

Knowledge, Attitudes, Practices, and Associated Factors Regarding Malaria Prevention among Undergraduate Regular Students at Debre Markos University, Ethiopia: A Cross-Sectional Study, 2026

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Knowledge, Attitudes, Practices, and Associated Factors Regarding Malaria Prevention among Undergraduate Regular Students at Debre Markos University, Ethiopia: A Cross-Sectional Study, 2026

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Abstract

Background: University students are at increased risk of malaria infection because they are highly exposed to both endemic and non-endemic malaria areas due to frequent travel back and forth between their home and university.

Methods: An institution based cross-sectional study was conducted among 374 undergraduate regular students of Debre Markos University, Ethiopia, from April to June 2026. The study followed a multi-stage sampling design and a systematic random sampling procedure. A structured, pretested and self-administered questionnaire was designed by using the world health organization malaria guidelines and Malaria indicator survey. Knowledge, attitude and practice of respondents were assessed by using standard scoring system. Both bivariate and multivariate logistic regression analyses were done to see the association between independent variables and the outcome variable. The adjusted odd ratios (AORs) with 95% confidence interval (CI) were reported with P-value less than $P < 0.05$.

Results: Among 374 participants, 237 (63.4%) of them had good knowledge, 209 (55.9%) had a positive attitude while 184 (49.2%) had good preventive practices. Being male and draining stagnant water were independently associated with good knowledge. Draining stagnant water was independently linked to positive attitude to malaria (AOR=0.50; 95% CI: 0.32-0.78). Regarding preventive practices, malaria campaigns participation (AOR=0.18; 95% CI: 0.08-0.39), use of insecticide treated bed nets (AOR=0.14; 95% CI: 0.07-0.28), draining stagnant water (AOR=0.07; 95% CI: 0.03-0.16), community support for malaria control (AOR=0.39; 95% CI: 0.17-0.91), use of mosquito repellents (AOR=0.17; 95% CI: 0.09-0.30) and closing windows

at night (AOR=0.18; 95% CI: 0.08-0.40) were independently associated with good malaria prevention practices.

Conclusions: Most students had good knowledge and a positive attitude, but less than half had good preventive practices. There is a need to reinforce knowledge and encourage community members to adopt preventive measures against malaria.

Keywords: Malaria prevention; knowledge, attitude, practice, Debre Markos University; Ethiopia.

Introduction

Malaria is a serious disease affecting both tropical and subtropical areas. This disease is caused by plasmodium parasites and is primarily spread by the *Anopheles* mosquitoes as vectors [1,2]. Though preventable and treatable, malaria continues to be a leading cause of morbidity and mortality in Sub-Saharan Africa [1,3]. In 2023, there were 263 million cases and 597,000 deaths worldwide, with African region bearing 94% of the total cases and 95% of total deaths from the disease [1]. Malaria is endemic in Ethiopia, with varying levels of transmission across different parts of the country [1,2].

Ethiopia is among the countries in sub-Saharan Africa with the highest burdens of malaria as a major disease and public health challenge [1, 4]. The country's land area has been defined by the occurrence of highly endemic malaria; therefore, 69% of Ethiopians are at risk of being infected [1,5]. Over 7.3 million cases and 1,157 deaths have been reported in Ethiopia alone in 2022 [6]. The rising cases of malaria in Ethiopia can partly be attributed to climate variations, population movements, wars, insecticide resistance, and the proliferation of *Anopheles stephensi* [5-8].

The Ethiopian Federal Ministry of Health has initiated malaria control strategies that include the use of long-lasting insecticidal nets (LLINs), indoor residual spraying (IRS), diagnosis using rapid diagnostic tests and microscopy, treatment with artemisinin-based combination therapy, environmental management, and health education [9,10]. Nonetheless, these strategies are dependent on the level of knowledge, attitude, and preventive practices of the community [11,12]. Having adequate knowledge and positive attitudes can increase the use of recommended

malaria prevention measures, such as the use of LLINs, the removal of mosquito breeding sites, the timely use of anti-malarial drugs, and participation in malaria control programs [11–14].

University students represent a key yet under-researched population group in malaria-endemic countries. Students may reside in a variety of ecological risk zones and be mobile between malaria-endemic and non-endemic areas, contributing to the complexity of malaria transmission foci [15, 16]. In addition, university students may play a critical role in changing the situation with malaria by promoting health-promoting behaviors [16, 17]. Nevertheless, there is a paucity of information on the level of knowledge, attitude and preventive practices of Ethiopian university students against malaria, including the regular undergraduate students [17, 18].

Prior studies undertaken in Ethiopia were mainly focused on determining the magnitude of malaria, household malaria prevention practices and risk factors among community members and health facility attendees, however there was limited information on malaria prevention knowledge attitude and practices (KAP) of students [12,18-20]. Ascertaining KAP and associated factors among the university students is essential for effective educational intervention and institution based malaria prevention strategy for the study group [13,17,19]. Therefore, the study was conducted to assess the knowledge attitude and practice of regular undergraduate students at Debre Markos University, northwest Ethiopia.

Methods

Descriptions of study areas

Debre Markos University is a state-sponsored teaching institution located in Debre Markos Town, Amhara National Regional State, about 300 km northwest from the capital city Addis Ababa. Students from different parts of the country, including malaria-endemic and non-malaria endemic areas, are admitted to DMU [21–23].

Study design

The cross-sectional study design was carried out among undergraduate regular students of Debre Markos University (DMU) during April-June 2026.

Study Population and eligibility criteria

The population for this study comprised all regularly admitted undergraduate students at Debre Markos University during the 2025/2026 academic year. The study population included all students selected from different batches during the study period. All students who were officially registered and available for the study were considered eligible to participate. Students who were sick, could not express their willingness to participate, or refused to give informed consent were excluded from the study.

