

## Research Article

# Health Literacy, Health Information-Seeking, and Preventive Health Practices among College and University Students in Hanoi, Vietnam: A Multicenter Cross-Sectional Study

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Health literacy and active health information-seeking may be associated with students' preventive health practices. This study examined these associations among college and university students in Hanoi, Vietnam, with a focus on fruit and vegetable consumption. A multicenter cross-sectional survey included 618 students aged 18 years or older from two universities and three colleges. Health literacy was assessed using a questionnaire adapted from the 12-item Short-Form Health Literacy Survey and expressed as an index ranging from 0 to 50. Active health information-seeking during the preceding three months was measured using five ordered frequency categories. Ordinal logistic regression examined the association between health literacy and information-seeking, while linear regression with HC3 robust standard errors examined fruit and vegetable consumption frequency. Models adjusted for age, gender, health-related major, financial circumstances, and institution. Mean health literacy was  $25.88 \pm 13.02$  among 486 students with complete scale responses. Mean fruit and vegetable consumption frequencies were  $3.17 \pm 1.63$  and  $4.41 \pm 1.51$  days per week, respectively, among 600 respondents. Adjusted models included 468 complete cases. Each 10-point higher health literacy score was associated with greater odds of more frequent information-seeking (adjusted odds ratio = 1.87; 95% confidence interval [CI]: 1.62-2.17) and 0.16 additional fruit-consumption days per week (95% CI: 0.03-0.29;  $p = 0.016$ ). Its association with vegetable consumption did not reach statistical significance (0.13 days; 95% CI: -0.02-0.28;  $p = 0.079$ ). Information-seeking frequency was associated with both dietary outcomes (overall  $p < 0.001$ ). These findings indicate associations between health

literacy, information-seeking, and selected dietary practices. Longitudinal research is needed to establish temporal relationships and inform campus health-promotion interventions.

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## 1. Introduction

Health literacy is an important resource for making informed decisions about health care, disease prevention, and health promotion. It encompasses the knowledge, motivation, and competencies needed to access, understand, appraise, and apply health information in everyday life <sup>[1]</sup>. This perspective extends beyond the ability to read medical instructions and includes the skills required to evaluate advice and translate information into health-related decisions. Nutbeam distinguished functional, interactive, and critical health literacy, emphasizing the role of increasingly advanced skills in enabling individuals to manage their health <sup>[2]</sup>. Subsequent conceptual research has also highlighted the interaction between individual abilities and the demands of health information and health care systems <sup>[3]</sup>.

College and university students are an important population for investigating these relationships. During higher education, students may assume greater responsibility for their food choices, physical activity, sleep, and use of health services. However, participation in higher education does not necessarily imply that students can confidently evaluate health information or apply it to their daily practices. A systematic review of health literacy among university students identified variation across populations, measurement instruments, and associated factors <sup>[4]</sup>. Studies in Nepal and Jordan have further documented differences in students' health literacy according to their socioeconomic and educational characteristics <sup>[5][6]</sup>. These findings support examining health literacy within specific institutional and social contexts rather than assuming that all students have similar health-related competencies.

Health information-seeking represents a related but distinct behavior. Health literacy concerns individuals' perceived abilities to work with health information, whereas information-seeking concerns their efforts to obtain it. Students can access health information through search engines, social media, health websites, and interpersonal sources, creating opportunities to address their information needs <sup>[7]</sup> <sup>[8][9]</sup>. Research among adults also shows that health information-seeking occurs across multiple channels and is associated with individual characteristics and health circumstances <sup>[10]</sup>. Nevertheless, frequent searching should not automatically be interpreted as effective appraisal or appropriate

application of information. The distinction is particularly relevant in digital environments, where eHealth literacy refers specifically to perceived competencies in finding, evaluating, and using electronically available health information <sup>[11]</sup>. General health literacy, digital health literacy, and information-seeking frequency therefore require separate consideration.

