

Health Literacy Profiles and Disparities Among Adolescents and Implications in Ethiopia

Adamu Amanu Asari^{1,2}, Ameyu Godesso², Zewdie Birhanu¹

¹Department of Health, Behavior, and Society, Faculty of Public Health, Jimma University, Oromia, Ethiopia; ²Department of Sociology, College of Social Sciences, Jimma University, Oromia, Ethiopia

Correspondence: Adamu Amanu Asari, Email adamuamanu1000@gmail.com; adamu.amanu@ju.edu.et

Background: Health literacy (HL) among adolescents is a crucial public health and health equity issue. Currently, research on HL among adolescents is expanding to support effective, evidence-based interventions. However, in Ethiopia, it remains under-researched. Thus, this study focuses on HL among adolescents in Ethiopia. It examines adolescents' HL profiles, identifies and analyzes existing HL inequalities, and ascertains the implications for developing targeted public health strategies and educational programs aimed at improving HL among adolescents.

Methods: This study employed a school-based, cross-sectional survey design. Data collection took place in January and February 2024. Data analysis comprised both descriptive and inferential statistics, using SPSS version 27.0. Descriptive statistics summarized sociodemographics and HL scores and statuses. Chi-square tests examined disparities in HL across these sociodemographics. Binary logistic regression analyses identified significant predictors of HL among adolescents.

Results: A total of 722 adolescents participated in this study, and only about one-quarter of them had adequate HL, with extreme disparities observed across sociodemographic and related factors. Chi-square tests revealed significant associations between HL and school type, parents' education, household income, Internet access, academic performance, interest in health matters, and outlooks on life/futurity. Logistic regression analyses further indicated that respondents having fathers with high education (AOR=1.824, 95% CI=1.126, 2.954), mothers with high education (AOR=1.942, 95% CI=1.154, 3.268), middle household income (AOR=3.819, 95% CI=2.197, 6.636), high household income (AOR=4.583, 95% CI=2.582, 8.137), high academic performance (AOR=3.275, 95% CI=1.472, 7.285), and positive outlooks on life/futurity (AOR=1.948, CI=1.060, 3.582) were more likely to have adequate HL. Respondents lacking Internet access (AOR=0.146, 95% CI=0.069, 0.309) and having low interest in health matters (AOR=0.196, 95% CI=0.096, 0.401) were less likely to have adequate HL.

Conclusion: This study investigates HL among adolescents in Ethiopia, revealing a high prevalence of inadequate HL and disparities that contribute to broader health inequalities in society. To address this, the study calls for targeted policies and interventions, including formal HL education in schools.

Plain Language Summary: Given that health knowledge, skills, and behaviors developed during adolescence often persist throughout life, influencing an individual's healthcare and health protection and enhancement practices, HL among adolescents is a vital healthcare and public health issue. This research examines HL among adolescents in Ethiopia, and finds it to be a significant concern requiring adequate attention. The study identifies key strategies to address the issue, including the integration of comprehensive and developmentally appropriate health education across schools, communities, and healthcare systems. It emphasizes the importance of targeted interventions, family and multispectral engagement, and supportive policies that address underlying social determinants and ensure equitable access to health information and resources through sustained monitoring and evaluation.

Keywords: health literacy, disparity, adolescent, developing country, Ethiopia

Background

Health literacy (HL) represents a broad range of attributes necessary to meet the complex demands of health and to effectively manage one's health.^{1,2} It is a multifaceted issue that comprises health awareness and knowledge, abilities to deal with health

information, exhibiting healthy behaviors, adhering to and upholding healthy norms and values, and being a responsible citizen.³ It basically includes the ability to effectively access, understand, appraise and use health information and services to make informed decisions.^{2,4} Thus, it is a basic issue for everyone in healthcare, disease prevention, and health promotion.¹ In other words, HL is a key determinant of health.^{1,2,5,6} Studies indicate that individuals with adequate HL are more likely to take responsibility for their own health, as well as for the health of their families and communities.^{1,7–9} They are more likely to adopt healthy lifestyle, practice preventive measures, and seek and utilize healthcare services appropriately.^{7–9} Consequently, they tend to have good health outcomes.^{9,10} Conversely, individuals with low HL are less likely to make healthy choices and to engage in beneficial behaviors, and they are at higher risk for poor health outcomes and reduced quality of life.^{9,11} Thus, HL is a critical public health and health equity issue.^{9,12} In addition, HL not only affects health but also impacts healthcare costs at societal level.^{1,13} Low HL accounts for higher healthcare expenditures and places a significant financial burden on communities and society.^{14,15}