Sample size determination

Sample size determination was calculated using the single population proportion formula [24-25].

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

n = calculated sample size;

$Z_{\alpha/2}$ = critical value at 95% confidence interval (1.96);

P = prevalence of 50%, since no previous study with similar objectives had been conducted among undergraduate students at Debre Markos University.

Because the total population of regular undergraduate students (N = 5,329) was less than 10,000, a finite population correction was applied. The corrected sample size was calculated as 377 participants. After data collection, three questionnaires (0.8%) were excluded due to non-response, resulting in a final sample size of 374 participants included in the analysis.

Sampling techniques

A multistage sampling technique was implemented to ensure a representative sample of undergraduate regular students. In the first stage, the total number of students selected was apportioned to the five academic batches according to the proportion of students enrolled in each batch by applying the principle of probability proportional to size. In the second stage, the sampling frame was prepared in each academic batch by identifying eligible students from the updated list of students' registration records available with the university registrar. Subsequently, systematic random sampling was used to select students from the prepared samplings frames in each academic batch [17, 26].

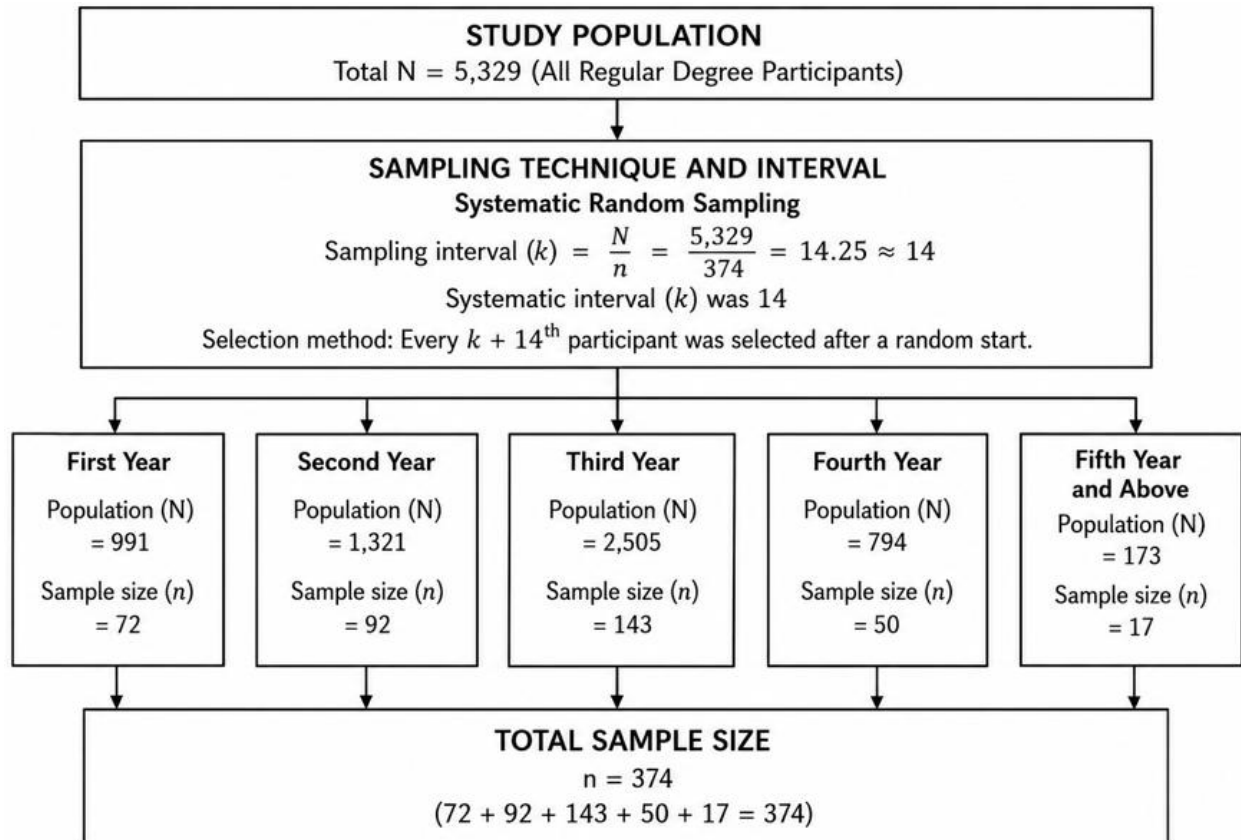


Figure 1 Sampling Framework Diagram

Data collection tools and procedures

Data were collected using a structured, self-administered questionnaire designed following a review of relevant literature, the World Health Organization malaria guidelines, the Malaria Indicator Survey questionnaire, and published malaria knowledge, attitude, and practice surveys conducted in Ethiopia and malaria-endemic countries [27-28].

The questionnaire was initially prepared in English, translated into Amharic by bilingual experts, and subsequently back-translated into English to ensure consistency of meaning. Before the actual survey, the questionnaire was pretested among students outside the study population, and necessary modifications were made to improve clarity, readability, and consistency. Data were collected by trained data collectors under close supervision of experienced supervisors.

Measurement of study variables

Knowledge about malaria prevention was assessed by asking a series of structured questions on the causative agent, mode of transmission, signs and symptoms, risk factors, preventive measures, diagnosis and treatment. Correct responses were awarded one point and incorrect and “don’t know” responses were awarded zero points. The total knowledge score was calculated by summing the scores of individual items. Based on the modified Bloom’s cut-off criterion, respondents who scored $\geq 80\%$ of the total knowledge questions were considered having good knowledge while those who scored $< 80\%$ were considered as having poor knowledge [29].

