Prevalence and Some Related Factors of *Taenia Saginata* Infection among People in Ea Bar Commune, Buon Don District, Dak Lak Province In 2024

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Abstract
Taenia saginata infection occurs when people consume beef-containing tapeworm larvae that have not been properly cooked. Once the larvae reach the small intestine, they become adult tapeworms within 2.5 to 4 months. The disease's impact and complications significantly affect human health. Patients may experience bloating, fatigue, dizziness, headaches, and discomfort in the anal region due to the detachment of tapeworm segments, which can crawl out of the body through the anus.
Objective: To determine the prevalence and describe some factors related to *Taenia saginata* infection among residents of Ea Bar commune, Buon Don district, Dak Lak province, in 2024.
Research Method: A cross-sectional study using the Kato stool examination technique and a KAP survey to detect the infection rate and describe related factors.
Results: The study found that the prevalence of *Taenia saginata* infection in the study area was 9.56%. The infection rate in the age group 26 and older was higher (17.65%) than those aged 25 and younger (2.13%). This difference was statistically significant ($p<0.05$). There was an association between tapeworm infection and knowledge about transmission routes, harmful effects, prevention measures, and eating undercooked beef.
Conclusion: Intervention programs need to be implemented in sync with education strategies, food source control, and improving people's awareness of helminth disease prevention in general and *Taenia saginata* infection in particular.

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Introduction

Infection with *Taenia saginata* is a significant public health issue, particularly in rural areas where people often consume undercooked or improperly processed beef. Factors such as dietary habits, sanitary conditions, and public awareness regarding the disease play crucial roles in increasing the risk of infection.
Taenia saginata infections are prevalent worldwide, with the highest incidence reported in the sub-Saharan Africa, Middle East, Latin America, Eastern Europe, and Southeast Asia. In Asia, the overall prevalence among countries ranges from 0.03% to 33.7%, with the Philippines reporting the highest prevalence, followed by Pakistan, Indonesia, and India. Conversely, countries with lower prevalence rates include South Korea, China, and Thailand [4, 6, 9, 12].
Infection with *Taenia saginata* can significantly impact public health, causing various uncomfortable symptoms and serious complications such as enteritis, gastrointestinal disturbances, and general weakness. Understanding the prevalence of infection and associated risk factors will enable local health authorities to implement timely interventions, thereby improving community

health and reducing the spread of the disease [2, 7].

The Ea Bar commune in Buon Don district, Dak Lak province, primarily relies on agriculture and livestock farming, particularly buffalo and cattle. This area is home to 10 different ethnic groups, with ethnic minorities constituting about 36% of the total population. The local population often consumes dishes such as beef blood pudding and smoked buffalo and cattle during festivals and mourning ceremonies. Moreover, livestock farming is mainly conducted on an individual household basis, with simple waste management systems that often discharge waste directly into the environment, significantly contributing to the transmission of infectious diseases in general and *Taenia saginata* infection specifically [5].

To contribute to the national program for the prevention of helminth infections in general and *Taenia saginata* infection specifically, we propose measures to prevent *Taenia saginata* infections. We are conducting the study titled: "***Prevalence and some related factors of taenia saginata infection among people in Ea Bar commune, Buon Don district, Dak Lak province in 2024",*** with two objectives:

1. To determine the prevalence of *Taenia saginata* infection among residents of Ea Bar commune, Buon Don district, Dak Lak province in 2024.
2. To describe some factors associated with *Taenia saginata* infection among residents at the study site.

Research Methods

Location: Ea Bar commune, Buon Don district, Dak Lak province.

Duration: from June 2024 to December 2024.

Subjects: All individuals aged 5 years and older.

Research Methodology

- **Design:** Cross-sectional study.
- **Sample Size:** The sample size will be calculated using the following formula:

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

In this:

n: Minimum sample size needed to estimate the prevalence of *Taenia saginata* infection.

p: 17.75% (According to the study by Dung Nguyen Thi, 2023) [1].

d: Absolute error. Chosen: d = 0.05

Thus, the sample size: **n = 225** (Including an 11% adjustment for potential loss, the final sample size is approximately 251 individuals).

Sampling Method: Systematic random sampling.

Inclusion Criteria

- Individuals aged 5 years and older.
- Willingness to undergo testing and participate in interviews.