Therefore, HL is a crucial issue for communities and societies, and it is particularly significant in adolescents. This is because adolescence is a critical stage for establishing a foundation for health in adulthood, as the health-related knowledge and skills acquired during this period shape decision-making and health behavior throughout life.¹⁶ HL plays a key role in fostering healthy lifestyles in adolescents,^{17–19} and a lack of HL exposes them to a higher prevalence of unhealthy behaviors, such as risky sexual behaviors and substance use that impact both their current and future health.^{20–22} Research indicates that many premature deaths in adulthood are linked to behaviors that instigated or are established during adolescence.^{23,24} Thus, promoting HL among adolescents is vital, as they are the future.^{16,25} Equipping adolescents with adequate HL from an early stage will help them adopt and sustain health-promoting behaviors throughout life.^{22,25}

HL is influenced by numerous factors, including socioeconomic circumstances and individual traits.^{19,26,27} That is, individuals experience HL differently within various contexts from an early age.^{19,28–30} Thus, there are disparities in HL among individuals (adolescents) and identifying and understanding the factors contributing to these disparities or influencing HL in the target group is essential for developing effective and targeted interventions.

Recently, research on HL in adolescents has been growing rapidly.^{22,25} However, most HL studies in both adolescents and the general population are largely concentrated in high-income countries.^{19,22,25} Moreover, until recently, instruments designed to assess HL in adolescents have been rare.^{17,25,31–34} In the context of developing countries, such as Africa, HL remains under-researched, and emerging HL studies from these countries also rely on HL tools developed in high income settings, which may not adequately capture the situations in the developing regions.^{35–38} Similarly, studies on HL in Ethiopia are very rare.³⁸ However, HL in Ethiopia and other sub-Saharan African countries, particularly among adolescents, is a very critical issue for various reasons. First, HL can play a vital role in achieving universal health coverage, in these countries, by equipping individuals with health knowledge and the ability to find, understand, and use health information and services appropriately.³⁹ Second, as the rapid increase in lifestyle-related non-communicable diseases (NCDs) is adding burden to the existing health problems,^{40,41} and as many behavioral risk factors for NCDs often emerge and are established during adolescence, HL especially among adolescents is essential for promoting healthy lifestyles and preventing the NCDs in adulthood.^{7,9}

Therefore, this research focuses on HL among adolescents in Ethiopia. Building on a sequential study^{3,42} and using an HL scale tailored to the local sociocultural context,⁴² it specifically examines the HL profiles of adolescents, identifies and analyzes existing HL inequalities based on sociodemographic factors, and ascertains the implications for developing targeted public health strategies and educational programs aimed at improving HL among adolescents in Ethiopia.

Methods

Study Area and Population

The research was carried out in Jimma city administration, the most populous city in southwestern Oromia, Ethiopia. Surrounded by rural districts, the city is home to over 250,000 people, who are socioeconomically diverse, with slightly more than half being females. The study population was high school adolescents. At the study time, the city had 16 high schools—eight public and eight private. This study involved four public and four private schools, intentionally chosen for their large and diverse adolescent population, reflecting the broader sociodemographic range of the area. The selected schools had a total enrollment of 9799 students (male = 4439 and female = 5360) at the time of the study.

Study Design, Sampling, and Sample Size

This study employed a cross-sectional survey design, and data collection took place from January to February 2024. To achieve the aim of this research, initially, a sample size of 464 was determined, using Cochran's sample size formula (1963)⁴³ (95% confidence level, $\pm 5\%$ margin of error, and 0.5 proportion), adjusting for finite population, and assuming a 25% non-response rate.^{43–45} However, eventually, sample size expanded to 737, exceeding the initially determined number to optimize the representation of adolescent diversity across the school types and enhance the resulting accuracy.^{46–48} To recruit participants, student name lists for each grade (9–12) were first stratified by sex, and then individual participants were selected from each group using a simple random sampling method, with proportional allocation for each grade and sex across all of the chosen schools.

