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Current Situation of Hookworm Infections in the People of Cu M'lan Commune, Ea Sup District, Dak Lak Province

Phan Van Trong ^{1*}, Dang Dinh Thanh ², Hoang Hai Phuc ³, Pham Thi Thanh Hong ⁴, Nguyen Tuan Anh ⁵

¹ Tay Nguyen University, Vietnam

² Buon Ma Thuot Medical University, Vietnam

^{3, 4, 5} Dak Lak Provincial Center for Disease Control, Vietnam

* Corresponding Author: **Phan Van Trong**

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Abstract

Hookworm infections are among the most common parasitic diseases worldwide, particularly in developing countries where sanitation conditions are poor and hygiene practices are inadequate. This disease can lead to serious health issues such as anemia, malnutrition, and negatively impact the quality of life of affected individuals.

Objective: To determine the prevalence and intensity of hookworm infections among the residents of Cu M'lan Commune, Ea Sup District.

Research Subjects and Methods: A cross-sectional research design conducted in the community (aged 3 and above) living in Cu M'lan Commune, Ea Sup District, Dak Lak Province, in 2024.

Results: The prevalence of hookworm infections was 22.73%, with intensity remaining at a mild level (46.4 eggs/1g of stool). The infection rates among different ethnic groups (Kinh and minorities) and genders (males and females) were similar. The infection rate in the 16-59 age group was 26.59%, and it was higher among individuals with education levels below high school (25%) and those working in agriculture (27.24%) compared to other groups in the research area.

Conclusion: The prevalence of hookworm infections in the area remains relatively high, but the intensity of infections is mild. The rate of hookworm infections is associated with education level and occupation.

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Introduction

Ancylostoma duodenale (*A. duodenale*) and *Necator americanus* (*N. americanus*) are two species of roundworms belonging to the Ancylostomatidae family. According to the World Health Organization (WHO), hookworm infections are among the most prevalent parasitic diseases in developing countries, affecting millions of people, particularly children and pregnant women [6]. Dak Lak Province, in general, and Ea Sup District, in particular, have soil and climatic conditions that are very suitable for the survival and development of hookworms. The outdated living and farming practices, poor hygiene in eating, and limited knowledge about hookworm infections among the local population increase the likelihood of hookworm infections. Numerous studies on the prevalence of hookworm infections in Dak Lak indicate a high infection rate. According to a research by Chu Thi Kim Huong (2022), the infection rate in the people of Bong Krang Commune, Lak District, Dak Lak Province, is 35.07% [2]. Cu M'lan Commune, Ea Sup District, is a particularly difficult economic area classified as Zone III, home to many ethnic minorities, with 34.7% of households living in poverty or near poverty, and 90% of the land used for agriculture. Given the widespread nature and serious complications of hookworm disease, early diagnosis and timely specific treatment are priorities in community health care. To contribute to efforts to prevent and mitigate the effects of hookworms and improve the health of residents, we

are conducting a research titled: “Current Status of Hookworm Infections and Related Factors Among the People of Cu M'Lan Commune, Ea Sup District, Dak Lak Province in 2024” with two objectives:

1. To determine the rate and intensity of hookworm infections among the people of Cu M'Lan Commune, Ea Sup District, Dak Lak Province in 2024.
2. To describe some related factors of hookworm infections among the residents at the research site.

Subjects and Methods

Location: Cu M'Lan Commune, Ea Sup District, Dak Lak Province.

Duration: April 2024 to October 2024.

Subjects:

- Inclusion Criteria: Residents aged 3 years and older living in the research area.

- Exclusion Criteria

- + Refusal to participate in the research.
- + Not present in the locality during the research period.
- + Inability to communicate (for KAP survey participants: individuals under 15 years without a relative to answer KAP; individuals 15 years and older unable to respond to KAP interviews).
- + Unsuitable samples due to improper collection, contamination with soil or sand.
- + Received deworming treatment less than 30 days prior to the survey.

Design: Cross-sectional research.

Sample Size: Calculated using the formula

$$n = \frac{Z_{(1-\alpha/2)}^2 p(1-p)}{d^2}$$

In this:

n: Minimum sample size needed to estimate the prevalence of hookworm infections..