Exclusion Criteria

- Individuals who refuse to participate in the study or are not present in the locality.
- Individuals unable to communicate effectively.

Data Processing and Analysis

All data collected in the study will be entered into Epidata software and statistically analyzed using Stata 10.0.

Potential Errors and Mitigation Strategies

This is a cross-sectional study; therefore, the data collected reflects results only at the time of the survey. Due to limited resources, the study will be conducted on 251 subjects, making the results not representative of the entire Buon Don district.

Potential errors may occur during KAP interviews. To minimize errors, local health workers or community health officials will assist in conducting interviews and serve as interpreters when necessary.

Ethical Considerations in Research

To ensure ethical standards in the research, the following guidelines must be adhered to:

- The research proposal must be presented to and approved by the scientific council, the educational institution, and local authorities before implementation.
- After obtaining research results, individuals with *Taenia saginata* infections and related behaviors will be counseled on preventive measures and appropriate treatment through local health officials.
- All participant information will be kept confidential and used solely for research purposes.

Results

Prevalence of Taenia saginata Infection at the research site

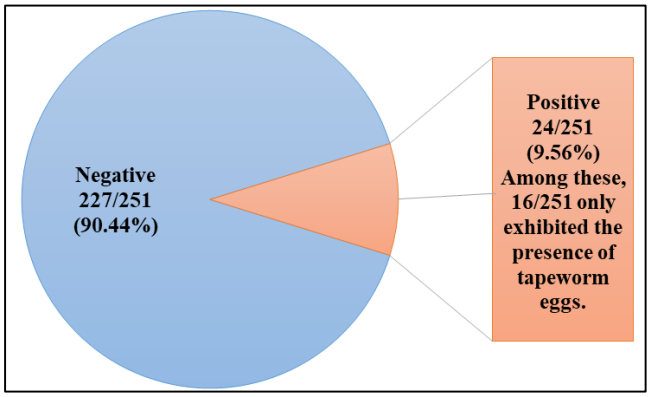

Fig 1: Prevalence of Taenia saginata Infection at the research site

The prevalence of *Taenia saginata* infection among residents of Ea Bar commune, Buon Don district, Dak Lak province, is 9.56%. Within this group: Samples with Tapeworm Eggs Only 16 cases, accounting for 6.37%. Samples with Both Tapeworm Eggs and Proglottids 24 cases, accounting for 9.56%.

Table 1: Prevalence of Taenia saginata by Gender, Ethnicity, Educational Level, and Age Group

Factor		*Taenia saginata* (n = 251)		OR (CI 95%)	p
		Positive (%)	Negative (%)		
Gender	Male	15 (12.20%)	108 (87.80%)	1.84 (0.77-4.37)	0.16
	Female	9 (7.03%)	119 (92.97%)		
Ethnicity	Ethnic Minorities	19 (15.57%)	103 (84.43%)	4.57 (1.65-12.67)	0.002
	Ethnic Kinh	5 (3.88%)	124 (96.12%)		
Educational level	Primary or Below	11 (11.58%)	84 (88.42%)	Reference Group	
	Lower Secondary	7 (8.64%)	74 (91.36%)	1.34 (0.50 - 3.62)	0.56
	Upper Secondary	6 (8.00%)	69 (92.00%)	1.45 (0.51 - 4.09)	0.48
Age group	5 - 15	0	69	No cases detected	
	16 - 25	1 (2.13%)	46 (97.87%)	Reference Group	
	26 - 60	18 (17.65%)	84 (82.35%)	0.10 (0.01 - 0.78)	<0.001
	> 60	5 (15.15%)	28 (84.85%)	0.12 (0.01 - 1.09)	0.03

There were no statistically significant differences in the prevalence of *Taenia saginata* infection based on gender and educational level. However, the prevalence of *Taenia saginata* infection among ethnic minorities was significantly higher than that of the Kinh ethnic group (15.57% compared to 3.88%), with a statistically significant difference ($p < 0.05$).

In the age group of 5 - 15 years, there were no reported infections, while the infection rate for those aged 16 - 25 years was 2.13%. The highest prevalence was observed in the group aged 26 - 60 years (17.65%), followed closely by those over 60 years (15.15%). There was a statistically significant difference among the age groups ($p < 0.05$).