Survey Instrument and Data Collection Procedure

The survey instrument used in this research included questions pertaining to sociodemographic variables (independent variables) and HL (dependent variable) among adolescents to address the study's aim. Sociodemographic factors included sex, age, school type, grade/class level, academic performance (final semester average score), place of origin or primary school background (rural/urban), parents' education, parents' occupation, average household monthly income, parents' marital status, Internet access and use, self-perceived health status, health problem experience, interest in learning about health, availability of a family member in the health profession, access to health services, current living arrangement, religious affiliation, and ethnicity. These variables were measured using multiple choice questions, with some responses re-categorized, after examining them, to facilitate analysis and simplify interpretation and reporting. Parents' (fathers' and mothers') education level was measured as "Do not know", "Cannot read and write", "Primary school/education", "Secondary school/education", "College education/diploma", and "University education/degree or above". The first three options were recoded as "Low education", while the last three were classified as "High education". Household's average monthly income was measured as "Do not know", "<5000 Birr", "5000–10,000", and ">10,000". The first two categories were grouped as "Low income", the third as "Middle income" and the last as "High income". Respondents' academic performances in the last semester were measured as, "Do not know or prefer not to say", "Final last semester average ≤ 54 (Poor)", "Final last semester average 55 to 64 (Fair)", "Final last semester average 65 to 74 (Good)", "Final last semester average 75 to 84 (Very good)", and "Final last semester average ≥ 85 (Excellent)". The first three categories were recoded as "Low performance", while the last three were classified as "High performance". The respondents' self-perceived health status was measured as "Excellent", "Very good", "Good", "Fair", "Poor", and "Very poor". The first two categories were recoded as "Good health", the next two as "Moderate health", and the last two as "Poor health". The respondents' experiences of health problems in the last month/s was measured as "Never", "Rarely", "Sometimes", "Often", and "Every day". The first two categories were recoded as "Rare problems", the third as "Occasional problems", and the last two as "Frequent problems". Additionally, the respondents were asked about factors influencing their HL practices, and beyond the socio-demographic factors mentioned above, the respondents reported concerns/outlooks related to life/futurity (eg, general life condition, academic performance, and future employment related). These issues were coded as "Negative" and "Positive" for analysis purpose.

HL was measured using an adolescent HL scale that was designed using insights from qualitative research³ and validated through both qualitative and quantitative evaluations involving experts and adolescents, in Afaan Oromo and Amharic, the widely spoken languages in the area. The scale has 33 items across five dimensions: health information competency (twelve items), communication (six items), health awareness and knowledge (five items), decision-making and behavior (seven items), and citizenship and responsibility (three items). The Cronbach's alpha coefficient of the scale was 0.973 for the Afaan Oromo version and 0.970 for Amharic version, with subscale values ranging from 0.850 to 0.937 for the Afaan Oromo version and from 0.783 to 0.937 for the Amharic version.⁴² All of the items on this HL scale were measured using a 4-point Likert scale: 1 = *strongly disagree*, 2 = *disagree*, 3 = *agree*, and 4 = *strongly agree*. The mean score for each item was calculated and then converted to a common metric using the formula established by the HLS-EU: $HL\ index\ score = (mean - 1) * (50/3)$ ⁴⁹ and adapted to a score range of 0 to 100, where 0 represents the 'least possible' HL score and 100 represents the 'best possible' HL score.^{49,50} HL scores were then categorized into 4 levels: poor (≤ 50), fair

(>50–66.67), good (>66.67–83.33), and excellent (>83.33).⁵⁰ Finally, for binary logistic regression analysis, poor and fair HL were recoded as inadequate HL, while good and excellent HL were classified as adequate HL.

Randomly selected and willing adolescents completed self-administered questionnaires in their classrooms or in nearby privately, and a data collector or the researcher was present to address any questions that arose. One teacher from each school and shift monitored the environment and ensured discipline. In cases where a randomly selected student was absent, over 19 years old, or unwilling to participate, s/he was replaced by another randomly selected and eligible student from the same grade or class. The respondents placed their completed questionnaires on a table in the vicinity, and the data collector collected them afterward. In total, 737 questionnaires were distributed, and 722 were completed.