α : Significance level. We choose $\alpha = 0,05$ thus $Z_{(1-\alpha/2)} = 1,96$.

p: Desired prevalence value, set at 35.07% (prevalence rate from the research by Chu Thi Kim Huong in 2022) [2].

d: Precision (allowed error), set at $d = 0,05$

Substituting the values gives $n=350$ individuals. Estimating the dropout rate (exclusion) at 5%, the required sample size is 368 individuals.

Sampling Method

- Create a complete list of all households in the commune (1,712 households).
- Sampling unit: Household
- Calculate sample interval: The research sample size is 368 individuals, with an average of 4 people per household, resulting in 93 households to be selected. Thus, the interval K is:

$$K = \frac{1.712 \text{ households}}{93 \text{ households}} \approx 19$$

- Randomly select a household with a number between 1 and 19, record the head of the household's name, and select that household as the first.
- From the first household, select subsequent households in the list with an interval of 19 until reaching 93 households.
- If reaching the last household and the sample size is not met, loop back to the beginning until the required number of samples is obtained.

Data Collection Method

- Assess the prevalence and intensity of hookworm infections using the Kato-Katz stool examination method.
- Investigate related factors through direct interviews using a KAP questionnaire.

Data Processing

- Data will be rounded to one decimal place.
- Data will be processed using STATA 13.0.
- Analysis of factors related to hookworm infection will be conducted (calculating PR, CI 95%, and p-value).

Ethical Considerations

- Participants will be informed about the purpose and content of the research.
- Research data will only serve research objectives.
- Participants will not incur costs for diagnostic tests, preventive counseling, and will receive deworming medication.

Results

The prevalence of hookworm infections at the research site

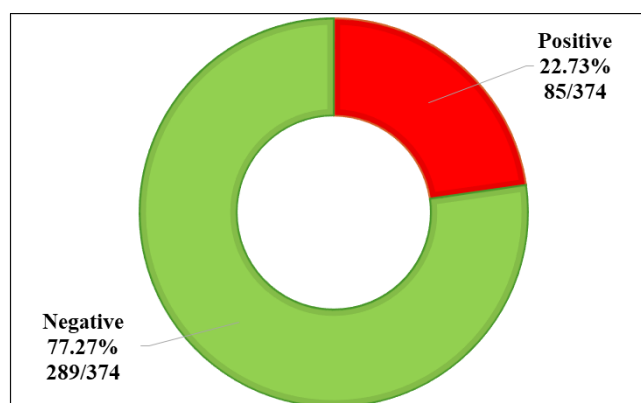


Fig 1: Prevalence of Hookworm Infections at the Research Site

Testing of 374 stool samples using the Kato-Katz technique revealed that the prevalence of hookworm infections at the research site was 22.73% (85/374).

Prevalence of Hookworm Infections by Characteristics of the Research Population

Table 1: Prevalence of Hookworm Infections by Gender, Ethnicity, Age Group, Education Level, and Occupation

Factor		Hookworm (n=374)				OR (CI 95%)	p
		Positive		Negative			
		Qty	%	Qty	%		
Gender	Male	33	21.43	121	78.57	0.9 (0.54 - 1.44)	> 0.05
	Female	52	23.64	168	76.36		
Ethnicity	Minorities	25	25.25	74	74.75	1.2 (0.71 - 2.07)	> 0.05
	Kinh Ethnic	60	21.82	215	78.18		
Age group	3-11 ¹	8	13.33	62	86.67	1	
	12-15 ²	2	11.43	13	88.57	1.2(0.23 - 6.28)	⁽¹⁻²⁾ > 0.05
	16-59 ³	71	26.59	196	73.41	2.8(1.28 - 6.25)	⁽¹⁻³⁾ 0.008
	≥ 60 ⁴	4	20.00	16	80.00	1.9(0.51 - 7.25)	⁽¹⁻⁴⁾ > 0.05
Education level	< High School	75	25.00	225	75.00	2.1 (1.04 - 4.37)	0.03
	≥ High School	10	13.51	64	86.49		
Occupation	Student ¹	9	10.11	80	89.89	1	
	Farmers ²	73	27.24	195	72.76	3.3(1.59 - 6.97)	⁽¹⁻²⁾ <0.001
	Others ³	3	17.64	14	82.35	1.9(0.45 - 7.92)	⁽¹⁻³⁾ >0.05

The prevalence of hookworm infections showed no statistically significant difference between genders (male, female) and ethnic groups (Kinh, minorities).