The five-point Likert-scale statements ranged from “strongly disagree” to “strongly agree” and were used to assess attitudes towards malaria prevention. Before analysis, all negatively worded items were reverse scored. The overall attitude score was calculated by adding individual item scores and those scoring at or above the mean value were categorized as having a positive attitude and respondents scoring below the mean were categorized as having a negative attitude as done in previous malaria KAP studies [30].

Regarding malaria prevention practices, questions on ownership and utilization of long-lasting insecticidal nets, environmental sanitation, health-seeking behavior and other recommended preventive measures were assessed. The responses of each item were summed up to calculate practice scores and the participants were classified accordingly into good or poor malaria prevention practices based on the previously established scoring criteria from previous studies [31-32].

Data quality assurance

The quality of the data was determined during the careful design and development of the questionnaire, translation and back-translation process, pre-testing, and extensive training of data collectors and supervisors before data collection commenced. This is because the data collectors were expected to be able to complete the questionnaires correctly and accurately without errors after undergoing this training. Daily review of completed questionnaires by supervisors and data cleaning and coding of the data before analysis were also done to enhance data quality by removing inconsistencies and errors. Similar quality assurance measures had been employed in previous epidemiological surveys and malaria knowledge, attitude, and practice studies [32].

Data analysis

Data were entered into EpiData version 17 and exported to SPSS version [version] (IBM Corp., Armonk, NY, USA) for statistical analysis. Descriptive statistics such as frequencies, percentages, means, and standard deviations were done to determine the study variables. A bivariable logistic regression analysis was performed to assess the association between independent variables and outcome variables. Independent variables with P value <0.25 in the bivariable logistic regression analysis were selected for the multivariable logistic regression analysis. The multivariable logistic regression analysis was done to identify independent predictors of the outcome variables by adjusting for possible confounders. Finally, adjusted odds ratios (AOR) and 95% confidence interval (CI) were estimated with a P-value of <0.05 considered statistically significant [33].

Results

Socio-demographic and malaria-related characteristics of the study participants

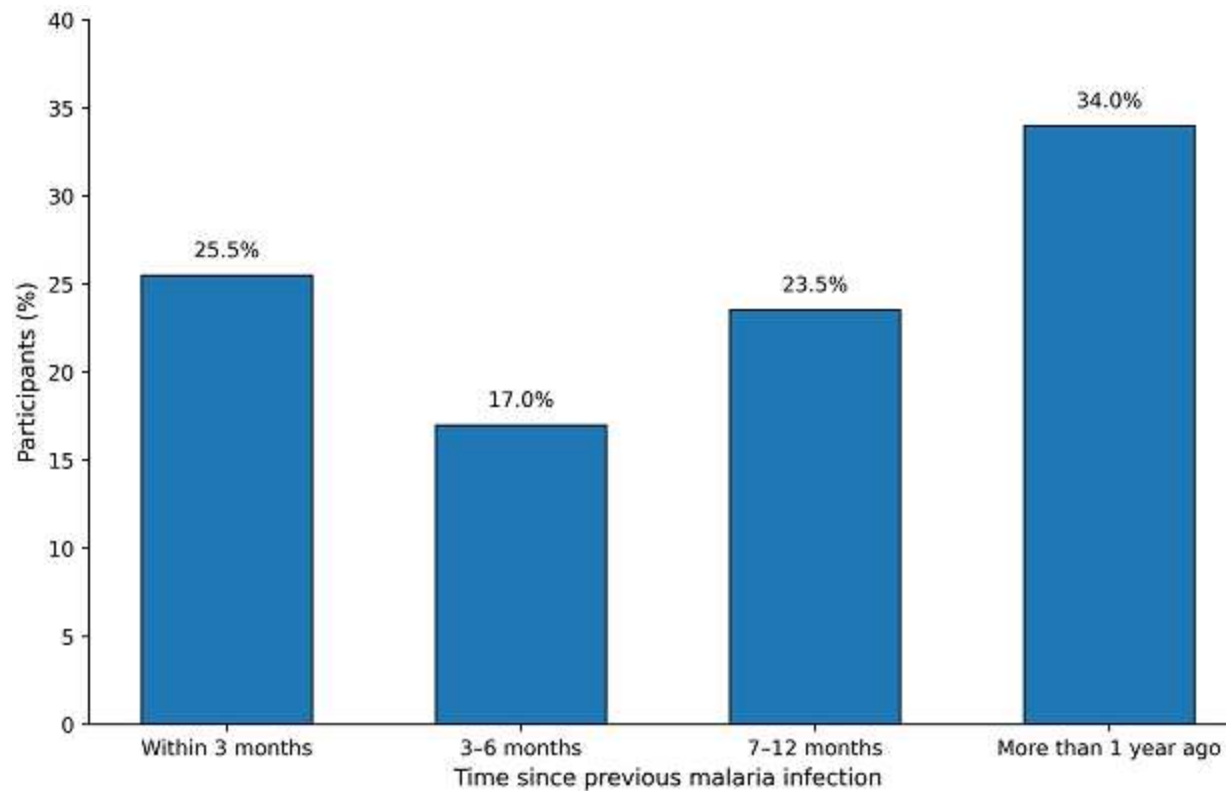
A total of 374 students participated in the study, of whom 153 (40.9%) reported a previous history of malaria infection (Table 1). Most participants were aged 20–24 years (74.9%), male (64.2%), and third-year students (38.2%). The majority originated from the Amhara region (94.9%), were single (86.6%), and identified as Orthodox Christians (86.6%). Natural and Computational Sciences (31.3%) and Social Sciences (28.6%) were the most common fields of study. Most participants received a monthly allowance below 1000 Birr (79.6%) and resided in rural areas (55.1%). Among those with a history of malaria, 33.9% reported their most recent infection occurred more than one year before the survey.