Factors Associated with Taenia saginata Infection

Table 2: Relationship Between Knowledge, Practices, and Taenia saginata Infection

Factor		Taenia saginata (n = 251)		OR (CI 95%)	p
		Positive (%)	Positive (%)		
Knowledge of Transmission	Not know	16 (19.51%)	66 (80.49%)	2.96 (0.14 - 0.83)	0.015
	Knew	8 (7.55%)	98 (92.45%)		
Knowledge of Harm	Not know	11 (34.38%)	21(83.78%)	4.15 (1.63 – 10.51)	0.001
	Knew	13 (11.21%)	103 (88.79%)		
Knowledge of Prevention	Not know	15 (34.88%)	28 (65.12%)	8.09 (3.22 – 20.33)	<0.001
	Knew	9 (6.21%)	136 (93.97%)		
Consumption of Undercooked Beef	Ate	21 (17.27%)	102 (82.93%)	4.25 (1.21 - 14.85)	0.015
	Not eat	3 (4.62%)	62 (95.38%)		

The group without knowledge of the transmission routes, harmful effects, and preventive measures has a risk of infection with *Taenia saginata* that is 2.96, 4.15, and 8.09 times higher compared to the other groups, with statistical significance. Individuals who consumed undercooked beef were 4.25 times more likely to be infected with *Taenia saginata* compared to those who did not consume it ($p < 0.02$).

Discussion

Prevalence of *Taenia saginata* Infection at the research site

The findings of this research indicate that the prevalence of *Taenia saginata* infection in Ea Bar commune, Buon Don district, Dak Lak province, is 9.56%. When compared with researches conducted by various authors globally, our results are lower than those reported by H. Ur Rahmana *et al*. (2022), who found an infection rate of 22.6% in urban areas of Lower Dir district, Pakistan [8]. Similarly, the research by Samson Terefe Kassa *et al*. (2023) in Ethiopia reported infection rates ranging from 10% to 70% [10]. However, our findings are comparable to those of Hong N.T.C *et al*. (2023), which reported an infection rate of 10.1% [3].

In contrast, when compared to researches from Southeast Asia, our prevalence rate of 9.56% is higher than the findings of Taehee Chang *et al*. (2020) in Cambodia, which reported a 2.4% positivity rate for *Taenia spp*. eggs, later confirmed to be *Taenia saginata* through molecular biology techniques [11]. Additionally, the research conducted by Teera Kusolsuk *et al*. (2021) recorded a prevalence of 2.8% [12]. These differences in reported prevalence rates can be attributed to various factors, including variations in dietary practices, cultural habits, and sanitation conditions across regions.

The results in Table 1 indicate that there is no significant difference in the prevalence of *Taenia saginata* infection between males and females in Ea Bar commune, Buon Don district. Our findings are consistent with reseaches conducted by Tuan B.V (2013) [14] and Dung N.T (2023) in Kon Tum province [1]. This similarity may be attributed to the cultural practices in Ea Bar, where undercooked beef dishes are commonly consumed during festivals, funerals, and weddings. These communal eating practices may expose both genders equally to the risk of infection.

The results in Table 1 demonstrate that the prevalence of *Taenia saginata* infection among ethnic minorities (15.57%) is 4.57 times higher than that of the Kinh ethnic group

(3.88%), with this difference being statistically significant ($p < 0.05$). Our findings align with the research conducted by Dung N.T (2023) in Dak Mon commune, Dak Glei district, Kon Tum province, which reported that the infection rate among ethnic minorities reached 100% [1]. This stark contrast in prevalence rates may reflect various socio-economic and cultural factors. Ethnic minority groups often have different dietary practices, including a higher frequency of consuming undercooked beef, which is a known risk factor for *Taenia saginata* infection. Additionally, limited access to healthcare and education, as well as less awareness of preventive measures, may contribute to the higher infection rates observed in these populations.

Our research found no significant difference in the prevalence of *Taenia saginata* infection based on educational level. This contrasts with the findings of Dung N.T (2023) in Dak Mon commune, which indicated a significant relationship between educational attainment and *Taenia saginata* infection ($p < 0.01$). In her research, individuals with lower educational levels were found to have a 4.7 times higher risk of infection compared to those with higher educational attainment [1]. The discrepancy between our results and those of Dung N.T may be attributed to various factors, including differences in the reseach populations, local dietary practices, and awareness of health-related information. In communities with lower educational levels, individuals may lack knowledge about safe food practices and the risks associated with consuming undercooked meat, which could contribute to higher infection rates. These findings suggest that while our study did not identify a significant correlation between educational level and infection rates, there may still be underlying factors that need to be explored further.