Data Analysis

The collected data were entered into database using Epidata 3.1 and analysed using IBM SPSS software version 27.0. Data analysis comprised both descriptive statistics and inferential statistics. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to provide an overview of the respondents' sociodemographic characteristics and HL status. Chi-square tests were performed to examine the disparities in HL status across sociodemographic characteristics (associations between HL and sociodemographic characteristics) among adolescents. A two-step logistic regression analyses, namely, bivariable logistic regression and multivariable logistic regression analyses, were performed to identify predictors of HL among adolescents. First, a bivariable logistic regression analysis was conducted to identify potentially significant variables for multivariate logistic regression analysis. Next, all variables with a p-value < 0.25 in bivariate analyses were included in the multivariate logistic model to determine predictors of HL among adolescents. The multivariate logistic regression analysis was performed using the Enter method to identify predictor variables, with a significance level of p-value < 0.05. Multicollinearity was assessed using the variance inflation factor (VIF) and tolerance test to check for any variables with a VIF value greater than 10 or a tolerance value less than 0.1, which would indicate a multicollinearity problem between the independent variables.

Ethical Considerations

The study was approved by the ethics committee of Jimma University (Ref. No. JUIH/IRB/321/23), and it complies with the Declaration of Helsinki, ensuring the protection of human participants' rights and well-being.⁵¹ Participation in this study was voluntary. Prior to participation, all respondents received a detailed explanation of the study's purpose. Respondents aged 18 years and older provided informed consent themselves, while those less than 18 years gave assent after their parents or someone with whom they live agreed on the issue and provided informed consent. Respondents were informed that they could withdraw from the study at any time before or during filling the questionnaire, and they were assured that their identities would remain anonymous and all data provided would be kept confidential.

Results

Sociodemographic Characteristics of the Respondents

A total of 722 adolescents participated in this study. As shown in [Table 1](#), the respondents came from diverse sociodemographic backgrounds, representing the diversity among the target population. Of the 722 respondents, 407 (56.4%) were female, reflecting the higher proportion of females in the adolescent population in the study area. Respondents' ages ranged from 14 to 19, with mean age of 16.75 (± 1.284) years. [Table 1](#) provides detailed information on the sociodemographic characteristics of the respondents.

Health Literacy Profiles (Scores and Status) Among the Respondents

The overall mean HL score among the respondents was 53.82 (± 17.25). And when examining the scores for each of its dimensions, the mean score was 54.00 (± 18.63) for health information competency, 54.83 (± 19.22) for communication, 50.28 (± 18.99) for health awareness and knowledge, 55.36 (± 18.01) for decision-making and behavior, and 53.39 (± 19.78) for citizenship and responsibility. However, of the total 722 adolescents, only 182 (25.2%) had adequate HL status. As well, notably, the percentage of respondents with adequate HL was low across all the dimensions, particularly

Table 1 Respondents' Sociodemographic and Related Characteristics (n = 722)

Characteristics	Frequency (Percentage)	Characteristics	Frequency (Percentage)
Sex		Father's education	
Male	315 (43.6%)	Low education	396 (54.8%)
Female	407 (56.4%)	High education	326 (45.2%)
Age group in years		Mother's education	
14–15	126 (17.5%)	Low education	432 (59.8%)
16–17	375 (51.9%)	High education	290 (40.2%)
18–19	221 (30.6%)		
Class/grade		Father's occupation	
9–10	387 (53.6%)	Merchant	204 (28.3%)
11–12	335 (46.4%)	Government employee	193 (26.7%)
		Farmer	192 (26.6%)
		Other	133 (18.4%)
School type		Mother's occupation	
Public	420 (58.2%)	Merchant	174 (24.1%)
Private	302 (41.8%)	Government employee	122 (16.9%)
		Farmer	60 (8.3%)
		Housewife	337 (46.7%)
		Other	29 (4.0%)
Place of origin (primary school background)		Household's monthly income status	
Urban	570 (78.9%)	Low income	353 (48.9%)
Rural	152 (21.1%)	Middle income	187 (25.9%)
		High income	182 (25.2%)
Living arrangement		Family member health professional	
Live with parents	499 (69.1%)	Yes	147 (20.4%)
Live with siblings	82 (11.4%)	No	575 (79.6%)
Live alone renting room	35 (4.8%)	Access to health services	
With friends renting room	24 (3.3%)	Yes, properly	236 (32.7%)
Live with relatives	61 (8.4%)	Yes, to some extent	300 (41.6%)
Other	21 (2.9%)	No	186 (25.8%)
Ethnicity		Internet access and use	
Oromo	545 (75.5%)	Yes	453 (62.7%)
Amhara	44 (6.1%)	No	269 (37.3%)
Gurage	23 (3.2%)		
Other	110 (15.2%)		
Religious affiliation		Interest to learn about health	
Islam	389 (53.9%)	Yes very interested	549 (76.0%)
Orthodox	189 (26.2%)	Not very interested	173 (24.0%)
Protestant	131 (18.1%)		
Other	13 (1.8%)		
Academic performance		Self-perceived health status	
Low performance	183 (25.3%)	Good health	550 (76.2%)
High performance	539 (74.7%)	Moderate health	150 (20.8%)
		Poor health	22 (3.0%)

(Continued)

Table 1 (Continued).