Table 1 Socio-demographic and malaria-related characteristics of the study participants (N = 374)

Variable	Category	Number (%)
Age group (years)	18–20	33 (8.8)
	20–24	280 (74.9)
	≥ 25	61 (16.3)
Sex	Male	240 (64.2)
	Female	134 (35.8)
Marital status	Single	324 (86.6)
	Married	50 (13.4)
Religion	Orthodox Christian	324 (86.6)
	Muslim	39 (10.4)
	Catholic	6 (1.6)
	Protestant	5 (1.3)
Year of study	First year	72 (19.3)

	Second year	92 (24.6)
	Third year	143 (38.2)
	Fourth year	50 (13.4)
	Fifth year and above	17 (4.5)
Field of study	Natural and Computational Sciences	117 (31.3)
	Social Sciences	107 (28.6)
	Engineering and Technology	37 (9.9)
	Agriculture	34 (9.1)
	Sport Sciences	25 (6.7)
	Law	10 (2.7)
	Others	44 (11.8)
Monthly payment (Birr)	<500	149 (39.8)
	500–1000	149 (39.8)
	1001–2000	45 (12.0)
	>2000	31 (8.3)
Residence	Rural	206 (55.1)
	Urban	168 (44.9)
Region of participants	Amhara	355 (94.9)
	Southern Region	5 (1.3)
	Addis Ababa	5 (1.3)
	Benishangul-Gumuz	4 (1.1)
	Oromia	3 (0.8)
	Gambela	1 (0.3)
	Somali	1 (0.3)
Previous self-reported malaria case	Positive	153 (40.9)
	Negative	221 (59.1)

Among 153 respondents who had ever been infected with malaria, 52 (34.0%) indicated that their most recent infection occurred more than one year ago ((Figure 2). The number of respondents who had malaria infection within the past three months was 39 (25.5%), while those infected 7–12 months previously numbered 36 (23.5%). The lowest percentage was reported among respondents whose most recent malaria infection was 3–6 months ago, numbering 26



(17.0%). Among the total examined 374 participants 39 (10.43%) were positive to malaria from April to June 2026.

Figure 2 Time since malaria infection among study participants

Among 374 participants, health professionals were the most common source of information on malaria (35.3%). The other sources of information included: Television (23.5%), radio (14.7%), and social media (13.4%). In addition, 2.4% of participants cited friends, while 1.9% relied on university campaigns as sources of information on malaria. On the other hand, 8.8% of participants identified no source of information on malaria (Figure 3).

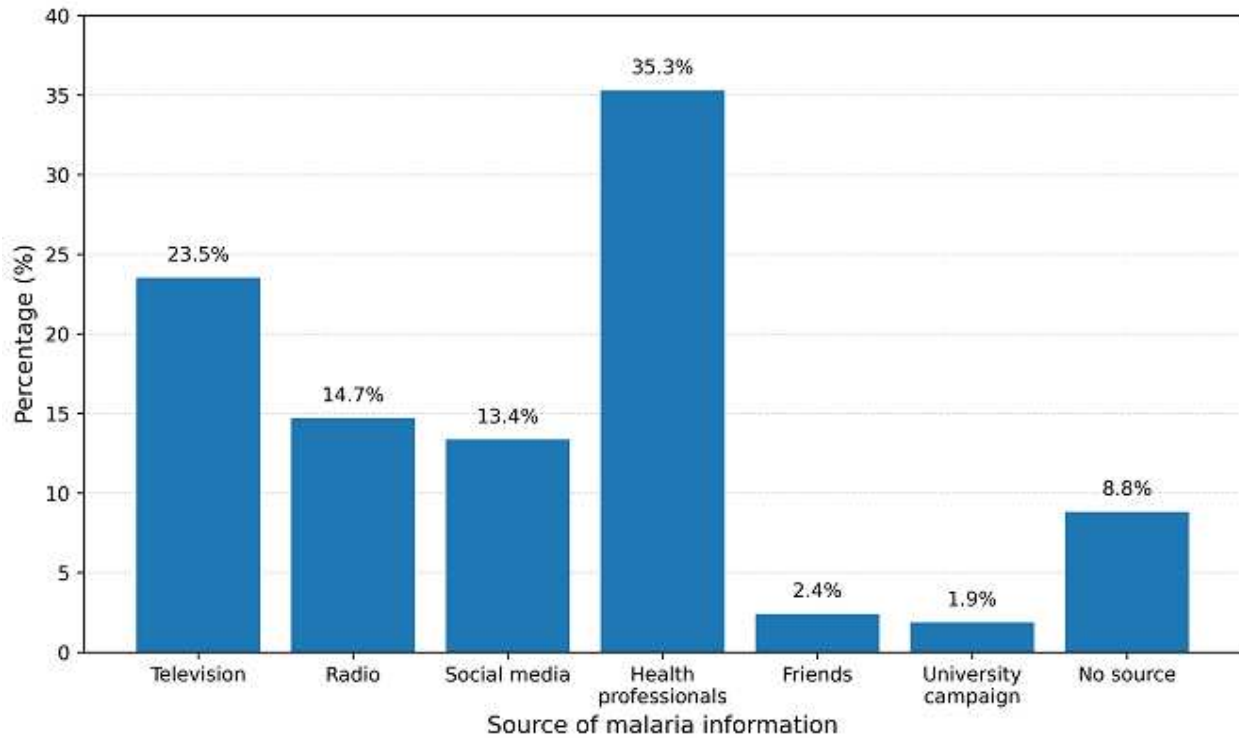


Figure 3 Sources of information about malaria and its preventions

Knowledge, Attitude and practice level of the study participants toward malaria prevention measures

Among 374 participants in the study, 237 (63.4%) had good knowledge of malaria, and 137 (36.6%) had poor knowledge of malaria. In terms of attitude towards malaria prevention, 209 (55.9%) of the participants had positive attitude and 165 (44.1%) had negative attitude. Regarding malaria prevention practices, good practice was observed in 184 (49.2%) of the participants and poor practice was observed in 190 (50.8%) of the participants (Table 2).

