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THE ASSOCIATION BETWEEN KNOWLEDGE, ATTITUDES, AND TOXOPLASMOSIS PREVENTIVE PRACTICES AMONG FEMALE STUDENTS IN THE HEALTH EDUCATION CLUSTER

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ABSTRACT

Background: Toxoplasmosis is an infectious disease resulting from exposure to the parasite *Toxoplasma gondii*. The prevalence of toxoplasmosis among women of reproductive age in Indonesia remains significant, attributed to factors such as individual behaviours, inadequate hygiene practices, and cultural traditions. Moreover, the prevalence of toxoplasmosis is elevated among populations with limited awareness of preventive measures, highlighting the importance of comprehensive education to decrease its incidence, particularly among women of reproductive age. Strengthening their comprehension, attitudes, and preventive behaviors is crucial as an initial strategy to reduce toxoplasmosis transmission. This study aimed to examine the association between knowledge, attitudes, and preventive practices regarding toxoplasmosis among female health education students at the University of Bengkulu.
Methods: This study employed an observational, cross-sectional design. The research population comprised 925 individuals, from which 70 female students in the health education cluster at the University of Bengkulu were selected as study subjects through stratified random sampling. Data were gathered via questionnaires and analyzed using the Spearman rank correlation test.
Results: The data indicated that 41 respondents (58.6%) demonstrated a high level of knowledge, 55 respondents (78.6%) maintained positive attitudes, and 59 respondents (84.3%) practiced effective preventive practices regarding toxoplasmosis. Statistical analysis revealed a significant association between knowledge level and preventive practices (p-value <0.001, r = 0.565), as well as between attitude and preventive practices (p-value <0.001, r = 0.705).
Conclusion: A significant association exists between knowledge levels and attitudes regarding toxoplasmosis prevention practices.
Keywords: attitude, knowledge, practices, prevention, toxoplasmosis

INTRODUCTION

Toxoplasmosis is an infectious disease caused by the parasite *Toxoplasma gondii*, first described in North Africa in 1908 by Nicole and Manceaux in the rodent species *Ctenodactylus gondii* (Lilis *et al.*, 2023). The prevalence of toxoplasmosis is notably higher in regions characterised by hot, humid, low-lying climates, as the parasite shows

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increased resistance to these conditions. Consequently, elevated incidence rates are frequently observed in such areas (CDC, 2025). According to data from the Centers for Disease Control and Prevention (CDC), more than 60% of the global population has been exposed to toxoplasmosis. In the United States, toxoplasmosis is identified as the leading cause of foodborne disease-related deaths, with over 40 million individuals estimated to be affected (CDC, 2025). Seroprevalence data indicate that, globally, toxoplasmosis affected approximately 32% of women of childbearing age (Rahmanian *et al.*, 2020) in 2018. In Indonesia, the seroprevalence was reported to be 32.6% in 2020 (Polanunu, Wahyuni, and Hamid, 2021).

A meta-analysis conducted across multiple regions of Indonesia from 1976 to 2024 reported the seroprevalence of toxoplasmosis. The data indicate that Java Island has the highest seroprevalence, at 53.15% (Perdana et al., 2025). This high prevalence may be influenced by individual habits, hygiene, and Indonesian culture. Consuming undercooked foods, such as satay and steak, may pose a risk of parasitic infection. Additionally, inadequate personal hygiene practices, including infrequent handwashing and the maintenance of household pets, particularly cats, can further elevate the likelihood of contracting toxoplasmosis (Pramardika et al., 2022).

Toxoplasmosis may be transmitted through various routes, including consumption of undercooked food, zoonotic transmission from animals to humans, vertical transmission via the placenta from mother to fetus, and other mechanisms such as blood transfusions and the transplantation of infected organs. Vertical transmission can result in spontaneous abortion, premature birth, fetal demise, or infants born with congenital toxoplasmosis. Incidents of infant mortality due to congenital toxoplasmosis have been reported in Indonesia, including a documented case in Bengkulu Province (CDC, 2025).

