

Factors influencing health literacy among undergraduates in northeast Thailand: A cross-sectional study

Ladda Pholputta¹, Orathai Pongkaew¹, Sutthisak Noradee², Thawatchai Toemjai³

¹Division of Adult and Gerontological Nursing, Faculty of Nursing, Roi Et Rajabhat University, Roi Et, Thailand.

²Prangku District Public Health Office, Sisaket, Thailand.

³Sirindhorn College of Public Health, Ubon Ratchathani Province, Faculty of Public Health and Allied Health Sciences, Praboromarajchanok Institute, Thailand.

Corresponding Author: Thawatchai Toemjai **Email:** toemthawat@scphub.ac.th

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ABSTRACT

To enable enlightened health decisions and sustain overall well-being, health literacy (HL) is fundamental. For university students in Thailand, HL influences lifestyle choices, healthcare access, and academic performance. The purpose of this research was to evaluate the variables linked to HL among university students. To guarantee sufficient statistical power, a descriptive cross-sectional study including 559 students was performed, and the sample size was established using power analysis. Data collection included a personal information form and a health literacy questionnaire based on the "3A2S" framework, covering six dimensions including health knowledge, information access, communication, decision-making, behavior modification, and information sharing. High reliability (Cronbach's alpha = 0.97) was exhibited by the questionnaire. The findings revealed significant associations between HL levels and gender, academic department, underlying disease status, and GPA ($p < 0.05$). Those in the nursing department ($p = 0.035$) and students with a GPA ≥ 3.0 ($p < 0.001$) were more prone to exhibit higher levels of HL, as revealed by multiple logistic regression analysis. These findings highlight the necessity for targeted measures, such as customized educational programs and seminars, to improve health literacy among students, especially those pursuing non-health-related disciplines. Future studies should develop and evaluate such programs to support informed health practices within academic communities.

Keywords:

Health literacy (HL), Undergraduate students, Cross-sectional study, Influencing factors

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INTRODUCTION

Individuals' capacity to acquire, examine, assess, and use health information in their daily lives is influenced by health literacy (HL), which is widely acknowledged as a critical predictor of public health.¹ It is vital for influencing health behaviors, helping inform decision-making to practice good health behaviors, and, eventually, supporting general well-being and reduced healthcare costs.² The concept of HL has evolved beyond basic literacy to encompass a broader set of rational and societal abilities. By expanding access to health data and their capability to employ it successfully, it boosts people's enthusiasm and ability to inspire themselves.^{3,4}

Among university students, HL holds particular significance as they transition into adulthood and assume greater responsibility for their health management.^{5,6} This life stage is crucial as health behaviors and practices established during young adulthood often persist into later life.^{7,8}

Despite being part of a highly educated demographic, many university students struggle with inadequate HL, which can result in unhealthy lifestyle choices such as poor diet, physical inactivity, and risky behaviors such as smoking and excessive alcohol consumption.⁹ Moreover, inadequate HL raises wider health issues in addition to affecting personal health, limiting students' ability to prevent diseases and handle stress and, possibly, leading to inappropriate health behaviors.^{4,9}

In Thailand, HL has gained increasing attention as a preventive tool against non-communicable diseases (NCDs), including diabetes and hypertension.^{9,10} Multiple factors influence HL levels among undergraduates, comprising personal characteristics,

socioeconomic standing, and availability of health data.^{11,12} Gender disparities have been observed, with female students often exhibiting higher HL levels than males, possibly due to differing health-seeking behaviors and attitudes.^{13,14} Additionally, socioeconomic status, particularly family income and educational background, plays a significant role, as students from lower-income families are inclined to have lower HL levels.¹⁵ Another deciding factor is the learners' concentrations in health-related subjects. Because of the emphasis on health information in their curricula, students in these fields typically exhibit higher HL levels.¹⁶

Especially in the digital era, the availability of health data is another key determinant of HL. University students are frequently exposed to vast amounts of online health content, much of which may be inaccurate or misleading.^{17,18} Therefore, the power to decisively assess and discern reliable information from doubtful sources is crucial for useful HL.¹⁹

Participation in health-promoting activities such as exercise programs, campus health workshops, and peer education initiatives has also been shown to enhance HL levels by reinforcing knowledge and encouraging positive health behaviors.^{20,21}

Thailand's Ministry of Public Health has recognized these challenges and implemented health literacy initiatives aimed at guiding individuals toward healthier lifestyles.²² Despite these efforts, comprehensive data on HL levels and the influencing factors among university students remains limited, underscoring the need for further research.²³ Existing studies suggest that undergraduates frequently have lower HL levels when contrasted to reference groups,¹¹ stressing the need for directed measures to enhance their capacity to gather, grasp, and use health data successfully.