Table 2 Knowledge, attitude and practice level regarding malaria prevention among undergraduate regular students at Debre Markos University, Ethiopia, 2026 (n = 374)

Variable	Category	Frequency (n)	Percentage (%)
Knowledge level	Good	137	36.6
	Poor	237	63.4
Attitude toward malaria prevention	Negative	165	44.1
	Positive	209	55.9
Malaria prevention practice	Good	184	49.2
	Poor	190	50.8

Bivariate and multivariate analysis of factors associated with knowledge regarding malaria prevention

Out of the 374 students, 237 (63.4%) had good knowledge on malaria prevention measures. From the multivariable analysis, sex, religion, and stagnant water drainage were factors associated with knowledge level. Male students and those who practiced stagnant water drainage had good knowledge on malaria prevention. Other variables were not significant predictors of knowledge on malaria prevention.

Table 3 Bivariate and multivariate analysis of Knowledge level of study participants toward malaria prevention measures

Variable	Category	Poor n (%)	Good n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age group (years)	18–20	11 (33.3)	22 (66.7)	0.88 (0.58–1.34)	0.55	—	—
	20–24	102 (36.4)	178 (63.6)	Ref			
	≥25	24 (39.3)	37 (60.7)				
Sex	Male	78 (32.5)	162 (67.5)	0.61 (0.40–0.95)	0.03	0.55 (0.33–0.90)	0.012
	Female	59 (44.0)	75 (56.0)	Ref		Ref	
Year of study	First year	24 (33.3)	48 (66.7)	0.97 (0.80–1.80)	0.79	—	—
	Second year	30 (32.6)	62 (67.4)	Ref			
	Third year	64 (44.8)	79 (55.2)				
	Fourth year	13 (26.0)	37 (74.0)				
	Fifth year and above	6 (35.3)	11 (64.7)				
Field of study	Natural and Computational Sciences	37 (31.6)	80 (68.4)	1.03 (0.94–1.13)	0.55	—	—
	Social Sciences	45 (42.1)	62 (57.9)	Ref			
	Engineering and Technology	17 (45.9)	20 (54.1)				
	Agriculture	12 (35.3)	22 (64.7)				
	Law	3 (30.0)	7 (70.0)				
	Sport Sciences	12 (48.0)	13 (52.0)				
	Others	11 (25.0)	33 (75.0)				
	Single	114 (35.2)	210 (64.8)	0.64 (0.35–1.16)	0.14	0.74 (0.36–1.50)	0.396
Marital status	Married	23 (46.0)	27 (54.0)	Ref		Ref	
	Orthodox Christian	110 (34.0)	214 (66.0)	0.59 (0.40–0.90)	0.01	0.13 (0.20–0.82)	0.03
Religion	Muslim	21 (53.8)	18 (46.2)			0.24 (0.64–1.89)	0.15

Residence	Protestant	2 (40.0)	3 (60.0)			0.20 (0.13–0.279)	0.19
	Catholic	4 (66.7)	2 (33.3)				
	Urban	53 (31.5)	115 (68.5)	0.67 (0.44–1.03)	0.06	0.68 (0.42–1.08)	0.10
	Rural	84 (40.8)	122 (59.2)	Ref		Ref	
Monthly allowance (Birr)	<500	55 (36.9)	94 (63.1)	1.02 (0.81–1.29)	0.85	—	—
	500–1000	54 (36.2)	95 (63.8)	Ref			
	1001–2000	18 (40.0)	27 (60.0)				
	>2000	10 (32.3)	21 (67.7)				
Self-reported malaria	Positive	52 (34.0)	101 (66.0)	0.82 (0.54–1.27)	0.38	—	—
	Negative	85 (38.1)	138 (61.9)	Ref			
Access to malaria information	Yes	92 (32.5)	191 (67.5)	0.54 (0.34–0.85)	0.008	0.77 (0.44–1.35)	0.36
	No	44 (49.4)	45 (50.6)	Ref		Ref	
Malaria campaign participation	Yes	33 (30.6)	75 (69.4)	0.69 (0.43–1.11)	0.12	0.61 (0.36–1.25)	0.76
	No	104 (39.1)	162 (60.9)	Ref		Ref	
ITN use	Yes	76 (34.2)	146 (65.8)	0.86 (0.58–1.27)	0.45	—	—
	No	60 (41.1)	86 (58.9)	Ref			
Draining stagnant water	Yes	66 (48.2)	71 (51.8)	0.37 (0.24–0.57)	<0.001	0.61 (0.36–1.05)	<0.001
	No	174 (74.0)	61 (26.0)	Ref			
Support malaria control in community	Yes	106 (33.7)	209 (66.3)	0.46 (0.26–0.80)	0.006	0.67 (0.34–1.28)	0.022
	No	31 (52.5)	28 (47.5)	Ref			

Attitude toward malaria prevention

Among the 374 participants, 209 (55.9%) had a positive attitude toward malaria prevention, and 165 (44.1%) had a negative attitude. In the multivariable analysis, only draining of stagnant water was significantly associated with malaria prevention attitude (AOR = 0.50, 95% CI: 0.32–0.78, $p = 0.002$), whereas residence, monthly income and ITN use were not significant predictors (Table 4)

Table 4 Bivariate and multivariate logistic regression analysis of factors associated with attitude toward malaria among undergraduate students, Debre Markos University, 2026 (n = 374)

Variable	Category	Poor n (%)	Good n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age group (years)	18–20	11 (33.3)	22 (66.7)	0.88 (0.58–1.34)	0.55	—	—
	20–24	102 (36.4)	178 (63.6)	Ref			
	≥25	24 (39.3)	37 (60.7)				