According to data from the Bengkulu Provincial Health Office in 2023, congenital abnormalities accounted for 12% of post-neonatal infant mortality cases (Dinas Kesehatan Provinsi Bengkulu, 2023). Congenital abnormalities in infants may result from maternal infections during pregnancy; however, not all pregnant individuals exhibit symptoms upon infection. Therefore, it is advisable for expectant mothers to undertake preventive measures early through regular health screenings (Aryani, 2017).

According to Guo et al. (2017), research shows that the incidence of toxoplasmosis is higher in groups that lack adequate knowledge about toxoplasmosis prevention. A thorough understanding of toxoplasmosis contributes to risk reduction by enhancing awareness and promoting effective preventive measures (Kurniawan, Suwandi, and Arniamantha, 2020). Despite ongoing public health efforts, awareness levels among women of childbearing age in Indonesia remain limited. Previous studies indicate that only 34.8% of women in this demographic possess adequate knowledge regarding toxoplasmosis (Afina & Mediana, 2022).

Infant mortality resulting from congenital toxoplasmosis has been consistently documented in Indonesia, including within Bengkulu Province. Data from the Bengkulu Provincial Health Office (2023) indicate that one contributing factor to post-neonatal infant deaths is congenital abnormalities, with 12% of infants affected by such conditions. These congenital abnormalities can arise from infections contracted during pregnancy. Importantly, many pregnant women may not exhibit symptoms when infected; therefore, it is essential for expectant mothers to undertake early preventive measures through regular health examinations (Aryani, 2017).

Female health students, typically in late adolescence to early adulthood, represent a demographic within the childbearing age who may be at increased risk for toxoplasmosis infection. It is essential that this population possesses comprehensive knowledge to implement effective preventative measures (Mahfouz et al., 2019). Nonetheless, the

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majority of health students demonstrate insufficient knowledge regarding toxoplasmosis. According to prior studies, only 3.2% of these students possess a satisfactory understanding of the disease (Senosy, 2022). Therefore, it is essential for female students to enhance their understanding of toxoplasmosis, as increasing awareness is a key factor in reducing the risk of infection (Al-Sheyab et al., 2015). This research distinguishes itself from prior studies by focusing on the specific location and population: female students in the health education group at the University of Bengkulu. The primary objective of this study is to assess the relationship between knowledge levels, attitudes, and toxoplasmosis prevention practices among these female students.

RESEARCH METHOD

This study employed an analytical observational research approach utilising a cross-sectional design to examine the association between levels of knowledge and attitudes, and toxoplasmosis prevention practices among female students within the health education cluster in 2025. Data collection was conducted at two locations: the Health Study Program, Faculty of Mathematics and Natural Sciences (FMIPA), and the Faculty of Medicine and Health Sciences (FKIK) at the University of Bengkulu between April and May 2025.

The independent variables in this investigation were knowledge and attitudes concerning toxoplasmosis among female health education students. The dependent variable was the preventive practices related to toxoplasmosis adopted by these students. The study population comprised female students enrolled in the Bachelor of Medicine (FKIK), Bachelor of Pharmacy, Diploma in Midwifery, and Diploma in Nursing programmes (FMIPA) at the University of Bengkulu in 2025. A stratified random sampling technique was employed in this study to ensure representation from all health students across each study program at the University of Bengkulu. Samples were drawn from each cluster that satisfied the established inclusion and exclusion criteria. The inclusion criteria required that participants be female, at least 18 years of age, willing to participate, and members of the health education group at the University of Bengkulu—specifically those enrolled in the Bachelor of Medicine, Bachelor of Pharmacy, Diploma 3 in Midwifery, or Diploma 3 in Nursing programs. Additionally, subjects must have owned a cat for at least one month. This requirement is based on the fact that oocysts are excreted through cat feces for approximately 1–3 weeks and require 1–5 days to sporulate and become infective. It generally takes a minimum of 30 days for cat owners to risk infection through exposure to contaminated fur or feces containing oocysts, which may be inadvertently ingested. Based on calculations utilizing the Lemeshow formula, the sample size was determined to be 70 individuals.