This analysis is based on the 3A2S theoretical framework encompassing Access, Appraise, Apply, Self-management, and Social engagement, which offers a wide-ranging methodology to HL by integrating information processing with behavioral and social dimensions. Compared to alternative models, 3A2S is particularly suitable for Thailand as it aligns with national health promotion priorities, emphasizes self-care, and supports community engagement within a collectivist culture. The chosen measurement tool, developed by the Thai Ministry of Public Health,²⁴ was selected after comparing international instruments such as HLS-EU-Q47, eHEALS, and NVS, considering its linguistic appropriateness, cultural relevance, and ease of administration, despite certain limitations in cross-country comparability. The Thai context, including the higher education structure, Universal Health Coverage policies, cultural values, and language accessibility challenges, shapes both health

literacy needs and intervention design. A review of the literature reveals a limited number of empirical studies integrating 3A2S within Thai higher education settings, particularly linking health literacy to underlying diseases and self-management, highlighting a critical research gap that this study seeks to address.

The purpose of this study was to look at what factors affect university students' health literacy (HL). Using a cross-sectional approach, the current research looked at how behavioral, socioeconomic, and demographic factors affected HL variability in this cohort. Gaining a deeper understanding of these influences is essential for developing effective health education activities fitted to the particular requisites of undergraduates in Thailand.²⁵ Ultimately, enhancing HL among young adults has the potential to foster healthier individuals and alleviate the burden of preventable diseases in the long run.²⁶

CONCEPTUAL FRAMEWORK

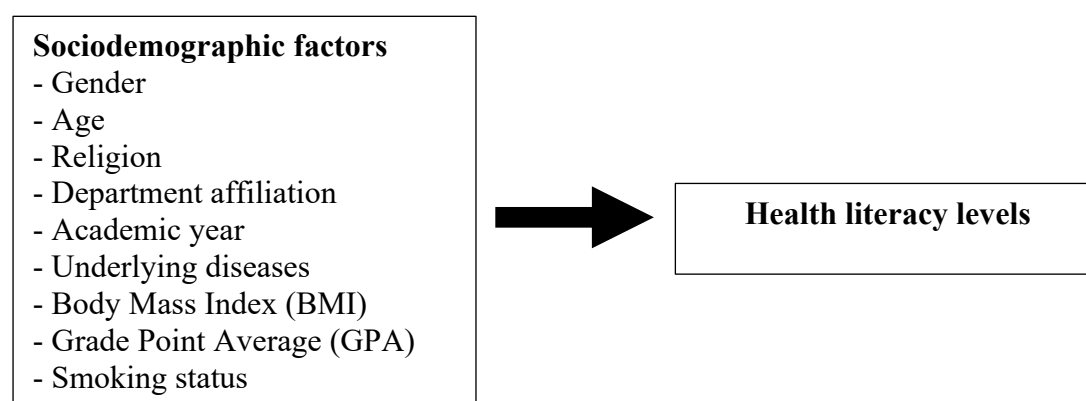


Figure 1. Conceptual Framework

METHODOLOGY

Study scheme and background

To investigate the circumstances affecting health literacy (HL) among undergraduate students at Roi Et Rajabhat

University, this research used a descriptive cross-sectional approach. The study was guided by the 3A2S framework, which encompasses Access, Appraise, Apply, Self-management, and Social engagement, offering a wide-ranging approach to

recognizing how learners gain, evaluate, and use health data to control their health and join social health events. Data were gathered over a three-month span (November 2023 to January 2024) to accommodate students' schedules across different faculties and to ensure adequate participation.

