that should be treated by surgically. Ascariasis is accounted for about 2,700 death each year and most of them resulted from intestinal obstruction.

1.3. Techniques for detecting soil-transmitted helminths

1.3.1. Direct feaces technique

- Advantages: Fast, simple, cheap and can be applied with a large number of samples at community.
- Disadvantages: Can not determine the intensity of helminth infection, miss diagnosis with very light infection.

1.3.2. Kato technique

- Advantages: Fast, simple, cheap and can be applied with a large number of samples at community.
- Disadvantages: Can not determine the intensity of helminth infection.

1.3.3. Kato-Katz technique

- Advantages: Simple, cheap and can be applied with a large number of samples at community, can identify the intensity of helminth infection. This method is adviced by World Health Organization (WHO) for detecting soil-transmitted helminths.
- Disadvantages: Miss diagnosis with very light infection.

1.4. Soil-transmitted helminths treatment

1.4.1. Drugs

Abendazole and mebendazole are 2 drugs which recommended for STH treatment by WHO. Both drugs are benzimidazole derivatives used for treatment of a variety of parasitic worm infestations. These ones are safe and common side effects include nausea, abdominal pains, headaches and usually not need treatment.

1.4.2. Soil-transmitted helminths treatment for people above 2 years

- Roundworm, whipworm: Albendazole 400mg or mebendazole 500mg single dose;
- Hookworm or multi-infection: Albendazol 400mg/day or mebendazole 500mg in 3 consecutive days.

1.4.3. Soil-transmitted helminths treatment for children from 12-23 months

- According to WHO guideline the dosage for children from 12-23 months are as followed:
- Albendazole 200mg or mebendazole 500mg.
- In case of hookworm infection dosage can be Albendazol 400mg/day or mebendazole 500mg in 3 consecutive days.

1.5 *Soil-transmitted helminths control*

- Increase knowledge about STH control through IEC;
- Improve hygenic condition;
- Food safety control;
- Periodic treatment of at-risk people living in endemic areas.

Chapter 2

SUBJECTS AND METHOLOGY

2.1. Objective 1: Determine the prevalence, intensity and some factors related to soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015

2.1.1. Subjects

- Children from 12-23 months in survey sites
- Parents, guardians
- Willing to participate in the study.

2.1.2. Time: Jan-June 2015

2.1.3. Study sites

Communes were selected on purpose:

- Tuan Giao district (Dien Bien prov.): 9 communes Muong Mun, Muong Chung, Quai Nua, Quai Cang, Na Say, Muong Thin, Quai To, Chieng Sinh, Chieng Dong.
- Van Yen district (Yen Bai prov.): 8 communes An Thinh, Dai Phac, Tan Hop, Dai Son, Dong An, An Binh, Quang Minh, Ngoi A.
- Meo Vac district (Ha Giang prov.): 9 communes: Lung Chinh, Tat Nga, Niem Son, Nam Ban, Sung Tra, Niem Tong, Ta Lung, Sung Mang, Pa Vi.

2.1.4. Study design: Cross-sectional study

2.1.5. Sample size and sample collection

Applied the sample size formula for a prevalence:

$$n = Z^2_{1-\alpha/2} \times p(1-p)/d^2$$

In which:

n: Minimun sample; p: Estimate prevallance

$\alpha = 0.01$ therefore $Z_{1-\alpha/2} = 2.58$

d: desire error (d = 0.055)

Applied p = 0.23 following Nguyen Thu Huong (2015) in chidren 12-23 months in Ha Giang

n = 389 for each district.

Sample selection: Systematic sampling base on the list of children from 12-23 months in 26 communes.

- 9 communes Tuan Giao district (Dien Bien prov): 812 children
- 8 communes Van Yen district (Yen Bai prov.): 764 trẻ
- 9 communes Meo Vac district (Ha Giang prov.): 787 trẻ

Sampling interval k = 2.

In total, 1240 children were enrolled in the study.

2.1.6. Research contents

Using Kato Katz technique to determine STH prevalence and intensity; questionnaire technique to determine risk factors.

Survey using Kato-Katz technique to assess STH prevalence and incidence after 3 and 6 months.

2.1.7. Techniques: Kato-Katz technique and KAP

2.2. Objective 2: Evaluate the effectiveness and safety of albendazole 200 mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months in survey sites (2015 - 2016).