Previous research has examined associations between students' information-related competencies and health-promoting behaviors. Studies in Taiwan have linked aspects of eHealth literacy with health-promoting lifestyles and selected health behaviors <sup>[12][13]</sup>. Research in the United States, Taipei, and Iran has also explored relationships between eHealth literacy and students' health practices <sup>[14][15][16]</sup>. Although these studies provide a rationale for examining information-related competencies alongside behavior, differences in instruments and outcomes limit direct comparisons. In particular, associations with a broad lifestyle score may not describe relationships with specific practices, such as the number of days on which students consume fruit or vegetables.

In Vietnam, research has examined university students' COVID-19-related health literacy and the relationships between digital health literacy, information-seeking, and subjective well-being <sup>[17][18]</sup>. A study in Hanoi has also investigated students' knowledge of depression as a component of mental health literacy <sup>[19]</sup>. These studies provide valuable evidence in specific health domains. Further investigation of general health literacy alongside active information-seeking and everyday dietary practices can complement this evidence, particularly across both college and university settings.

This multicenter cross-sectional study therefore aimed to describe health literacy, active health information-seeking, and selected preventive health practices among college and university students in Hanoi, Vietnam. It also examined the association between health literacy and information-seeking frequency and the associations of both variables with fruit and vegetable consumption frequency, after adjustment for demographic, financial, and institutional characteristics. The analysis focused on associations and did not seek to establish causal effects or mediation.

## 2. Methods

### 2.1. Study design and participants

A multicenter cross-sectional survey was conducted from May 30 to August 25, 2026, among students attending two universities and three colleges in Hanoi, Vietnam. Data were collected using a self-administered questionnaire hosted on Google Forms. Student affairs offices at the participating

institutions distributed the survey link through class groups. Students voluntarily accessed the link and completed the questionnaire. Recruitment therefore followed a convenience sampling approach with self-selected participation.

Eligibility for the present analysis required current enrollment at a participating institution and an age of at least 18 years. The main survey dataset contained 628 responses. Ten respondents younger than 18 years were excluded, leaving 618 students eligible for analysis. Respondents with missing data were retained for analyses in which their available responses could be used. The number of observations consequently varied across analyses. A response rate could not be calculated because the total number of eligible students reached through the class groups was not recorded in the analytical dataset.

## *2.2. Questionnaire preparation and pilot testing*

The Vietnamese-language questionnaire covered sociodemographic characteristics, health literacy, active health information-seeking, dietary practices, and other preventive health practices. Before the main survey, the questionnaire was piloted with 30 students and subsequently revised to improve its suitability for the target population. Pilot responses were excluded from the main analytical dataset, and the pilot participants were not invited to participate again in the main survey.

Pilot testing informed questionnaire refinement but was not treated as a formal psychometric validation of the adapted measures. Internal consistency of the health literacy items was subsequently assessed in the main analytical sample.

## *2.3. Measures*

### *Health literacy*

Health literacy was measured using 12 items adapted from the Short-Form Health Literacy Survey questionnaire (HLS-SF12), developed from the European Health Literacy Survey framework and validated among populations in six Asian countries <sup>[20][21]</sup>. The items assessed perceived difficulty in accessing, understanding, appraising, and applying information relevant to health care, disease prevention, and health promotion.

Responses ranged from 1 (“very difficult”) to 4 (“very easy”). Responses coded as “not previously done or uncertain” or “not applicable” were treated as missing. The health literacy index was calculated only for respondents with valid answers to all 12 items, using the following formula:

Health literacy index = (mean item score - 1) × (50/3).

The index ranged from 0 to 50, with higher scores indicating greater perceived health literacy. It was analyzed continuously without assigning respondents to health literacy categories. Cronbach's alpha and corrected item-total correlations were used to assess internal consistency. These statistics were interpreted as evidence of reliability within the sample rather than confirmation of the adapted instrument's overall validity [\[22\]](#).