The group aged 16 - 59 years had a hookworm infection rate 2.9 times higher than the group aged 3 - 11 years (the difference is statistically significant). The groups aged 12 - 15 years and ≥ 60 years had higher infection rates compared to the 3 - 11 year group, but the differences were not statistically significant.

The prevalence of hookworm infections in the group with education level below high school (25.00%) was 2.1 times higher than in the group with education level at or above high school (13.51%), with a statistically significant difference ($p < 0.05$).

The group engaged in agriculture (27.24%) had an infection rate 3.3 times higher than the student group (10.11%), with a statistically significant difference ($p < 0.001$). The group with

other occupations had an infection rate 1.9 times higher than the student group; however, this difference was not statistically significant ($p > 0.05$).

Table 2: Levels of Hookworm Infection Intensity

Infection Intensity Level	Quantity	Percentage (%)
Mild	85	100
Moderate	0	0
Severe	0	0

At the research site, 100% of the individuals infected with hookworms had a mild infection level, with no cases of moderate or severe infections.

Table 3: Intensity of Hookworm Infections by Research Subject Information

Factor		Sample Size	Hookworm Infections	Average Eggs per Gram of Stool
Gender	Male	154	33	47.7
	Female	220	52	45.5
Total		374	85	46.6
Ethnicity	Minorities	99	25	47.9
	Kinh Ethnic	275	60	47.2
Age group	3-11	70	8	22.4
	12-15	15	2	30.7
	16-59	267	71	54.9
	≥ 60	20	4	24.0
Education level	< High School	300	75	52.6
	≥ High School	74	10	28.7
Occupation	Student	89	9	24.3
	Farmers	268	73	46.6
	Others	17	3	33.9

The overall intensity in the research group is 46.4 eggs per gram of stool, indicating a mild level of infection.

The infection intensity among genders (male and female) and ethnic groups (Kinh and ethnic minorities) is comparable.

The highest intensity of hookworm infection is found in the 16-59 age group (54.9 eggs per gram of stool) compared to other age groups.

In the group with education levels below high school, the intensity is 52.6 eggs per gram of stool, and in the agricultural group, it is 46.6 eggs per gram of stool, both still indicating a

mild level of infection.

Discussion

Prevalence of Hookworm Infections at the Research Site

Stool tests using the Kato-Katz method revealed a hookworm infection rate of 22.73% at the research site. This result is higher than the research conducted by Doan Thi Kieu Nga (2020) in Long An Province (13.1%) [3], or the research by Do Trung Dung (2021) in Son La Province (19.78%) [1]. Our results are consistent with those of Tran Thi Kim Phuong

(2023) in Krong Nang District, which showed a prevalence of 25.58% [4]. The differences between our findings and those of other authors may be due to variations in the timing and location of the studies, as well as differences in economic, cultural, and social characteristics, customs, and living habits. Annually, Dak Lak Province conducts regular deworming campaigns for at-risk populations. Before this research, women aged 15-45 across the province had undergone deworming 11 months prior, and children aged 2-5 and 6-11 had been dewormed 6 months prior. However, the prevalence of hookworm infections in our research community (22.73%) remains quite high, indicating a need for focused efforts in the prevention of intestinal parasitic diseases, particularly hookworm infections.

Prevalence of Hookworm Infections by Characteristics of the Research Population

Prevalence of Hookworm Infections by Gender

In our research, there was no statistically significant difference in hookworm infection rates between genders (male and female). This result is quite similar to the findings of Chu Thi Kim Huong (2022) in Lak District [2], Tran Thi Kim Phuong (2023) in Krong Nang District [4]. The results from various authors suggest that the prevalence of hookworm infections is not related to gender. Infection rates depend more on other risk factors such as personal hygiene and exposure to contaminated soil.