2.2.1 Subject

- Children 12-23 months infected with at least 1 kind of STH
- Albendazol, tablet 400mg manufactured by Glaxo SmithKline and mebendazole tablet 500mg manufactured by Imexpharm:

2.2.2. Survey sites: same as in Objective 1

2.2.3. Time: 2015-2016

2.2.4. Study design: Interventional study

2.2.5. Sample size and sample collection

Sample size was calculated as followed:

$$n = \frac{(Z1-\alpha/2+\ Z1-\beta)^2\ [\pi1(1-\pi1)+\pi2(1-\pi2)]}{(\pi1-\pi2-\delta)^2}$$

In which:

- $Z_{1-\alpha/2}$: With confidence interval 95%, α =0,05 thì $Z_{1-\alpha/2}$=1.96
- β: Type 2 error. If β= 0,2, sample power 80%, $Z_{1-\beta}$ =0.84
- π_1: Efficacy of mebendazole estimated 90%
- π_2: Efficacy of albendazole, estimated 95%
- δ: the difference between two drug efficacy, if less than 5%, mean two of them have the same effectiveness (δ= 0.05).
- n = 108 for each group.

Because the study need at least six months to follow up the children therefore sample size will be sum up with 10%. In totale ach group need 119 positive children to asses the efficacy of the drugs.

Treatment groups:

- Abendazol 200mg: Positive children in 9 communes belong to Tuan Giao and 3 communes Ta Lung, Pa Vi, Nam Ban (Meo Vac-Ha Giang). Total 159 children.
- Mebendazol 500mg: Positive children in 8 communes belong to Yen Bai and 3 communes Lung Chinh, Sung Mang, Sung Tra, Niem Tong, Niem Son, Tat Nga (Meo Vac-Ha Giang). Total 135 children.

2.2.6. Drugs using in the study

- Abendazole tablet 400mg manufactured by GlaxoSmithKline, United Kingdom, manufactured date 31/10/2013 expiry date 31/10/2018. Lot 347262.

- Mebendazol 500mg manufactured by Imexpharm, Viet Nam. Name Benca, manufactured date 16/6/2014 expiry date 16/6/2017, registed number VD-7992-09.

2.2.7. Study contentes

- Faecal test for positive children at day 21 after treatment to assess cure-rate (CR), egg reduction rate (ERR). Assess by compare with WHO reference rates:
  + Albendazole: For round worm >95% ± 10%, hookworm >90% ± 10%, whipworm >50% ± 10%.
  + Mebendazole: For round worm >95% ± 10%, hookworm >70% ± 10%, whipworm >50% ± 10%.
- Follow up and calculate acute side-effects rate (within 60 minutes after treatment).

2.3. Errors and management

- Stricly follow the study process including taking samples, faecal technique and questionnaire to minimize systematic error.

2.4. Data entry and analysis

- Data enter by EPIDATA and excel sofwaves
- Use SPSS 20.0 softwave for data analysis.

2.5. Ethical

Strictly follow ethical issue approved by NIMPE.

Chapter 3

RESULT OF THE STUDY

3.1. Prevalence, intensity and some factors related to soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015

3.1.1. Prevalence, intensity of soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015

Total of 1,240 children from 12-23 months in 3 districts had their fecal samples tested by Kato-Katz technique and 1.240 parents were interviewed by questionnaire about some risk factors related to STH

Table 3.7. Soil-transmitted helminths in 3 districts

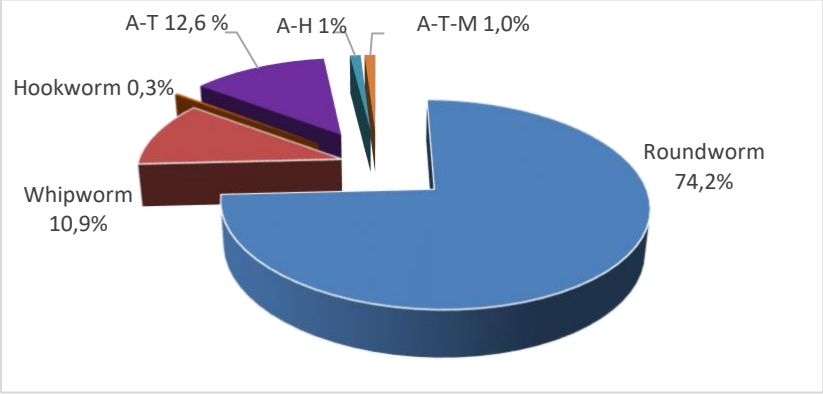
Districts	Tested	Infected	Rate %	p- value
Tuan Giao[1]	419	134	32.0	$p_{(1:2)}$ =0.04
Meo Vac[2]	389	91	23.4	$p_{(2:3)}$ =0.05
Van Yen[3]	432	69	16.0	$p_{(1:3)}$ =0.00
Total	**1240**	**294**	**23.7**	