### *Active health information-seeking*

Active health information-seeking was assessed using a single item asking how often respondents had deliberately searched for health information for themselves during the preceding three months. The question distinguished intentional searching from incidental exposure to health-related content on social media or other platforms.

Responses were classified into five ordered categories: no searches, 1-2 searches, 3-5 searches, 6-10 searches, and more than 10 searches. "Cannot remember" responses were treated as missing. Information-seeking frequency was analyzed as an ordinal outcome when examining its association with health literacy and as a categorical explanatory variable in the dietary models. The measure captured searching frequency rather than information quality or appraisal accuracy.

### *Dietary and other preventive health practices*

Dietary practices were measured by the reported number of days during the preceding seven days on which respondents consumed fruit, consumed vegetables, ate breakfast, or drank sugar-sweetened beverages. Each frequency ranged from 0 to 7 days, with zero retained as a valid response.

For the focused regression analysis, fruit consumption frequency was designated as the primary outcome and vegetable consumption frequency as the secondary outcome. Additional descriptive measures included the number of days with at least 30 minutes of moderate-to-vigorous physical activity and the number of nights with 7-9 hours of sleep during the preceding week.

The behavioral measures were analyzed separately and were not combined into an overall preventive health practice score. Fruit and vegetable consumption frequencies represented the number of consumption days rather than total intake or compliance with dietary recommendations.

## *Sociodemographic characteristics*

Sociodemographic measures included age, gender, institution, educational level, year of study, health-related major, residence, and perceived financial circumstances. Regression covariates comprised age in years, gender, health-related versus non-health-related major, perceived financial circumstances, and institution.

Gender was classified as male, female, or another gender, with responses declining disclosure treated as missing. Financial circumstances were assessed in relation to daily living and health-related needs and classified as substantial difficulty, difficulty, sufficient resources, or comfortable resources. Institution was entered as a categorical covariate. Educational level was not included simultaneously with institution because university or college status was determined by the participating institution.

## *2.4. Statistical analysis*

Categorical variables were summarized using frequencies and percentages, with denominators specified. Continuous variables and weekly behavioral frequencies were summarized using means and standard deviations. Spearman's rank correlation coefficients examined unadjusted associations between health literacy, information-seeking frequency, and fruit and vegetable consumption frequencies. Correlations used available pairs of observations.

Ordinal logistic regression with a logit link examined the association between health literacy and information-seeking frequency, adjusting for age, gender, health-related major, financial circumstances, and institution. The proportional odds assumption was assessed using the test of parallel lines. Adjusted odds ratios and 95% confidence intervals were reported per 10-point higher health literacy index score. Odds ratios above 1 indicated greater odds of belonging to a higher information-seeking frequency category.

Separate multiple linear regression models examined fruit and vegetable consumption frequencies. Both models included health literacy, categorical information-seeking frequency, and the same adjustment covariates. More than 10 searches was the reference category for information-seeking frequency. Health literacy coefficients were expressed as differences in consumption days per week associated with a 10-point higher index score.

HC3 heteroskedasticity-consistent standard errors were used for confidence intervals and significance tests in the dietary models. Joint robust Wald F tests assessed the overall association between categorical

information-seeking frequency and each dietary outcome. Residual distributions, residual-versus-fitted plots, leverage, and Cook's distance were inspected to evaluate model behavior and potentially influential observations. Institution was modeled using fixed effects; HC3 standard errors did not account for residual dependence among students within the same institution.

Regression analyses used complete cases without imputation, with 468 students included in each adjusted model. All tests were two-sided, and p values below 0.05 were considered statistically significant. No adjustment for multiple comparisons was applied, and the findings were interpreted as exploratory associations. Analyses were performed using IBM SPSS Statistics, with independent verification and supplementary robust tests conducted in Python.