Sex	Male	78 (32.5)	162 (67.5)	0.61 (0.40–0.95) 0.03	0.55 (0.33–0.90)	0.012
	Female	59 (44.0)	75 (56.0)	Ref	Ref	
Year of study	First year	24 (33.3)	48 (66.7)	0.97 (0.80–1.80) 0.79	—	—
	Second year	30 (32.6)	62 (67.4)	Ref		
	Third year	64 (44.8)	79 (55.2)			
	Fourth year	13 (26.0)	37 (74.0)			
	Fifth year and above	6 (35.3)	11 (64.7)			
	Natural and Computational Sciences	37 (31.6)	80 (68.4)	1.03 (0.94–1.13) 0.55	—	—
Field of study	Social Sciences	45 (42.1)	62 (57.9)	Ref		
	Engineering and Technology	17 (45.9)	20 (54.1)			
	Agriculture	12 (35.3)	22 (64.7)			
	Law	3 (30.0)	7 (70.0)			
	Sport Sciences	12 (48.0)	13 (52.0)			
	Others	11 (25.0)	33 (75.0)			
	Single	114 (35.2)	210 (64.8)	0.64 (0.35–1.16) 0.14	0.74 (0.36–1.50)	0.396
	Married	23 (46.0)	27 (54.0)	Ref	Ref	
Religion	Orthodox	110 (34.0)	214 (66.0)	0.59 (0.40–0.90) 0.01	0.13 (0.20–0.82)	0.03
	Muslim	21 (53.8)	18 (46.2)		0.24 (0.64–1.89)	0.15
Marital status	Protestant	2 (40.0)	3 (60.0)		0.20 (0.13–0.279)	0.19
	Catholic	4 (66.7)	2 (33.3)			
	Urban	53 (31.5)	115 (68.5)	0.67 (0.44–1.03) 0.06	0.68 (0.42–1.08)	0.10
	Rural	84 (40.8)	122 (59.2)	Ref	Ref	
Monthly allowance (Birr)	<500	55 (36.9)	94 (63.1)	1.02 (0.81–1.29) 0.85	—	—
	500–1000	54 (36.2)	95 (63.8)	Ref		
	1001–2000	18 (40.0)	27 (60.0)			
	>2000	10 (32.3)	21 (67.7)			
Self-reported malaria case	Positive	52 (34.0)	101 (66.0)	0.82 (0.54–1.27) 0.38	—	—
	Negative	85 (38.1)	138 (61.9)	Ref		
Access to malaria information	Yes	92 (32.5)	191 (67.5)	0.54 (0.34–0.85) 0.008	0.77 (0.44–1.35)	0.36
	No	44 (49.4)	45 (50.6)	Ref	Ref	
Malaria campaign participation	Yes	33 (30.6)	75 (69.4)	0.69 (0.43–1.11) 0.12	0.61 (0.36–1.25)	0.76
	No	104 (39.1)	162 (60.9)	Ref	Ref	
ITN use	Yes	76 (34.2)	146 (65.8)	0.86 (0.58–1.27) 0.45	—	—
	No	60 (41.1)	86 (58.9)	Ref		
Draining stagnant water	Yes	66 (48.2)	71 (51.8)	0.37 (0.24–0.57) <0.001	0.61 (0.36–1.05)	<0.001

Support in community	No	174 (74.0)	61 (26.0)	Ref			
	Yes	106 (33.7)	209 (66.3)	0.46 (0.26–0.80)	0.006	0.67 (0.34–1.28)	0.22
	No	31 (52.5)	28 (47.5)	Ref			

Bivariate and multivariate analysis of practices toward malaria prevention measures

In the multivariable logistic regression analysis, participation in malaria campaigns, use of insecticide-treated nets (ITN), drainage of stagnant water, community support for malaria control, use of mosquito repellent, and closing windows at night were significantly associated with the malaria prevention practice ($p < 0.05$). In the same analysis, age, field of study, marital status, religion, previous malaria history, and access to information were not significant predictors of malaria prevention practice (Table 5).

Table 5 Bivariate and multivariable logistic regression analysis of factors associated with malaria prevention practice among study participants (n = 374)

Variable	Category	Poor n (%)	Good n (%)	COR (95% CI)	P-value	AOR (95% CI)	p-value
Age group (years)	18–20	21	15	1.46 (0.96–1.22)	0.07	0.91 (0.26–3.19)	0.881
	20–24	145	136	Ref		0.92 (0.37–2.27)	0.851
	≥25	23	34	Ref		1.00 (Reference)	—
Sex	Male	119	121	0.92 (0.60–1.40)	0.70	—	—
	Female	70	63	Ref		Ref	
Year of study	First year	35	37	0.98 (0.81–1.20)	0.79	—	—
	Second year	52	40	Ref			
	Third year	64	79				
	Fourth year	28	22				
	Fifth year and above	10	17				
Field of study	Natural and Computational Sciences	60	57	1.10 (1.00–1.20)	0.03	1.77 (0.59–5.27)	0.306
	Social Sciences	58	49	Ref		1.76 (0.59–5.22)	0.310
	Engineering and Technology	23	14			1.52 (0.39–5.96)	0.546
	Agriculture	17	17			2.32 (0.60–9.01)	0.223
	Law	1	8			0.76 (0.07–8.51)	0.820
	Sport Sciences	15	10			3.60 (0.90–14.40)	0.070