- Of 1.240 children were tested, with 294 children had infected with at least 1 kind of STH, accounting for 23.7%.
- The prevalence of STH in Tuan Giao was highest 32.0%, followed by Van Yen 23.4%. In Yen Bai the prevalence is lowest 16.0%.

Table 3.1. Single, double and triple STH infection in survey sites (n=294)

Districts	Infected	Single		Double		Triple	
		n	(%)	n	(%)	n	(%)
Tuan Giao[1]	134	111	82.8	22	16.4	1	0.7
Meo Vac[2]	91	74	81.3	15	16.5	2	2.2
Van Yen[3]	69	66	95.6	3	4.4	0	0
Total	**294**	**251**	**85.4**	**40**	**13.6**	**3**	**1.0**
p- value		$p_{(1:2,3)}$ >0.05		$p_{(1,2:3)}$ <0.01			

- In children 12-23 months, most of them had infected with one worm, accounting for 85.4%. There are 13.6% of children infected with 2 types of worms and only 3 children had triple infected accounting for 1.0%.
- The rate of multi- infection in Tuan Giao and Meo Vac was higher than in Van Yen. The difference is statistically significant with p <0.01



Figue 3.1. Prevalence of each type of STH infection (n=294)

- The rate of single infection with roundworm is highest, accounting for 74.2% of the total number of infected cases.
- The rate single infection with hookworm was the lowest, only 1 child, accounting for 0.3%.

Table 3.2. Soil-transmitted helminths intensity in survey sites

Type of worms	Infected	Light		Moderate		Heavy	
		SL	%	SL	%	SL	%
Roundworm	261	195	74.7	56	21.4	10	3.9
Whipworm	72	71	98.6	1	1.4	0	0
Hookworm	7	7	100	0	0	0	0

The data showed that, children of this age are mainly infected with light intensity. There were 74.7% of cases of light infection with roundworm. Only 10 children had heavy infection

with roundworm, accounting for 3.9%. Whipworm infections are mostly light 98.6%. All children were infected with hookworm (7/7) with mild intensity.

We conducted survey 3 months and 6 months after the initial investigation for all children. After 6 months, 925 children were tested for STH, of which 189 children were infected with at least 1 kind of STH and 646 children were not infected in the initial survey.

Table 3.3. Soil-transmitted helminths before and after 3 and 6 months

Districts	**Initial survey (n=1.240)**			**After 3 months (n=925)**			**After 6 months (n=925)**		
	n	(+)	%	n	(+)	%	n	(+)	%
Tuan Giao	419	134	32.0	349	62	17.8	349	88	25.2
Meo Vac	389	91	23.4	151	30	19.9	151	50	33.1
Van Yen	432	69	16.0	361	7	1.9	361	12	3.3
Total	**1,240**	**294**	**23.7**	**925**	**99**	**12.1**	**925**	**150**	18.0

To calculate the incidence of each type of worm we analyze based on the number of children not infected with helminths in the baseline investigation and have taken stool samples to test at both 3 and 6 months. A total of 646 children not infected with earth-borne helminths at the baseline survey were sampled and tested again at 3 and 6 months.

Table 3.24. Incidence of each type of worms after 3 and 6 months (n = 646)

Type of worms	**After 3 months**		**Month 3 - 6**		**After 6 months**	
	(+)	%	(+)	%	(+)	%
Roundworm	27	4,2	23	3,6	50	7,7
Whipworm	11	1,7	13	2,0	24	3,7
Hookworm	2	0,3	2	0,3	4	0,6

The rate of newly infected roundworm was highest 4.2% after 3 months and 7.7% after 6 months;

The incidence of whipworm ranged from 1.7% -3.7%;

The incidence of hookworm is very low 0.3%-0.6%.