Study contributors and sampling

This research comprised 4,356 normal undergraduates registered for semester one of the 2023 academic year. Inclusion criteria were: (1) enrollment in the first semester of 2023, (2) proficiency in Thai to ensure effective communication, and (3) voluntary consent to participate. The requisite sample size of 508 contributors was determined using G*Power 3.1.9.2 software²⁷ with an effect size of 0.3 (Cohen, 1988),²⁸ significance level of 0.05, power of 0.80, and r-value of 0.124. An extra 10.0% (51 students) was added to make up for possible nonresponse or incomplete data, resulting in a total sample size of 559.

A simple random sampling method was used to choose the sample. Each student was assigned a unique ID number, and participants were randomly selected using a random number generator, ensuring that every student had an equal chance of inclusion. All 559 students who were invited completed the survey, yielding a 100% response rate.

Data collection tools and techniques

The research instruments were comprised of two questionnaires. The first was the Personal Information Questionnaire, which gathered demographic and background data, including gender, age, year of study, faculty, religion, underlying diseases, body mass index (BMI), and monthly individual expenditures. The second was the Health Literacy Questionnaire, which was

grounded in the "3A2S" principles and was modified from the 2018 Health Literacy Questionnaire for individuals aged 15 years and older, established by the Bureau of Health Education, Department of Health Service Support of the Ministry of Public Health (2018).²⁴ It comprised six measurements including 1) Health Information and Comprehension (4 items), 2) Availability of Health Information and Services (4 items), 3) Collaborative Interaction to Boost Understanding (4 items), 4) Health Decision-Making (4 items), 5) Health Behavior Modification (4 items), and 6) Distribution and Sharing of Health Data (4 items). Replies were ranked on a 5-point Likert scale: 5 = Very often, 4 = Often, 3 = Sometimes, 2 = Rarely, and 1 = Very rarely. The total DHL score was the sum of the scores for all items (ranging from 24 to 120). Levels of HL were classified as poor (ranging between 24.00–71.99 points), fair (ranging between 72.00–83.99 points), good (ranging between 84.00–95.99 points), and very good (ranging between 96.00–120 points). The Health Literacy Questionnaire underwent content validity assessment by three experts, and its reliability was established through pilot testing with 30 participants who shared similar characteristics with the main study group. The Cronbach's alpha coefficient of the instrument was 0.97, representing high internal consistency.

Data analysis

Statistical software was used to analyze the data gathered from the surveys and score them according to preset standards. To review the participants' demographic data, descriptive statistics were used, comprising frequencies and percentage distributions. Before inferential investigation, the Shapiro-Wilk test was used to assess the normality of continuous variables in order to verify the accuracy of parametric assertions. Associations

between categorical variables and health literacy levels were examined using the Chi-square test, especially for evaluations concerning gender, department affiliation, underlying disease status, GPA, and other sociodemographic factors. Multiple logistic regression analyses were performed to identify predictors of health literacy. The power of correlations was described as adjusted odds ratios (OR), 95% confidence intervals (CI), and *p*-values, with statistical significance set at $p < 0.05$.

RESULTS

All participants responded to the study questionnaire. Table 1 shows the characteristics of the 559 Roi Et Rajabhat University students who took part in this study. The correlations between levels of health literacy (HL) and sociodemographic characteristics among the Roi Et Rajabhat

University students showed that gender was significantly associated with health literacy, with females showing greater "Very Good" HL levels (67.8%) compared to males (57.0%) ($p = 0.049$). Department affiliation also revealed notable disparities; nursing students had the highest "Very Good" HL levels (85.1%), while the lowest levels were observed among Business Administration and Accountancy students (44.3%) ($p < 0.001$). Students without underlying diseases demonstrated better HL, with 69.3% in the "Very Good" category compared to 52.6% for those with underlying diseases ($p = 0.002$). GPA was also a strong predictor, as students with a GPA ≥ 3.0 had significantly higher "Very Good" HL levels (71.9%) than those with a GPA < 3.0 (43.4%) ($p < 0.001$). However, age ($p = 0.530$), academic year ($p = 0.740$), BMI ($p = 0.762$), and smoking status ($p = 0.696$) showed no significant associations with health literacy.