### **3. Results**

#### *3.1. Participant characteristics*

Of the 628 responses collected in the main survey, 10 were excluded because respondents were younger than 18 years, leaving 618 eligible participants. Their mean age was 19.69 years (SD = 1.38; range: 18–24). Among the 615 participants who disclosed their gender, 54.5% were female, 43.1% were male, and 2.4% reported another gender. College students accounted for 55.3% of the sample, and 54.4% were enrolled in health-related majors. Regarding financial circumstances, 41.9% reported sufficient resources, while 41.9% reported difficulty or substantial difficulty meeting their needs. Participant characteristics are presented in Table 1.

| Characteristic           | n            | %    |
|--------------------------|--------------|------|
| Age, years, mean (SD)    | 19.69 (1.38) | —    |
| Gender                   |              |      |
| Male                     | 265          | 43.1 |
| Female                   | 335          | 54.5 |
| Another gender           | 15           | 2.4  |
| Declined disclosure      | 3            | —    |
| Educational level        |              |      |
| University               | 276          | 44.7 |
| College                  | 342          | 55.3 |
| Field of study           |              |      |
| Health-related major     | 336          | 54.4 |
| Non-health-related major | 282          | 45.6 |
| Financial circumstances  |              |      |
| Substantial difficulty   | 84           | 13.6 |
| Difficulty               | 175          | 28.3 |
| Sufficient resources     | 259          | 41.9 |
| Comfortable resources    | 100          | 16.2 |
| Institution              |              |      |
| Institution 1            | 141          | 22.8 |
| Institution 2            | 135          | 21.8 |
| Institution 3            | 107          | 17.3 |
| Institution 4            | 79           | 12.8 |
| Institution 5            | 156          | 25.2 |

**Table 1.** Sociodemographic characteristics of eligible participants

*Note: N = 618. Gender percentages use the 615 participants who disclosed their gender; other categorical percentages use all 618 participants. SD, standard deviation.*

### *3.2. Health literacy, information-seeking, and preventive health practices*

Complete responses to all 12 health literacy items were available for 486 participants (78.6%). The mean health literacy index was 25.88 (SD = 13.02), with observed scores ranging from 0 to 50. The items demonstrated high internal consistency, with Cronbach's alpha of 0.952. Corrected item-total correlations ranged from 0.752 to 0.792.

Information-seeking frequency was available for 594 participants. The most frequently reported category was 3-5 searches during the preceding three months (30.6%), followed by 1-2 searches (24.1%). No active searches were reported by 13.6%, whereas 13.3% reported more than 10 searches.

Weekly behavioral responses were available for 600 participants. Mean fruit consumption frequency was 3.17 days per week (SD = 1.63), compared with 4.41 days per week for vegetables (SD = 1.51). Participants reported eating breakfast on an average of 4.73 days, drinking sugar-sweetened beverages on 3.40 days, and undertaking at least 30 minutes of moderate-to-vigorous physical activity on 2.81 days during the preceding week. They reported 7-9 hours of sleep on an average of 3.66 nights. These measures are summarized in Table 2.

| Measure                                                              | Valid n | Mean (SD) or n (%) |
|----------------------------------------------------------------------|---------|--------------------|
| Health literacy index, 0–50                                          | 486     | 25.88 (13.02)      |
| Active searches during the preceding three months                    | 594     |                    |
| No searches                                                          |         | 81 (13.6)          |
| 1–2 searches                                                         |         | 143 (24.1)         |
| 3–5 searches                                                         |         | 182 (30.6)         |
| 6–10 searches                                                        |         | 109 (18.4)         |
| More than 10 searches                                                |         | 79 (13.3)          |
| Practices during the preceding seven days                            |         |                    |
| Fruit consumption, days                                              | 600     | 3.17 (1.63)        |
| Vegetable consumption, days                                          | 600     | 4.41 (1.51)        |
| Breakfast consumption, days                                          | 600     | 4.73 (1.63)        |
| Sugar-sweetened beverage consumption, days                           | 600     | 3.40 (1.71)        |
| Moderate-to-vigorous physical activity for at least 30 minutes, days | 600     | 2.81 (1.64)        |
| Sleep lasting 7–9 hours, nights                                      | 600     | 3.66 (1.56)        |