The analysis of *Taenia saginata* infection according to age groups at the research site (Table 1) reveals the following findings: There were no reported infections in the age group of 5 - 15 years. The infection rate among individuals aged 16 - 25 years was 2.13%. The highest infection rate was observed in the 26 - 60 years age group at 17.65%, followed closely by those over 60 years, who had an infection rate of 15.55%. Statistical analysis indicates significant differences among the age groups ($p < 0.05$). These results are consistent with studies by Tuan B.V (2013) [14] and Dung N.T (2023) [1]. However, our findings differ from those of Wali Khan *et al*. (2018) [16], who reported a higher prevalence of *Taenia saginata* infection among individuals under 15 years in their study in Swat, Pakistan, with rates of 22.7% compared to 20.0% in those over 15 years. Despite this, the difference was not statistically significant ($p = 0.3856$) [15]. This problem can be explained by: The higher prevalence of infection among adults can be attributed to their greater exposure to a variety of food sources, particularly undercooked beef, which is commonly consumed during festivals, funerals, weddings, and social gatherings. The preparation of rare beef dishes is often straightforward and less complex, making it a popular choice in households. In contrast, children typically have more limited dietary practices and social interactions, which likely contributes to their lower infection rates.

Discussion on Knowledge and *Taenia saginata* Infection

The results in Table 2 indicate significant infection rates of *Taenia saginata* among individuals lacking knowledge about transmission routes (19.51%), the harms of the infection (34.38%), and preventive measures (34.88%). These rates are 2.96, 4.15, and 8.09 times higher, respectively, compared to those with knowledge, and these findings are statistically significant ($p < 0.05$). However, the research by Dung N.T *et al*. (2023) suggests that knowledge about transmission routes does not significantly affect the incidence of *Taenia saginata* infection ($p > 0.05$) [1]. Our findings are consistent with those of Tinh V.V (2015), where the infection rate among individuals with knowledge of helminth prevention was only 1.8%, while the rate was significantly higher at 20.2% among those without such knowledge, which was also statistically significant ($p < 0.05$) [13]. These differences in research outcomes highlight the complexity of the relationship between knowledge and health outcomes. While our study emphasizes the importance of education in preventing Taenia saginata infections, the contrasting results from other studies suggest that additional factors such as socio-economic conditions, cultural practices, and access to healthcare might influence infection rates.

When analyzing the consumption of undercooked beef (Table 2), we found a significant association between eating undercooked beef and the prevalence of *Taenia saginata* infection. Specifically, individuals who consumed undercooked beef had a 4.25 times higher risk of infection compared to those who did not consume it, with this finding being statistically significant ($p < 0.02$). These results align with the research conducted by Dung N.T *et al*. (2023), which reported that individuals consuming undercooked beef faced a 6.1 times higher risk of *Taenia saginata* infection compared to those who did not eat undercooked beef, with a p-value of < 0.01 [1]. The strong association between undercooked beef consumption and increased infection risk underscores the importance of public health messaging regarding safe food practices. The data clearly indicate that increased awareness about the risks associated with eating undercooked beef can significantly reduce the incidence of *Taenia saginata* infections.

Conclusion

Prevalence of Taenia saginata Infection at the research site

The prevalence of *Taenia saginata* infection in Ea Bar commune, Buon Don district, Dak Lak province is as follows:

- The overall infection rate is 9.56%.
- There is no significant difference in infection rates based on gender or educational level.
- The infection rate is higher among ethnic minorities (15.57%) compared to the Kinh ethnic group (3.88%).
- The age group with the highest infection rate is 26 - 60 years (17.65%), followed by those over 60 years (15.55%), the 16 - 25 years group (2.13%), and the 5 - 15 years group (0%).

Factors Associated with *Taenia saginata* Infection

- There is a significant association between knowledge of transmission routes, the harms of the disease, preventive measures, and the consumption of undercooked beef with *Taenia saginata* infection.
- Individuals who consume undercooked beef have a 4.25 times higher risk of infection compared to those who do not consume it.

These findings highlight the need for targeted health education and intervention strategies to reduce the prevalence of *Taenia saginata* infection, particularly focusing on dietary

practices and increasing awareness about the disease among vulnerable populations.

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