Table 1. Correlations between levels of health literacy and sociodemographic features

Sociodemographic data	Health literacy index [n (%)]				Total	<i>p</i> -value
	Poor	Fair	Good	Very Good		
Gender						
Female	10 (2.3)	44 (10.2)	85 (19.7)	292 (67.8)	431 (77.1)	0.049*
Male	3 (2.3)	24 (18.8)	28 (21.9)	73 (57.0)	128 (22.9)	
Age (in years)						
≤20.0 years	10 (2.7)	48 (13.2)	70 (19.2)	237 (64.9)	365 (65.3)	0.530
>20.0 years	3 (1.5)	20 (10.3)	43 (22.2)	128 (66.0)	194 (34.7)	
Mean (S.D.) = 19.98 (1.70)						
Religion						
Buddhist	13 (2.3)	68 (12.3)	110 (19.9)	363 (65.5)	554 (99.1)	0.159
Other			3 (60.0)	2 (40.0)	5 (0.9)	
Department						
Nursing		1 (1.5)	9 (13.4)	57 (85.1)	67 (12.0)	<0.001***
Business Administration and Accountancy	4 (6.5)	12 (19.7)	18 (29.5)	27 (44.3)	61 (10.9)	
Education	3 (1.0)	32 (10.7)	50 (16.8)	213 (71.5)	298 (53.3)	
Liberal Arts and Science	3 (3.9)	12 (15.8)	22 (28.9)	39 (51.4)	76 (12.6)	
Information Technology	1 (8.3)	1 (8.3)	1 (8.3)	9 (75.1)	12 (2.1)	
Political Science	2 (4.4)	10 (22.2)	13 (29.0)	20 (44.4)	45 (8.1)	
Academic year						
First	8 (3.5)	32 (13.9)	44 (19.0)	147 (63.6)	231 (41.3)	0.740
Second	2 (1.5)	12 (9.2)	24 (18.5)	92 (70.8)	130 (23.3)	
Third	2 (1.6)	17 (13.4)	28 (22.0)	80 (63.0)	127 (22.7)	
Fourth	1 (1.4)	7 (9.9)	17 (23.9)	46 (64.8)	71 (12.7)	

Sociodemographic data	Health literacy index [n (%)]				Total	p-value
	Poor	Fair	Good	Very Good		
Underlying diseases						
Yes	2 (1.5)	24 (18.1)	37 (27.8)	70 (52.6)	133 (23.8)	0.002**
No	11 (2.6)	44 (10.4)	76 (17.8)	295 (69.2)	426 (76.2)	
Body Mass Index (BMI)						
Normal weight	11 (2.7)	49 (11.8)	86 (20.7)	269 (64.8)	415 (74.2)	0.762
Overweight	2 (1.4)	19 (13.2)	27 (18.8)	96 (66.6)	(25.8)	
GPA						
<3.0	7 (5.4)	31 (24.0)	35 (27.2)	56 (43.4)	129 (23.1)	<0.001***
≥3.0	6 (1.4)	37 (8.6)	78 (18.1)	309 (71.9)	430 (76.9)	
Smoking						
Yes	10 (2.5)	52 (13.1)	80 (20.2)	255 (64.2)	397 (71.0)	0.696
No	3 (1.9)	16 (9.9)	33 (20.3)	110 (67.9)	162 (29.0)	

*p value < 0.05, **p value < 0.01, ***p value < 0.001

Among undergraduates, the division of health literacy (HL) levels fluctuated by gender, age, religion, department, academic year, underlying diseases, BMI, GPA, and smoking status. The highest proportion of “Very Good” HL was observed among nursing students (85.1%), followed by students in Political

Science (75.1%) and those with a GPA ≥ 3.0 (71.9%). Lower proportions of “Very Good” HL were found among Business Administration and Accountancy (44.3%), and Liberal Arts and Science students (51.4%), as well as smokers (64.2%), as shown in Figure 2.