**Table 2.** Health literacy, active health information-seeking, and selected preventive health practices

*Note: Behavioral frequencies ranged from 0 to 7. Information-seeking percentages use 594 valid responses. SD, standard deviation.*

### 3.3. Unadjusted associations

Health literacy was positively correlated with information-seeking frequency (Spearman's  $r_s = 0.365$ ;  $n = 471$ ), fruit consumption frequency ( $r_s = 0.328$ ;  $n = 476$ ), and vegetable consumption frequency ( $r_s = 0.323$ ;  $n = 476$ ). Information-seeking frequency was also positively correlated with fruit consumption ( $r_s = 0.406$ ;  $n = 594$ ) and vegetable consumption ( $r_s = 0.367$ ;  $n = 594$ ). All five correlations had  $p$  values below 0.001.

### 3.4. Adjusted associations

Each adjusted model included 468 participants with complete data, representing 75.7% of the eligible sample. In the ordinal logistic regression model, each 10-point higher health literacy index score was associated with greater odds of belonging to a higher information-seeking frequency category (adjusted odds ratio = 1.87; 95% CI: 1.62-2.17;  $p < 0.001$ ). The test of parallel lines did not detect a violation of the proportional odds assumption ( $\chi^2 = 38.28$ ;  $df = 36$ ;  $p = 0.366$ ).

In the fruit consumption model, each 10-point higher health literacy score was associated with 0.16 additional consumption days per week after adjustment (95% CI: 0.03-0.29;  $p = 0.016$ ). Information-seeking frequency was associated with fruit consumption in the joint HC3 robust test ( $F^{[14]} = 14.48$ ;  $p < 0.001$ ). Compared with participants reporting more than 10 searches, those reporting no searches consumed fruit on 2.22 fewer days per week (95% CI: -2.86 to -1.58). All four lower-frequency categories had lower fruit consumption frequencies than the reference category.

In the vegetable consumption model, the estimated difference associated with a 10-point higher health literacy score was 0.13 days per week (95% CI: -0.02-0.28;  $p = 0.079$ ), which did not reach statistical significance. Information-seeking frequency remained associated with vegetable consumption in the joint robust test ( $F^{[14]} = 7.86$ ;  $p < 0.001$ ). Participants reporting no searches, 1-2 searches, or 3-5 searches had lower vegetable consumption frequencies than those reporting more than 10 searches. The difference between the 6-10-search category and the reference category was not statistically significant.

The fruit consumption model had an  $R^2$  of 0.264 and an adjusted  $R^2$  of 0.238. Corresponding values for the vegetable consumption model were 0.208 and 0.179. Adjusted estimates are presented in Table 3.

| Outcome and explanatory variable            | Adjusted estimate  | 95% CI         | p      |
|---------------------------------------------|--------------------|----------------|--------|
| <b>Information-seeking frequency</b>        | <b>Adjusted OR</b> |                |        |
| Health literacy, per 10 points              | 1.87               | 1.62 to 2.17   | <0.001 |
| <b>Fruit consumption, days per week</b>     | <b>B</b>           |                |        |
| Health literacy, per 10 points              | 0.16               | 0.03 to 0.29   | 0.016  |
| No searches vs. >10 searches                | -2.22              | -2.86 to -1.58 | <0.001 |
| 1-2 searches vs. >10 searches               | -1.34              | -1.79 to -0.89 | <0.001 |
| 3-5 searches vs. >10 searches               | -1.08              | -1.51 to -0.65 | <0.001 |
| 6-10 searches vs. >10 searches              | -0.52              | -0.93 to -0.10 | 0.014  |
| <b>Vegetable consumption, days per week</b> | <b>B</b>           |                |        |
| Health literacy, per 10 points              | 0.13               | -0.02 to 0.28  | 0.079  |
| No searches vs. >10 searches                | -1.80              | -2.51 to -1.09 | <0.001 |
| 1-2 searches vs. >10 searches               | -0.84              | -1.32 to -0.37 | 0.001  |
| 3-5 searches vs. >10 searches               | -0.59              | -1.02 to -0.16 | 0.008  |
| 6-10 searches vs. >10 searches              | -0.14              | -0.56 to 0.28  | 0.514  |