3.1.2. Factors related to soil-transmitted helminth infection in children from 12-23 months

Table 3.34. Logistic regression analysis of risk factors related to worm infection in children 12-23 months

Factors	Category	OR [95% CI]	p value
Age group	18-23 month	1.65 [1.25-2.17]	0.01
	12-17 month		
Play at groud/with soil	Yes	1.20 [0.88-1.65]	**0.331**
	No		
Number of children	≥ 3 children	2.28 [1.64-3.18]	**0.00**
	1-2 children		
Latrine	Hygienic	1.71 [1.16-2.49]	**0.015**
	Un hygienic		
Parents knowledge	Good	1.28 [0.89-1.86]	0.139
	Not good		

When analyzing univariate, we determined that there are 6 factors related to STH infection. However, the two factors of education and knowledge are two related factors, so we choose the knowledge factor to include in the model. Multivariate regression analysis to eliminate confounding factors:

- The age group 18-23 months has a risk of worm infection 1.65 times higher than that of the 12-17 month group.
- Children living in families with 3 or more children had a risk of STH infection 2.28 times higher than in a family with 1-2 children.
- Families with unhygienic latrines, children at risk of worm infection 1.71 times higher than families with hygienic latrines

3.2. The effectiveness and safety of albendazole 200 mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months in survey sites (2015 - 2016)

3.2.1. The effectiveness of albendazole 200mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months

All 294 infected children were given deworming drugs as recommended by WHO. Infected children were randomly assigned to the two treatment groups of albendazole or mebendazole.

There were 159 positive children received albendazole 200mg and 135 infected children received mebendazole 500mg.

There were 258 of 294 positive children in the baseline survey were tested to evaluate the efficacy of the drug after 21 days of treatment according to WHO guidelines.

Table 3.36. Cure-rate after 21 days of treatment

Type of worms	Albendazole 200mg			Mebendazole 500mg		
	(1)	(2)	%	(1)	(2)	%
Roundworm	129	12	90.7	97	11	88.6
Whipworm	26	12	53.8	24	3	87.5
Hookworm	3	0	100	2	0	100

(1): Number of positive children before treatment

(2): Number of positive children after treatment defined at 21-day survey.

The cure rate of albendazole and mebendazole for roundworm were very high 88.6% -90.7%.

The cure rate of mebendazole for whipworms was high at 87.5% while that of albendazole for whipworms was 53.8%.

Evaluation cure rate with hookworm did not apply due to small number of infected children.

Table 3.37: Egg reduction rate after 21 days of treatment

Type of worms	Albendazole 200mg			Mebendazol e500mg		
	(1')	(2')	%	(1')	(2')	%
Roundworm	15,034	294.3	98.0	5,296	37.1	99.3
Whipworm	277.8	60.6	78.1	158	53.7	66.0
Hookworm	141.0	0	100	180	0	100

(1'): Number of average eggs before treatment

(2'): Number of average eggs after treatment

The reduction rate of eggs of albendazole and mebendazole for roundworm and hookworm is very high, from 98.0-100%.

Comparing the criteria of WHO, the egg reduction rate of both drugs and 3 types of worms is higher than the reference rate. Therefore, we can conclude that albendazole and mebendazole are effective in treating earth-transmitted worms.

3.2.2. Re-infection rate of soil-transmitted helminths

To calculate the reinfection rate we analyzed based on the number of children infected with helminths in the initial investigation but negative in the test after 21 days and have taken stool samples for testing at both 3 and 6 months. A total of 189 children were taken for this calculation.

Table 3.43. Re-infection rate of each worm after 3 and 6 months (n=189)

Type of worms	After 3 months		From 3 – 6 months		After 6 months	
	(+)	%	(+)	%	(+)	%
Roundworm	38	20.1	5	2.6	43	22.7
Whipworm	23	12.2	0	0	23	12.2
Hookworm	2	1.1	1	0.5	3	1.6

After 6 months, the rate of re-infection with roundworm was the highest, up to 22.8%.

The rate of whipworm re-infection was 12.2% after 6 months.

Hookworm had the lowest rate of re-infection, was 1.6% after 6 months.