The research has been approved by the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, University of Bengkulu, with number 71/UN30.14.9/LT/2025. Initially, researchers will seek consent from potential participants. Upon agreement, participants will be evaluated against the study's inclusion and exclusion criteria and subsequently invited to proceed online via a Google form. This form provides a concise overview of the research objectives and benefits, collects personal data, and includes the research questionnaire. Respondents who decide to participate will provide their personal information and electronically submit their informed consent through the designated Google form, confirming their willingness to join the study. Should the study explanation not align with the respondent's understanding or expectations, they retain the right to decline completion of the questionnaire. The validity and reliability assessments for the knowledge, attitude, and preventive practices questionnaire yielded coefficients of 0.898, 0.910, and 0.866, respectively.

Submitted online questionnaires will undergo completeness checks prior to data

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processing. Once collected, responses will be coded to streamline subsequent analysis and validation procedures. The data will be analyzed using univariate and bivariate methods with Spearman's rank correlation formula, processed through Statistical Program for Social Science (SPSS) for Windows Version 29. Following processing, the data will be reviewed and archived. Spearman's rank correlation has been selected as the statistical test to evaluate associations between ordinal variables. A significance threshold of less than 0.05 will be used to determine whether a statistically significant relationship exists between the variables.

RESULTS

This study involved 70 female students enrolled in the health education program at the University of Bengkulu. As presented in Table 1, the largest proportion of participants was 19 years old (23 students; 32.9%), followed by those aged 20 (18 students; 25.7%), 21 (17 students; 24.3%), and 18 (8 students). Analysis of respondents' age distribution revealed that most were between 18 and 23 years old, with 19 years being the most common age (32.9%). These findings are consistent with research conducted at An-Najah University in Jordan (Sweileh & Jodeh, 2017), which indicated a predominance of female participants aged 18–23 years. Similarly, a previous study reported that the majority of their respondents were students aged 23, a productive demographic with higher levels of education. These attributes enabled easier access to information, which positively influenced their knowledge and attitudes towards toxoplasmosis (Nurseha, 2023).

According to the data presented in Table 1, the frequency distribution analysis indicates that the majority of female students demonstrated a good level of knowledge about toxoplasmosis (41 individuals; 58.6%). Additionally, most students (55 individuals; 78.6%) exhibited a positive attitude towards toxoplasmosis, and a substantial proportion engaged in appropriate preventive practices (59 individuals; 84.3%).

Table 1. Distribution of Characteristics of Research Subject

Subject Characteristics	Frequency	Percentage (%)
Age		
18 years	8	11.4
19 years	23	32.9
20 years	18	25.7
21 years	17	24.3
22 years	3	4.3
23 years	1	1.4
Force		
2021	5	7.1
2022	25	35.7
2023	20	28.6
2024	20	28.6
Level of Knowledge		
Good	41	58.6
Enough	16	22.9
Not enough	13	18.6
Attitude		

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Subject Characteristics	Frequency	Percentage (%)
Positive	55	78.6
Negative	15	21.4
Preventive Practices		
Good	59	84.3
Not enough	11	15.7

According to Table 2, statistical analysis using this test yielded a significance value of <0.001 (*p-value* <0.05). Given that the *p-value* is less than 0.05, the result indicates a statistically significant relationship between knowledge level and toxoplasmosis prevention practices among female students in the health education group at the University of Bengkulu. The correlation coefficient (r = 0.565) demonstrates a strong positive association, suggesting that an increase in knowledge is associated with improved preventive practices.