**Table 3.** Adjusted associations with information-seeking and dietary practices

*Note: n = 468 in each model. All models adjusted for age, gender, health-related major, financial circumstances, and institution. Dietary models additionally included health literacy and categorical information-seeking frequency simultaneously. Information-seeking was modeled using ordinal logistic regression; dietary outcomes were modeled using linear regression with HC3 robust standard errors. B denotes the unstandardized difference in consumption days per week. OR, odds ratio; CI, confidence interval.*

## 4. Discussion

### 4.1. Principal findings

This study examined health literacy, active health information-seeking, and selected preventive health practices among students from five higher education institutions in Hanoi. Higher health literacy was associated with more frequent information-seeking and greater fruit consumption frequency after adjustment for demographic, financial, and institutional characteristics. The adjusted association with vegetable consumption did not reach statistical significance. Information-seeking frequency was associated with both dietary outcomes, although not every comparison between frequency categories was statistically significant.

These findings are consistent with a conceptual distinction between the competencies required to work with health information and the behavior of actively obtaining it. The integrated health literacy framework emphasizes accessing, understanding, appraising, and applying information, while Nutbeam's model highlights the importance of interactive and critical skills in health-related decision-making [2][1]. The present associations support considering these competencies alongside students' information-seeking behavior. However, the cross-sectional design does not establish whether health literacy precedes searching or whether searching contributes to greater perceived health literacy.

### 4.2. Health literacy and information-seeking

The positive association between health literacy and information-seeking complements previous research on students' use of health information. Studies among college students have examined searching behavior across different sources and its relationship with information-related competencies [7][8][9]. Vietnamese research has also linked aspects of digital health literacy with information-seeking during the COVID-19 pandemic [18]. The present study extends this perspective to general health literacy and active searching for personal health information across both college and university settings.

Interpretation requires attention to differences between measures. General health literacy covers competencies across health care, disease prevention, and health promotion, whereas eHealth literacy focuses on electronic information environments [3][11]. Likewise, searching frequency does not establish that information was accurate, appropriately evaluated, or applied. More frequent searching may reflect

greater health interest, an existing health concern, or uncertainty. Research among adults illustrates the relevance of personal characteristics and health circumstances to information-seeking [10]. Findings from Germany also show that students' searching patterns can change across public health contexts [23]. Consequently, frequent searching should not be treated as an inherently beneficial behavior without considering its purpose, sources, and quality.

### *4.3. Associations with dietary practices*

The association between health literacy and fruit consumption is broadly compatible with research linking eHealth literacy to selected health behaviors and health-promoting lifestyles among students [14], [15], [12], [16], [13]. Nevertheless, these studies employed different instruments and behavioral outcomes. Their findings cannot be directly equated with differences in weekly fruit or vegetable consumption days.

The adjusted fruit consumption estimate was modest: a 10-point higher health literacy score corresponded to 0.16 additional consumption days per week. Its statistical significance should therefore be considered alongside its magnitude and the limitations of the outcome measure. Consumption days do not indicate portion sizes, total nutrient intake, or dietary adequacy.

For vegetable consumption, the confidence interval included both a small negative association and a positive association. This finding does not demonstrate that health literacy is unrelated to vegetable consumption, nor does the difference in statistical significance establish that its associations with fruit and vegetables differ. Dietary practices may also depend on food availability, affordability, household arrangements, and opportunities to choose meals. These are plausible explanations for future investigation rather than mechanisms established by this study.