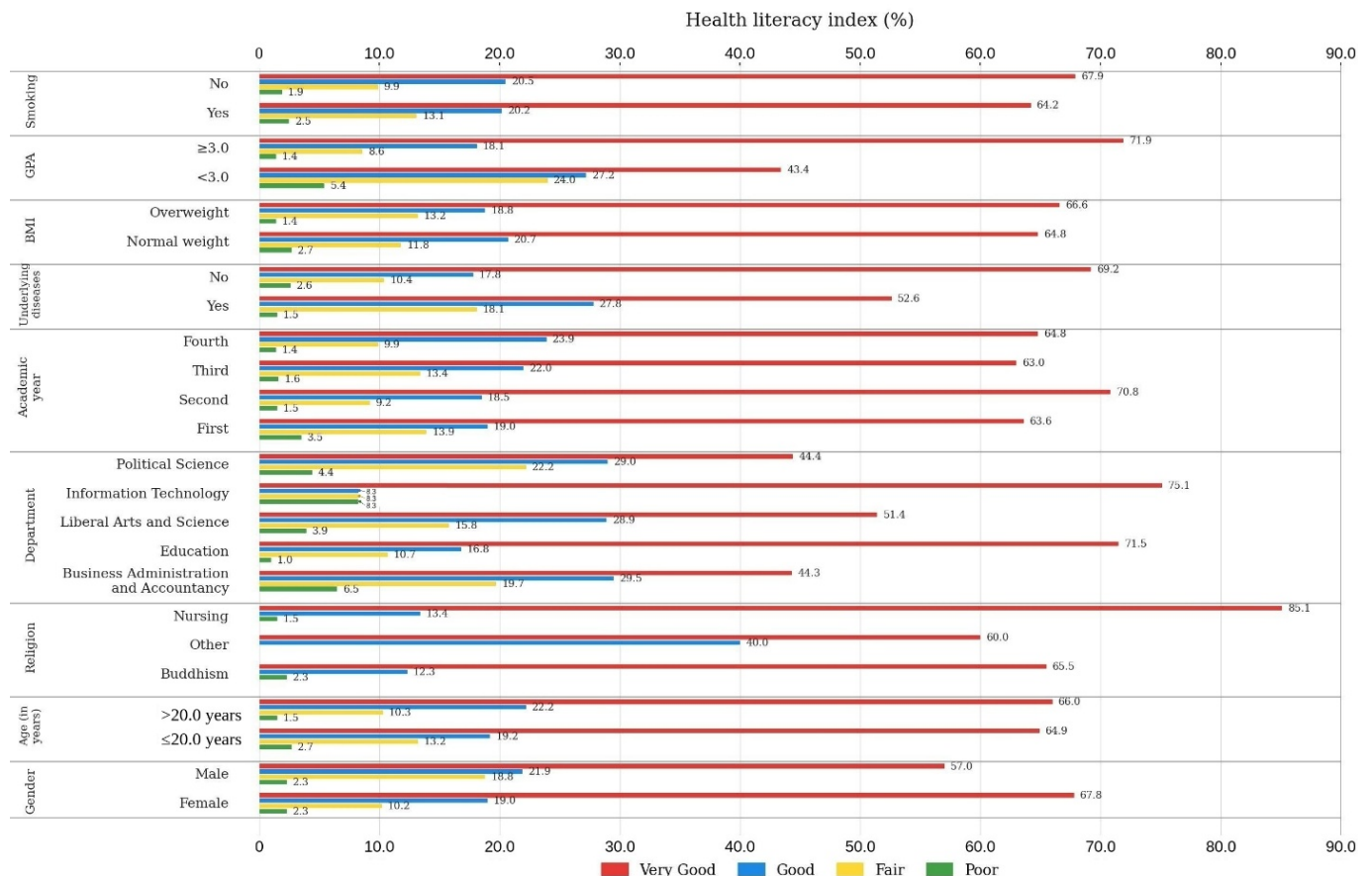


Figure 2. Health literacy levels across sociodemographic factors

The multiple logistic regression analysis of the components affecting health literacy levels is shown in Table 2. Those in the nursing department tended to have higher health literacy ($p = 0.035$, $OR = 0.116$, 95% CI: 0.016–0.863), as did those

having a $GPA \geq 3.0$ ($p < 0.001$, $OR = 0.344$, 95% CI: 0.206–0.574). Other factors, including gender, age, religion, underlying diseases, weight, and smoking, showed no significant associations with health literacy levels ($p > 0.05$).