Marital status	Others	14	30	Ref		1.00 (Reference)	—
	Single	169	155	1.64 (0.90–3.00)	0.11	1.20 (0.49–2.94)	0.691
	Married	20	30	Ref		1.00 (Reference)	—
Religion	Orthodox Christian	166	158	1.44 (0.95–2.20)	0.09	0.20 (0.01–3.97)	0.292
	Muslim	21	18	Ref		0.16 (0.01–3.50)	0.242
	Protestant	2	3			0.21 (0.00–13.71)	0.463
Residence	Catholic	0	6	Ref		1.00 (Reference)	—
	Urban	81	87	0.85 (0.56–1.27)	0.42	—	—
	Rural	108	98	Ref			
Monthly allowance (Birr)	<500	76	74	1.03 (0.82–1.29)	0.80	—	—
	500–1000	75	74	Ref			
	1001–2000	25	20				
	>2000	13	17				
Self-reported history of malaria	Positive	70	83	0.72 (0.48–1.09)	0.12	0.87 (0.47–1.61)	0.652
	Negative	119	102	Ref		1.00 (Reference)	—
Access to malaria information	Yes	128	155	0.42 (0.25–0.69)	<0.001	—	—
	No	61	30	Ref			
Participation in malaria campaigns	Yes	49	59	0.39 (0.24–0.63)	<0.001	0.18 (0.08–0.39)	<0.001
	No	140	126	Ref		1.00 (Reference)	—
ITN use	Yes	84	141	0.25 (0.16–0.39)	<0.001	0.14 (0.07–0.28)	<0.001
	No	105	44	Ref		1.00 (Reference)	—
Draining stagnant water	Yes	84	162	0.12 (0.07–0.20)	<0.001	0.07 (0.03–0.16)	<0.001
	No	62	23	Ref		1.00 (Reference)	—
Support for malaria control in the community	Yes	145	169	0.32 (0.17–0.60)	<0.001	0.39 (0.17–0.91)	0.030
	No	43	16	Ref		1.00 (Reference)	—
Use of mosquito repellent	Yes	45	130	0.13 (0.08–0.21)	<0.001	0.17 (0.09–0.30)	<0.001
	No	144	55	0.22 (0.13–0.37)	<0.001	1.00 (Reference)	—
Closing windows at night	Yes	119	164	—	—	0.18 (0.08–0.40)	<0.001
	No	70	21	Ref		1.00 (Reference)	

Discussion

The overall prevalence of previous self-reported malaria history among undergraduate students was from April to June 2026 was (10.43%). This indicates that malaria is still a major health problem among university students in malaria endemic settings of Ethiopia. University students are generally considered a relatively educated population with better access to health information, but may still be vulnerable to malaria infection because of their prior exposure in endemic communities, rural backgrounds, seasonal movement, and inconsistent use of preventive measures. Similarly 9.8% malaria cases were reported from University of Dschang, students in Cameroon [33]. On the other hand the present finding was lower than the 16.7% malaria prevalence among summer degree students at Debre Markos University [17] and 13.5% was positive among Lira University teaching Hospital, Uganda [34]

In the present study, good knowledge was recorded. The good level of knowledge may be attributed to the educational background of students and their exposure to malaria information thru health professionals, mass media, social media and activities organized in the university. However, the 'gaps in knowledge' identified suggest that exposure to information does not necessarily translate to comprehensive understanding of malaria transmission and prevention. This is in line with the findings in university students in Kavango East, Namibia and the University of Nigeria, Nsukka campus, Nigeria [35-36]. The knowledge level was lower than the previous report among summer degree students at Debre Markos University [17]. This difference may be attributed to variation in study population, time of data collection, educational characteristics and criteria for knowledge assessment. Thus the observed difference should be interpreted according to difference in methodology and populations and not as a sign of decline in the knowledge of malaria.

More than half of the students expressed positive attitudes towards malaria prevention. Nevertheless, the proportion with unfavorable attitudes remains important because perceived susceptibility and perceived severity can influence adoption of preventive measures. Previous studies have similarly shown that university students may recognize the importance of malaria prevention while underestimating their personal risk [36-37]. Although the level of knowledge and attitude was found to be good, the study revealed that malaria preventive practices were poor. This reflects the knowledge-practice gap, with good knowledge and attitude having little effect on the prevalence of the disease.

The present study demonstrated that a considerable proportion of university students had good knowledge of malaria prevention measures. Furthermore, male students were more likely to have good knowledge of malaria prevention measures than female students. This may be explained by variations in exposure to malaria-related information, social roles, mobility patterns, and participation in malaria prevention activities. This finding was consistent with the study in Ethiopia [39, 40].

In this study, religion was also independently associated with malaria-prevention knowledge. This observation should be interpreted cautiously, since religion may well proxy for a range of social and environmental variables, such as, in general, social networks, residential location, socioeconomic variables, and differential access to health information [17, 36]. In the case of Ethiopia and international comparisons, this study also notes that sociodemographic variables and a range of community context factors, including religious beliefs, are commonly associated with health literacy, malaria, and knowledge [12, 38]. At the same time, the small size of some religious subgroups also makes the odds ratios harder to evaluate confidently [17, 36].

In this study participants who reported draining stagnant water had a higher proportion of good knowledge compared to those who did not report draining stagnant water (51.8% versus 26.0%). This observation is in agreement with Ethiopian studies that indicated that recognition and elimination of stagnant water and mosquito breeding sites are an essential component of knowledge and practices of malaria prevention and control [12-13, 18]. The association may be explained by the fact that students with good knowledge are more likely to identify stagnant water as a breeding site for malaria vectors and take action to manage it. It is possible that good knowledge promoted draining of stagnant water or participation in the activity might have improved knowledge. While an association between access to malaria information and good knowledge was observed in the bivariate analysis, this was not observed after adjusting for possible confounders. The implication of this may be that just providing malaria information may not be sufficient to ensure comprehensive knowledge of malaria. The content, frequency, context, and source of the information may be important determinants of good knowledge. This observation is similar to that of the Debre Markos University study, which also reported the overall good awareness of malaria but with poor knowledge of ITN use and treatment-seeking behaviors [17].