Information-seeking frequency remained associated with both dietary outcomes when health literacy and the adjustment variables were included simultaneously. Students reporting no searches had lower fruit and vegetable consumption frequencies than those reporting more than 10 searches. However, the vegetable consumption difference between the 6-10-search category and the reference category was not statistically significant. The findings therefore support an overall association across categories without establishing a uniform increase at every frequency level. They also do not demonstrate that information-seeking mediates the relationship between health literacy and dietary behavior.

#### *4.4. Implications for student health promotion*

The findings provide a rationale for evaluating campus initiatives that combine health information skills with practical support for everyday dietary choices. Such initiatives could teach students to formulate useful questions, identify credible sources, compare conflicting advice, and translate relevant information into feasible actions. Their effectiveness would need to be tested prospectively.

Support should also consider differences in students' resources and educational backgrounds. Research in Nepal and Jordan has documented socioeconomic and educational variation in health literacy <sup>[5][6]</sup>, while the systematic review of university students emphasizes the diversity of student populations and measurement approaches <sup>[4]</sup>. Including both colleges and universities may help institutions identify needs across different educational settings.

The broader questionnaire captured several preventive practices, but adjusted analyses focused on diet. Future studies could examine health service use and other outcomes separately. Research on eHealth literacy and health service utilization illustrates this wider scope <sup>[24]</sup>. Vietnamese studies addressing depression knowledge and COVID-19-related health literacy also demonstrate the importance of distinguishing general competencies from competencies relevant to specific health domains <sup>[17][19]</sup>.

#### *4.5. Strengths and limitations*

A strength of this study was the inclusion of students from five institutions, covering both university and college education and health-related and non-health-related majors. The analysis distinguished general health literacy from active information-seeking and retained fruit and vegetable consumption as separate outcomes. Pilot testing informed questionnaire refinement, and robust standard errors were used for the dietary models.

Several limitations should be considered. First, the cross-sectional design precludes establishing temporal order or causation. Second, recruitment through class groups involved convenience sampling and voluntary participation. Students who were more interested in health may have been more likely to respond, and the findings cannot be assumed to represent all students in Hanoi.

Third, the measures were self-reported and may be affected by recall error and socially desirable responding. Health literacy reflected perceived difficulty rather than demonstrated performance. Although the adapted items had high internal consistency, reliability alone does not establish construct validity or equivalence with the original HLS-SF12 <sup>[22][21]</sup>. Earlier validation of the parent instrument in

Asian populations provides relevant background but does not replace validation of the adapted questionnaire in this student sample [\[20\]](#).

Fourth, complete-case regression excluded 150 eligible participants, or 24.3% of the sample. If missingness was associated with health literacy or behavior, the adjusted estimates may be affected by selection bias. Fifth, the dietary outcomes were bounded counts of consumption days. HC3 standard errors addressed heteroskedasticity but did not resolve all possible model specification problems or account for residual dependence within institutions. Finally, multiple associations were examined without adjustment for multiple comparisons, and the findings should be considered exploratory.

No formal research ethics approval was obtained, as disclosed in the Methods. Future studies should strengthen prospective ethical oversight and document recruitment reach, participation, and missing-data procedures in greater detail. Clear reporting of these features is important for assessing survey quality and reproducibility [\[25\]](#).

## 5. Conclusion

Among college and university students in Hanoi, higher health literacy was associated with more frequent active health information-seeking and greater fruit consumption frequency after adjustment. Its association with vegetable consumption did not reach statistical significance, while information-seeking frequency was associated with both dietary outcomes. These findings provide a rationale for evaluating campus health-promotion initiatives that combine information appraisal skills with practical support for healthy dietary choices. However, the cross-sectional design, convenience sampling, and missing data limit causal interpretation and generalizability. Longitudinal and intervention studies are needed to clarify these relationships and assess whether such initiatives improve students' health practices.

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## Potential Competing Interests

No potential competing interests to declare.

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