Table 2. Multiple logistic regression evaluation of components affecting levels of health literacy

Independent data	B	SE	Wald	p-value	OR	95% CI
Gender=no (ref=yes)	-0.322	0.276	1.369	0.242	0.724	0.422-1.243
Age>20.0 years=no (ref=yes)	-0.316	0.277	1.306	0.253	0.729	0.424-1.254
Buddhism= no (ref=yes)	-0.143	0.829	0.030	0.863	0.867	0.171-4.405
Nursing department=no (ref=yes)	-2.156	1.025	4.425	0.035*	0.116	0.016-0.863
Underlying diseases=no (ref=yes)	0.369	0.272	1.839	0.175	1.447	0.848-2.468
Normal weight=no (ref=yes)	-0.010	0.274	0.001	0.971	0.990	0.578-1.695
Overweight=no (ref=yes)	0.004	0.288	0.000	0.990	1.004	0.571-1.764
GPA≥3.0=no (ref=yes)	-1.068	0.261	16.697	<0.001***	0.344	0.206-0.574
Smoking= no (ref=yes)	0.256	0.292	0.767	0.381	1.291	0.729-2.288
Constant	4.124	1.088	14.360	<0.001	61.811	

*p value < 0.05, **p value < 0.01, ***p value < 0.001

DISCUSSION

The links between HL levels and sociodemographic traits among Roi Et Rajabhat University undergraduates were investigated in this research, revealing several significant associations. Gender was a key factor, with females demonstrating higher "Very Good" HL levels compared to males. These results align with previous research suggesting that women tend to show superior health literacy, possibly because of more practical health-seeking habits, greater engagement with preventive health services, and stronger communication with healthcare providers.^{29,30} Such behaviors may facilitate more frequent exposure to health information and skill-building in interpreting health messages.

This contrasts with previous studies suggesting that HL was lower among women, possibly due to poorer mean reading skills in certain populations and unequal access to health information.^{31,32} Moreover, other studies, such as research among Danish university students, found no sex-based difference, though female students achieved somewhat better scores than males. These distinctions may reveal differences in social, educational, and healthcare system contexts, reinforcing the need for localized HL interventions.³³

Department affiliation also showed a strong correlation with HL. Nursing students reported the highest "Very Good" HL levels, whereas Business Administration and Accountancy students had the lowest. This pattern may be explained by curriculum content: health-related programs directly develop knowledge, attitudes, and skills relevant to the 3A2S framework (Access, Appraise, Apply, Self-efficacy, and Social support), which together foster stronger health literacy competencies. In contrast, low HL scores could result from decreased chances

to learn these abilities in non-health curricula. This result is in line with previous research showing students in health-related disciplines typically have stronger health literacy because of their knowledge of health concepts and educational background.^{34,35} Therefore, integrating health literacy training into non-health-related programs could have meaningful and practical benefits, enabling students from diverse disciplines to better manage personal and community health challenges.³⁶

Underlying disease status also influenced HL. Students without chronic conditions reported higher HL levels than those with underlying diseases, possibly because managing chronic illness requires processing complex and sometimes conflicting health information, which can be overwhelming without targeted support. This underscores the need for disease-specific HL interventions, particularly those enhancing appraisal and application skills (as emphasized in the 3A2S framework) to improve self-management and treatment adherence.³⁷

Academic performance, as reflected by GPA, emerged as an important predictor of HL, with learners attaining a GPA ≥ 3.0 demonstrating considerably higher "Very Good" HL levels. This may be attributed to stronger cognitive abilities, critical thinking skills, and information processing skills, which are vital for the successful use of health data. Similarly, department affiliation showed a strong association with HL, as nursing students exhibited better HL levels compared to students in other fields, probably because of more experience with health-related content and real-world uses within their course. These findings have both clinical and educational significance, suggesting that the enhancement of academic skills and integration of health literacy training into non-health-related programs may indirectly improve HL and,

in turn, promote healthier behaviors and outcomes.^{38,39} However, they differ from a prior study on nursing students that reported no significant differences in knowledge, experience, academic performance, and HL.⁴⁰ In contrast, other sociodemographic factors, including gender, age, religion, underlying disease status, BMI, and smoking, did not reveal statistically significant links to HL.