3.2.3. The effectiveness of albendazole 200mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months.

Table 3.44. Prevalence of acute side-effects

Side effect	Albendazol 200mg n=159		Mebendazol 500mg n=135	
	n	%	n	%
Fever	0	0	0	0
Urticaria, rash	0	0	1	0,7
Pain abdomen	0	0	0	0
Vomit, nausea	0	0	0	0
Diarhearr	0	0	0	0

In 159 children taking albendazole 200mg, there was no case of children having unwanted effects.

Among 135 children receiving mebendazole 500mg, there was 1 child with acute urticaria after taking the drug within 1 hour, accounting for 0.7%. In this case, the child completely recovered immediately after taking antiallergic drugs and did not require inpatient treatment.

Describe the case of side-effect:

This is the case of a young girl aged 19 months.

Completely healthy, with no history of allergy.

Before taking the drug, the child did not appear itchy, rash. After taking the drug for about 30 minutes, children appear a rash in the abdomen, size 0.5-2cm. The rash gradually spread to the groin, back, arms, and thighs, accompanied by itching. Children had no fever, no difficulty breathing. Before taking the drug, children did not eat strange foods and/or any other drugs, so we thouth a lot about undesirable effects after taking

mebendazole 500mg. Children were taking Siro Fexofenadine 15mg and monitored at the station. Symptoms relieved immediately after taking the drug 1 hour and the child did not need additional medication after the above therapeutic dose.

Thus, in this case, the child develops urticaria about 30 minutes after taking mebendazole and therefore was classified into the group of acute undesirable effects.

Children with acute urticaria after taking the drug have symptoms of the whole body, but did not affect the function of life and living. Symptom relieved rapidly after medical treatment and was not hospitalized and was therefore classified in category 2.

Chapter 4.
DISCUSSION

4.1. Prevalence, intensity and some factors related to soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015.

4.1.1. Prevalence, intensity of soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015

In a total of 1,240 children tested by the Kato-Katz method, there are 294 children infected with STH, accounting for 23.7%. In which Tuan Giao district had the highest infection rate of 32%, followed by Meo Vac district 23.4% and the lowest was Van Yen district 16%.

Our survey results show that there are differences in infection rates and worm infection intensity depending on the study sites due to economic, cultural, sanitation and hygiene differences. active.

In our study, Van Yen district had the lowest STH infection rate at 16%. Analysis of interview results shows that Van Yen district is the district with the best socio-economic

conditions, also the place with the highest percentage of hygienic latrines at 52.8% and this is the reason why. Prefer the worm infection rate here is lower than the other two districts in the study.

The rate of worm infection in Tuan Giao, Dien Bien was up to 32%, of which, roundworm infection was 28.9%. However, compared with the previous survey by the National Institute of Malaria- Parasitology and Entomology in 2009 at the same location, the rate in our study was lower due to the difference in the time of the investigation as well as research subjects.

The prevalence of soil-transmitted helminth infection in our investigation in Meo Vac, Ha Giang is also consistent with the research results of author Nguyen Thu Huong in 2015. Accordingly, the results of fecal testing by Kato-Katz method of the rate of sex ratio 23.3% of children aged 12-23 months in Yen Minh district, Ha Giang province, and 20.4% in Muong Lat district, Thanh Hoa province. According to Nguyen Thu Huong (2015), the rate of worm infection in children 13-24 months old in Muong Te district, Lai Chau is 20.2%.

This study showed that children aged 12-23 months mainly infected with 1 type of worm with mild intensity of infection.

The rate of infection with the light intensity roundworm was 74.7%, the average infection was 21.4 and only 3.9% of the heavy intensity.

Up to 98.6% of cases of mild-intensity whipworm infection and 100% of cases of mild-intensity hookworm infection.

Our research shows that children 12-23 months are a young age, so they often get infected with one type of worms, rarely combine two or more types of worms. Out of 294 cases of worm infection, 85.4% of children were infected with a worm. The number of children infected with two or more worms accounts for 13.6%. In which, there were only 3 cases of

simultaneous infection with all 3 types of worms with the prevalence of 1.0%.

4.1.2 Factors related to soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang)

Children aged 18-23 months had a risk of STH infection 1.65 times higher than children aged 12-17 months. Our research results are also consistent with reports of domestic and foreign authors showing that the older the child, the more worm infection rate tends to increase due to the more active children, the risk of exposure to source of worm infection increased.