Table 2. Relationship between Knowledge Level and Toxoplasmosis Prevention Practices

Level of Knowledge		Preventive Practices		Total	Sig (p-value)	Correlation Coefficient (*r*)*
		Good	Not Enough			
Good	n	41	0	41	<0,001	0,565
	%	58,6%	0%	58,6%		
Enough	n	16	0	16		
	%	22,9%	0%	22,8%		
Not enough	n	2	11	13		
	%	2,8%	15,7%	18,6%		
Total	n	59	11	70		
	%	84,3%	15,7%	100%		

**Spearman Correlation Test*

According to Table 3, statistical analysis using this test yielded a significance value of <0.001 (*p-value* <0.05). The significance level (*p-value* <0.05) indicates a statistically significant relationship between attitudes and toxoplasmosis prevention practices among female students in the health education group at the University of Bengkulu. The correlation strength is strong (r = 0.705), and the direction of the correlation is positive, suggesting that a favourable attitude is associated with effective prevention practices.

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Table 3. Relationship between Attitudes and Toxoplasmosis Prevention Practices

Attitude		Preventive Practices		Total	Sig (p-value)	Correlation Coefficient (*r*)*
		Good	Not Enough			
Positive	n	54	1	55	<0,001	0,705
	%	77,2%	1,4%	78,6%		
Negative	n	5	10	15		
	%	7,1%	14,3%	21,4%		
Total	n	59	11	70		
	%	84,3%	15,7%	100%		

**Spearman* Correlation Test

DISCUSSION

The respondents in this study were health science students who primarily acquired information about toxoplasmosis through academic coursework delivered by lecturers. Other notable sources of information included social media platforms, such as Instagram and TikTok, which also contributed to respondents' knowledge on the subject. Additionally, exposure to immediate or extended family members who had contracted toxoplasmosis contributed indirectly to the respondents' knowledge of the disease. This is in line with research conducted by Hamou et al (2021). It was determined that the majority of health students acquired knowledge about toxoplasmosis through academic lectures, whereas a smaller percentage accessed this information via social media platforms (Hamou et al., 2021). A study conducted among students in Iran revealed that books were identified as the primary source of information regarding toxoplasmosis (Ebrahimi et al., 2015).

A positive attitude is established through acquired knowledge. An individual must first recognise an external stimulus, such as material or objects, which leads to new understanding. This knowledge, in turn, shapes the individual's response as reflected in their attitude (Notoatmodjo, 2014). This finding aligns with previous research, indicating that most respondents possess a strong understanding of toxoplasmosis. This knowledge appears to positively influence individual attitudes, particularly among final-year female students, who demonstrate increased awareness and concern regarding the potential future risks associated with toxoplasmosis (Senosy, 2022).

In addition to having a positive attitude, the majority of study respondents also practiced good preventive practices. This indicates that female students majoring in health education at the University of Bengkulu are interested in implementing toxoplasmosis prevention practices, which aligns with the theory. of reason Action, which states that a person's practices or actions are influenced by their own interests. Meanwhile, individual interests are influenced by social norms and individual attitudes. Thus, a positive attitude in research respondents will influence the formation of good preventive practices (Swandi et al., 2024).

Previous research in 2018 found that younger age and higher education levels were significantly associated with improved knowledge of toxoplasmosis (Smereka et al., 2018). The study also showed that the majority of respondents (35.7%) were from the class of 2022. This is because the majority of female students active in the health study program at the University of Bengkulu are from the class of 2022.

The better the respondent's knowledge level, the more likely they are to implement appropriate (Nurseha et al., 2023) toxoplasmosis prevention practices. Further bivariate analysis confirms a robust and significant correlation between knowledge levels and toxoplasmosis prevention practices among these students. This aligns with Notoatmodjo's (2014) assertion that individuals with higher knowledge are more likely to engage in preventive behaviours, ultimately enhancing their overall health status. The findings of this study also corroborate those of Nurseha et al. (2023), who reported a significant association

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between knowledge and preventive practices regarding toxoplasmosis. Adequate knowledge plays a critical role in shaping attitudes and behaviours toward disease prevention, whereas insufficient knowledge can hinder the adoption of effective preventive measures.