Notably, no substantial links were revealed between HL and age, academic year, BMI, or smoking status in this study, despite previous research reporting such links. For example, lower HL has been associated with unhealthy BMI through limited understanding of nutrition, physical activity, and weight management, as well as with smoking through lower awareness of cessation benefits, decreased intention to quit, and inadequate awareness concerning the dangers of using tobacco.⁴¹ The absence of these associations in our findings may reflect cultural, educational, or sample-specific factors, or possibly insufficient statistical power to detect smaller effects. These results align with recent evidence suggesting that certain sociodemographic characteristics exert a less direct influence on HL when contrasted against considerations including educational level and branch of learning.⁴² However, they contrast with other studies reporting significant associations between HL and age,⁴³ BMI⁴⁴, or smoking.⁴⁵

In Thailand, health literacy (HL) among university students has been shown to vary across regions and disciplines. In Northern Thailand, Pissamorn et al. (2022)⁴⁶ reported that more than half of public health students had moderate HL, with financial resources and access to information playing important roles. In the Central region, Tubklay et al. (2024)⁴⁷ found that demographic factors such as gender, occupation, and environment were significantly associated with HL, while Sukrueangkul et al. (2022)⁴⁸ in the Northeast and Klanarong & Pakdevong

(2023)⁴⁹ in the Central region highlighted psychosocial and academic factors, including stress, self-efficacy, income, and social support, as key predictors among nursing students. In Southern Thailand, Siri et al. (2022)⁵⁰ showed that most undergraduates (84.6%) had adequate HL, which was closely linked to disease preventive behaviors. While these studies focused mainly on specific faculties or disease-related contexts, our research extends the evidence by examining students from multiple faculties, illustrating how HL differs by academic discipline and performance. Notably, in Roi Et we found no significant associations between HL and demographic factors such as gender, age, or BMI; instead, GPA and department emerged as consistent predictors. This suggests that structural and academic contexts, together with institutional support, may play a more central role in shaping HL than demographic characteristics alone.

LIMITATIONS AND SUGGESTIONS

It is important to take into account the potential limitations of this study. First, the study was limited to a single university's departments, thus restricting the applicability of the findings to other organizations. Second, self-reported questionnaires were used to gather data, potentially presenting social desirability bias, as respondents might provide answers they perceive as acceptable rather than their actual behaviors. To address these limitations, future multi-site studies should include various universities throughout Thailand, allowing for comparative analysis and more representative insights. Building on the 3A2S health literacy framework, future interventions should be designed to strengthen specific abilities, including detailed evaluation of digital health data, self-management of lifestyle behaviors, and social engagement through

peer-led programs, particularly for students in non-health majors. Policymakers should consider integrating health literacy development into higher education curricula and national youth health promotion strategies, ensuring that interventions are culturally adapted, sustainable, and aligned with Thailand's public health priorities.

CONCLUSION

As shown in this study, educational considerations have a crucial impact on establishing levels of HL among the students at Roi Et Rajabhat University. The findings reveal that nursing students and those with a GPA ≥ 3.0 exhibited significantly higher HL, emphasizing the impact of academic performance and field of study on health-related knowledge and skills. In contrast, other sociodemographic factors, including gender, age, religion, underlying disease status, weight, and smoking habits, were not significantly associated with HL. The findings point to the necessity for focused health education initiatives that extend beyond health-related disciplines, thus guaranteeing that access to health information and the skills needed to apply it effectively are similarly available to students from all academic backgrounds. The concentration of future studies should be on increasing the applicability of the results to other wide-ranging populations at universities and designing and assessing interventions aimed at boosting HL, especially for learners in non-health-related courses, so as to cultivate a more enlightened and health-competent student population.

AUTHOR CONTRIBUTIONS

LP: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing - Original Draft and

Writing - Review & Editing. TT: Conceptualization, Methodology, Data curation, Formal analysis, Writing - Original Draft, Writing - Review & Editing and Supervision. P: Investigation and Writing - Review & Editing. SN: Data curation and Writing - Review & Editing.

ETHICAL CONSIDERATION

This study was conducted in accordance with ethical principles for human research. Ethical approval was obtained from the Human Research Ethics Committee of Roi Et Rajabhat University (Approval No. 097/2566; approved on October 24, 2023). Written informed consent was obtained from all participants before data collection.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest related to this study.

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