According to Teha Shumbej (2015), in Ethiopia, the prevalence rate among children 12-23 months was 14%, while that in the 24-35 month group was 21.7%, in the 36-47 month group was 33. , 0%. Compared to the group of 12-23 months, the group of children 24-35 months had a risk of worm infection 1.3 times higher, while the group of children 36-47 months had a risk of infection with worms 2.5 times higher

According to Kirwan, a group of children aged 12-17 months had a risk of worm infection 2.18 times, a group of children 18-24 months had a risk of infection with worms 2.52 times higher than a group of children 7-11 months.

Our research has shown that the risk of worm infection in children whose families do not have hygienic latrines are 1.71 times higher than those in families using hygienic latrines.

Children living in families with 3 or more children had a risk of worm infection 2.28 times higher than a family with only 1-2 children.

Similarly, Samuel (2017) showed that children living in families with more than 3 children were at higher risk of worm infection than families with 1-2 children.

This is completely explainable. In our study, the average age of young parents was 25 years old. Getting married early and giving birth at a young age can lead to parents not having enough time and economic conditions to care for their children. Therefore, children are not only susceptible to worms but also susceptible to other infectious diseases, or malnutrition, slow growth.

4.2 The effectiveness and safety of albendazole 200 mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months in survey sites (2015 - 2016)

4.2.1 The effectiveness of albendazole 200mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months

The study results showed that the egg-reduction rate of albendazole for roundworm was 90.7%, whipworm was 53.8% hookworm was 100%. The egg cleanliness rate of mebendazole for roundworm is 88.6%, whipworm is 87.5% and hookworm was 100%.

Our research shows that the rate of albendazole egg reduction for roundworm is 98%, whipworm is 78.1% hookworm was 100%. The egg reduction rate of mebendazole for roundworm is 99.4%, whipworm is 66% and hookworm was 100%.

This result is completely consistent with the conclusions of other authors' studies.

According to WHO, with both albendazole and mebendazole drugs, the drug is considered effective if the rate of egg reduction with roundworm is over 90%, with hookworm was over 70% and whipworm is over 50%. According to WHO, the egg reduction rates of both drugs with 3 types of worms are higher than the reference threshold.

After 3 months, the incidence of roundworm was 3.6%, after 6 months it was 7.7%; The incidence of whipworm after 3 and 6 months was 2.0% and 3.7%, respectively. The incidence of hookworm was very low, only 0.3% and 0.6% at 2 times.

After 3 months, the rate of re-infection with roundworm was 20.1%, after 6 months, it was 22.7%; The rate of re-infection with whipworms after 3 and 6 months were both 12.2%. The rate of hookworm re-infection was 1.1% after 3 months and 1.6% after 6 months.

4.2.2. The safety of albendazole 200mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months

There were 159 infected children taking the drug albendazole 200mg without any case of children showing side effects.

There were 135 infected children who were given mebendazole 500mg, one child showed acute urticaria after taking the drug within 1 hour, accounting for 0.7%. This iwas classified as an acute reaction, degree 2.

According to Pamba (1998), treatment for 100 children aged 8-24 months infected with STD with albendazole 200mg a single dose, but none of the children experienced undesirable effects.

Similarly, Montresor (2002) compared two groups that treated children 12-24 months with mebendazole 500mg (317 infants) and the control group using placebo (336 infants). The results showed that the rates of undesirable symptoms occurring within 7 days after taking the drug of the two groups were similar, 34.0% and 32.1%, respectively. Accordingly, there was no difference in the rate of unwanted effects between the two groups. Undesirable symptoms that cannot be confirmed due to oral drug. Therefore, the author suggests that mebendazole can be used in the treatment of STH in children 12-24 months.

According to Horton (2000), albendazole is highly effective and safe in the treatment of hip fracture even in case

treatment as well as in community treatment. Follow-up of 22,810 children taking albendazole 400mg showed that the rate of unwanted effects was 1.0%, mainly stomach pain 0.38%, diarrhea 0.35%, headache 0.34%, urticaria 0.026%, allergy 0.013% ...According to Annert Ehrhardt, the post-treatment survey at 91 primary schools, with 2323 students taking a 400mg albendazol worm bleach participating in interviews, the rate of unwanted effects was 0.4%. According to WHO (2000), of 35 trials involving 13,013 worm-infected people treated with albendazole 400mg, no adverse events have been reported. In another trial on 9,220 patients there were 409 cases of side effects, accounting for 4.4%, of which epigastric pain was 0.3%, diarrhea was 0.3%, nausea was 0.2%; headache 0.2%, dizziness 0.1%; edema 0.7/oo, rash 0.2/oo, urticaria 0.1/oo ...