The results of this study are in line with research conducted in Saudi Arabia, which stated that there is a significant relationship between the level of knowledge and preventive practices regarding toxoplasmosis. (Alghafari, 2025). In addition, research conducted by Hilmi et al (2021) also obtained similar results, namely a significant relationship between the level of knowledge and preventive actions or practices for toxoplasmosis. According to Lawrence Green's theory, a person's practices towards a disease are influenced by various factors, one of which is knowledge, which is included in the predisposing factors, where a person's level of knowledge will be the basis for consideration for a person's practices (Green et al., 2022). Adequate knowledge about toxoplasmosis can reduce the incidence and risk of infection with the disease because having a good understanding of how the disease is transmitted allows one to carry out appropriate preventive practices to avoid toxoplasmosis. (Afina and Mediana, 2022).

The findings of this study differ from previous research conducted on students of the Faculty of Medicine, Andalas University in Padang, Indonesia. The study stated that there was no significant relationship between the level of knowledge and practices or actions to prevent toxoplasmosis. Researchers argue that preventive actions taken by individuals are not entirely influenced by knowledge. There are other factors that can influence an action, namely, predisposing factors such as attitudes and beliefs. Enabling factors such as age, socioeconomic status, and environment. Reinforcing factors such as community leaders. In addition, researchers also stated that individuals will take preventive action depending on the perceived threat and consideration of benefits and disadvantages, for example, someone will take action if toxoplasmosis is perceived as a threat, such as the emergence of symptoms, requiring treatment, causing side effects, or being quite expensive (Swandi et al., 2024).

Attitude is an individual's feeling towards an object that can be supportive or not supportive of an object (Notoatmodjo, 2014). Based on the results of the statistical test of the bivariate analysis of the relationship between attitude variables and toxoplasmosis prevention practices in female students of the health education group at the University of Bengkulu, it was found that there is a significant relationship between attitudes and toxoplasmosis prevention practices in female students of the health education group at the University of Bengkulu. A positive attitude can be a driving factor that will direct individuals to behave positively. This is in accordance with the results of research data analysis, where the majority of female students of the health education group at the University of Bengkulu have positive attitudes with good prevention practices (54%). The results of previous studies also indicate a significant influence of attitudes on toxoplasmosis prevention practices. (Anggreni, Kurniati, and Subrata, 2019). Furthermore, this study aligns with research conducted by Nurseha et al (2023), which states that there is a significant relationship between attitudes and preventative practices regarding toxoplasmosis. This is because attitudes can trigger practical changes. Positive attitudes arise from awareness that influences a person through the information provided, so that positive attitudes will lead to appropriate practices in preventing infections such as toxoplasmosis. (Nurseha et al., 2023).

Toxoplasmosis prevention practices. This is because neutral to positive attitudes indicate a person's willingness to learn and take preventive action if given information. In addition, higher education can significantly improve attitudes towards toxoplasmosis, thereby influencing the desire to carry out preventive practices (Aldali et al., 2024).

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However, the results of other studies say that positive attitudes do not always have a significant effect on good preventive practices, and conversely, negative attitudes are not always related to poor preventive practices. Research conducted by Senosy et al (2020) described the majority of female students as having negative attitudes but engaging in good preventive practices. This is because female students in Egypt simply avoid risky practices in the correct manner, without realizing what they are avoiding (Senosy, 2022).

CONCLUSIONS

The research demonstrates a substantial association between knowledge levels and preventive behavior, as well as between attitudes and preventive practices, among female health education students at the University of Bengkulu.

RECOMMENDATION

Increasing knowledge through various methods and media is necessary to optimize individuals' knowledge about toxoplasmosis, including prevention efforts. This is expected to improve individuals' behavior towards toxoplasmosis prevention efforts in the community.

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