Prevalence of Hookworm Infections by Ethnicity

Our research's findings (Table 1) showed no significant difference in hookworm infection rates between ethnic groups (Kinh and ethnic minorities). This differs from the research by Chu Thi Kim Huong (2022), which found higher rates of infection among ethnic minorities compared to the Kinh group [2], and similar results from Tran Thi Kim Phuong (2023) [4] cũng cho kết quả tương tự. In our research area, ethnic minorities only constituted 26.47% (99/374), making it difficult to assess the relationship between infection rates and ethnic characteristics.

Prevalence of Hookworm Infections by Age Group

The infection rates in the 12-15 age group (11.43%) and those aged ≥ 60 (20.00%) were 1.2 and 1.9 times higher, respectively, compared to the 3-11 age group, though the differences were not statistically significant ($p > 0.05$). The infection rate in the 16-59 age group (26.59%) was 2.8 times higher than in the 3-11 age group, with a statistically significant difference ($p < 0.05$). Studies by Chu Thi Kim Huong (2022) [2], and Tran Thi Kim Phuong (2023) [4] also noted high infection rates in the 16-59 age group, as this is the working-age population. In our research area, 71.66% of the population is engaged in agriculture, which leads to increased exposure to soil and potential risk behaviors such as not using protective gear (gloves, boots) and going barefoot while working in the fields. The 3-11 age group, consisting of preschool and elementary school children, has been regularly dewormed over the past decade, showing a hookworm infection rate of 13.33%.

Prevalence of Hookworm Infections by Education Level

The infection rate in the group with education levels below high school (25%) was 2.1 times higher than in those with education levels \geq high school (13.51%), with a statistically significant difference ($p = 0.03$). Studies by Ajampur SSR

(2021) in South India [5]; Chu Thi Kim Huong (2022) in Lak District [2], Tran Thi Kim Phuong (2023) [4] also indicated that hookworm infection rates are related to education levels. Lower educational attainment likely limits awareness of hookworm disease, thereby increasing the risk of infection. This highlights the need for educational interventions to prevent hookworm infections in the community.

Tỷ lệ nhiễm giun móc/mô theo nhóm nghề nghiệp

The infection rate in the agricultural group (27.24%) was 3.3 times higher than in students (10.11%), with a statistically significant difference ($p < 0.001$). The infection rate in other occupational groups was 1.9 times higher than in students; however, this difference was not statistically significant ($p > 0.05$). Studies by Chu Thi Kim Huong (2022) in Lak District [2], Tran Thi Kim Phuong (2023) [4] also found that agricultural workers had the highest rates of hookworm infections compared to other occupational groups. This is consistent with the nature of agricultural work, which frequently involves contact with soil, thus increasing the risk of hookworm infections.

Prevalence of Hookworm Infections by Occupation

At the research site, the overall intensity of infection among participants was 46.4 eggs per gram of stool; the intensity of infection was similar between genders (male and female) and ethnicities (Kinh and ethnic minorities), all showing mild levels of infection. Our findings align with those of Chu Thi Kim Huong (2022) in Lăk District, which also found comparable intensity levels between genders and ethnic groups, with all infections classified as mild [2]. Table 3 shows that the intensity of hookworm infections across age groups was highest in the 16-59 age group at 54.9 eggs per gram of stool, followed by the 12-15 age group at 30.7 eggs per gram, and lowest in the 3-11 age group at 22.4 eggs per gram (all indicating mild infection levels). The intensity of hookworm infections was notably higher in the agricultural group compared to others. This suggests that infection rates in the community remain high, but the intensity of infections is mild, reflecting the efforts of local health authorities in combating parasitic diseases.

Conclusion

The overall prevalence of hookworm infections is relatively high (22.73%), but the intensity of infections is mild (46.4 eggs per gram of stool) at the research site.

The prevalence and intensity of hookworm infections are comparable between genders (male and female) and ethnicities (Kinh and ethnic minorities).

The infection rates in the 12-15, 16-59, and ≥ 60 age groups are higher than in the 3-11 age group, with the highest intensity in the 16-59 age group at 54.9 eggs per gram of stool.

The prevalence of hookworm infections is associated with education levels and occupations.

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