In the current study, it was found that malaria-prevention attitudes were moderately favorable (positive). This might be explained by an apparent lack of awareness of the connection between malaria risk and effective means of its control. Indeed, another survey conducted among university students at Debre Markos University also revealed generally positive perceptions regarding the severity of malaria and the effectiveness of ITNs, but failed preventive activities [17]. Similar results were obtained in a study conducted among students at Obafemi Awolowo University [37].

In the current study, stagnant-water drainage was independently associated with malaria-prevention attitude. This observation was supported by reports from Woreta and Halaba Town, Ethiopia, where stagnant-water drainage was commonly practiced as a form of malaria prevention measure [12, 18]. It is possible that environmental management activities, such as stagnant-water drainage, were likely to increase the perception of individual efficacy to take part in malaria control, which in turn positively influenced malaria-prevention attitude among university students.

In the present study, the factors residence and monthly allowance were not associated with attitude toward malaria prevention following adjustment for potential confounders. The reason for this may be that university students may reside in a relatively homogenous group of individuals regarding education and information about malaria prevention. The obtained results are similar to those from Ethiopian studies attitude toward malaria prevention remains independent from these factors [12, 18].

In the present study, draining stagnant water was significantly associated with favourable malaria-prevention perceptions, suggesting that active participation in environmental control may reinforce positive perceptions of malaria prevention. This finding is consistent with evidence from northwest Ethiopia, where draining stagnant water was a commonly reported environmental malaria-control practice [12]. These findings support integrating routine stagnant-water surveillance and elimination into university malaria-control activities alongside health education.

In the present study, ITN was not independently associated with malaria-prevention attitude. ITN use may depend more on practical factors, such as access, comfort, sleeping conditions, and

consistency of use, than on attitude alone. This differs from community-based Ethiopian studies, where socioeconomic and environmental factors influenced malaria-related perceptions and practices [12, 20]. These findings support integrated university interventions combining health education with practical and environmental malaria-control activities.

In the current study, malaria-prevention practice was independently associated with participation in malaria campaigns, ITN use, draining of stagnant water, support for community malaria control, mosquito-repellent use, and closing windows at night. However, sociodemographic variables and history of malaria were not significant predictors. The association suggests that repeated exposure to practical measures together with active community participation could reinforce the message and contribute to its successful implementation. This finding is consistent with the studies conducted at schools and community in Ethiopia [42-43]. Moreover, the current study found that the use of ITN was strongly associated with good practice (AOR = 0.14, 95% CI: 0.07–0.28). This implies the need for encouraging people to take precautions against mosquito bites to reduce exposure to malaria parasites. In line with this result, a study conducted in Ethiopia also revealed that ITN use was protective against malaria and showed that the odds of getting malaria were higher among those who did not use ITNs [18, 20].

Importantly, access to malaria information turned out to be significantly associated with the malaria prevention practices in the bivariate analysis but lost significance after adjustment, which suggests that information exposure alone is insufficient to promote the desired outcome. Indeed, the evidence from Ethiopia revealed that knowledge about malaria and access to ITNs do not necessarily result in consistent use of these tools due to various behavioral barriers, such as sleeping arrangements, perceived inconvenience, lack of perceived risk, and inconsistent use [44-45]. Behavioral change interventions, including peer-to-peer education, repetitive information, and engagement, have proven effective in promoting ITN use among rural Ethiopian communities [42-43].

Previous malaria history and demographic characteristics were not independently associated with malaria prevention practice in the current study. This could be due to the relatively homogeneous university environment, where students have similar access to information on malaria and opportunities for its prevention and some preventive behaviors require limited financial resources. Also, past experience of malaria may not translate to sustained practice as behavior is

influenced by perceived risk, environmental factors, access to preventive tools and practical barriers. Ethiopia provides similar evidence of the stronger influence of knowledge, access, information exposure and practical barriers on malaria-prevention behavior than demographic characteristics alone [13, 45-46].

Conclusion

Malaria remains a significant concern among university students, with 10.4% self-report test positive and 40.9% reporting previous infection. Although most students had good knowledge and a positive attitude, only half demonstrated good prevention practices. Knowledge was associated with sex and religion, while stagnant-water drainage was associated with attitude. Prevention practices were independently associated with campaign participation, ITN use, stagnant-water drainage, community support, repellent use, and closing windows at night. Integrated university-based interventions should therefore combine health education with practical and environmental malaria-control measures. Thus, malaria communication among university students should extend beyond information provision to address practical and behavioral barriers to prevention.

Limitations of the study

The cross-sectional study design may not allow establishing temporal and causal relationships between malaria-related knowledge, attitude, and practice as well as their influencing factors. Self-reported malaria history and prevention measures may be subject to recall and social-desirability biases. The study was conducted at one university, and most of the participants came from the Amhara region, which questions the study's applicability to other student populations. Moreover, the study's findings may not be accurate due to the small sample size in each category and the season, during which the study was conducted, not being representative of the whole year.

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Author contribution

AH conceived the study, designed the research, collected and analyzed the data, and drafted the manuscript.

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Data availability

The data analyzed in this study are presented in the manuscript. The raw data are available from the corresponding author upon reasonable request.

Ethical approval and consent to participate

Prior to conducting the study, ethical approval was obtained from the Ethical Review Committee of the Department of Biology, Debre Markos University (DMU/NCS/Biol/10/20/206). The study's aims, benefits, and possible risks were explained to the health professionals, heads of the health institutions, and study participants or their parents or legal guardians. Informed consent was obtained from all participants and for those under 18 years old, permission was sought from their parents or legal guardians (see attached informed consent form). All information was kept strictly confidential and anonymous. This study followed the ethical guideline of the Declaration of Helsinki [47].

Consent for publication

The author has approved the submission of final copy for publication

Competing interest

The author declared no conflict of interests

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