Thus, albendazole, mebendazole is effective and high safety in the treatment STH for children 12-23 months.

CONCLUSION

1. Prevalence, intensity and some factors related to soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015.

1.1. Prevalence, intensity of soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015

- In 3 districts of 3 provinces, Dien Bien, Ha Giang, Yen Bai, feces tested for 1240 children aged 12-23 months, with 294 children infected with at least one type of STH, accounting for 23.7%;
- The rate of STH infection in Tuan Giao was 32%, in Meo Vac was 23.4%, in Van Yen was 16.0%;
- There are 85.4% of children had single infection. The number of children infected with combination of 2 types of worms or more, accounted for 14.6%.

- There were 74.7% of cases infected with roundworm with mild intensity, 21.4% with moderate intensity and 3.9% with severe intensity.
- Most of the mild intensity whipworm infections are 98.6%, only 1.4% are infected with moderate intensity whipworms.
- 100% hookworm cases (7/7 cases) was infected with mild intensity.

1.2 Factor related to soil-transmitted helminths infection in children from 12 - 23 months in Tuan Giao (Dien Bien), Van Yen (Yen Bai) and Meo Vac (Ha Giang) in 2015.

- Factors related to STH infections in children 12-23 months include the child's age group, the number of children in the household, and unhygienic latrines.
- The age group 18-23 months had a risk of infection with worms 1.65 times higher than that of children 12-17 months.
- Children living in families with 3 or more children had a risk of worm infection 2.28 times higher than a family with only 1-2 children.
- Families with unhygienic latrines, children at risk of worm infection 1.71 times higher than families with hygienic latrines.

2. The effectiveness and safety of albendazole 200 mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months in survey sites (2015 - 2016)

2.1 The effectiveness of albendazole 200mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months

- The egg reduction rate of albendazole with roundworm is 90.7%, whipworm is 53.8% and hookworm is 100%; The

rate of albendazole egg reduction with roundworm is 98.0%, whipworm is 63.8% and hookworm is 100%

- The egg cleanliness rate of mebendazole with roundworm was 88.6%, whipworm was 87.5% and hookworm was 100%; The rate of egg reduction of mebendazole with roundworm was 99.3%, whipworm was 66.0% and hookworm was 100%.
- According to WHO's reference threshold, albendazole 200mg and mebendazole 500mg are effective in the treatment of STH in children 12-23 months.

2.2 The safety of albendazole 200mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months

- Among 159 children receiving albendazole 200mg for deworming, no children showed side-effects, rate 0%.
- Among 135 children who received mebendazole 500mg, 01 child showed acute urticaria, accounting for 0.7%. The child received medical treatment and recovered completely after that.
- Thus, albendazole and mebendazole are highly effective and safe drugs when treating DM as well as mass deworming in the community for children aged 12-23 months.

RECOMENDATION

- Albendazole and mebendazole are highly effective and safe drugs when treating STH for children aged 12-23 months.
- Treating for children 12-23 months infected with STH by albendazole 200mg or mebendazole 500mg
- Community treatment for children aged 12-23 months with albendazole 200mg or mebendazol 500mg single dose in areas with STH prevalence over 20%.

LIST OF PUBLISHED PAPERS DIRECTLY RELATED TO THE THESIS

1. Vu Thi Lam Binh, Do Trung Dung, Ta Thi Tinh, Ngo Duc Thang (2020), Situation and factors related to soil-transmitted helminths in children from 12-23 months in some mountainous districts of Dien Bien, Yen Bai, Ha Giang (2015-2016), *Journal of Malaria-Parasite Diseases Control* No. 5 (119)/2020, pp. 32 - 37
2. Vu Thi Lam Binh, Do Trung Dung, Ta Thi Tinh, Nguyen Thu Hien, Tran Xuan Truong (2020), The effectiveness and safety of albendazole 200 mg, mebendazole 500mg single dose in soil-transmitted helminths treatment for children from 12 - 23 months in some Northern provinces, *Journal of Malaria-Parasite Diseases Control* No. 5 (119)/2020, pp. 38- 44.