Characteristics	Frequency (Percentage)	Characteristics	Frequency (Percentage)
Parents' marital status		Health experience	
Married	551 (76.3%)	Rare problems	523 (72.4%)
Divorced	89 (12.3%)	Occasional problems	163 (22.6%)
Widowed	62 (8.6%)	Frequent problems	36 (5.0%)
Other	20 (2.8%)	Outlooks on life/futurity	
		Negative	146 (20.2%)
		Positive	576 (79.8%)

Table 2 Health Literacy Profiles (Scores and Status) Among the Respondents (n = 722)

Dimension	HL Scores			HL Status	
	Mean (SD*)	Minimum	Maximum	Adequate Frequency (%)	Inadequate Frequency (%)
General	53.82 (±17.25)	21.21	94.95	182 (25.2%)	540 (74.8%)
Health information competency	54.00 (±18.63)	22.22	100.00	173 (24%)	549 (76.0%)
Communication	54.83 (±19.22)	16.67	100.00	178 (24.7%)	544 (75.3%)
Health awareness and knowledge	50.28 (±18.99)	13.33	93.33	130 (18.0%)	592 (82.0%)
Decision making and behavior	55.36 (±18.01)	19.05	100.00	177 (24.5%)	545 (75.5%)
Citizenship and responsibility	53.39 (±19.78)	22.22	88.89	167 (23.1%)	555 (76.9%)

Note: *Standard Deviation.

in health awareness and knowledge dimension. Only 173 (24%), 178 (24.7%), 130 (18.0%), 177 (24.5%), and 167 (23.1%) achieved adequate HL status in each respective dimension (see [Table 2](#)).

Disparities in Health Literacy and Predicting Factors Among the Respondents

HL status among the respondents varied based on their sociodemographic characteristics. For instance, chi-square tests revealed significant variations in HL status across school type, parents' (fathers' and mothers') education, parent's (mother's) occupation, household average monthly income, academic performance, Internet access and use, interest in learning about health, as well as outlook on life/futurity. Respondents who attended private schools were significantly more likely to have adequate HL ($P < 0.001$). As well, respondents who had parents with high education ($P < 0.001$), who had employed mothers ($P = 0.030$), who had middle/high household monthly income ($P < 0.001$), who had Internet access and used it ($P < 0.001$), who had access to health services ($P = 0.053$), and who had a family member in the health profession ($P = 0.057$) were more likely to have adequate HL. In addition, respondents having high academic performance, a strong interest in learning about health, and positive outlook on life/futurity were significantly more likely to have adequate HL ($P < 0.001$). The detailed disparities in HL status across sociodemographic and related factors among the respondents are presented in [Table 3](#).

Similarly, bivariate logistic regression analyses found that HL among the respondents was significantly associated with school type, parents' (fathers' and mothers') education, mothers' occupation, household monthly income, academic performance, access to health services, Internet access and use, interest in learning about health, and outlook on life/futurity (See [Table 4](#)). Multivariate logistic regression, as presented in [Table 4](#), showed that parents' education, household monthly income, academic performance, Internet access and use, interest in learning about health, and outlook on life/futurity were significant predictors of HL among the adolescents. Specifically, respondents having fathers with high education were 1.824 times more likely to have adequate HL compared to those having fathers with low education

Table 3 Disparities in HL Across the Respondents' Characteristics (n = 722)

Characteristics	HL Status			Characteristics	HL Status		
	Adequate Freq. (%)	Inadequate Freq. (%)	P-value		Adequate Freq. (%)	Inadequate Freq. (%)	P-value
Sex				Father's education			
Male	73 (23.2%)	242 (76.8%)	0.268	Low education	59 (14.9%)	337 (85.1%)	< 0.001
Female	109 (26.8%)	298 (73.2%)		High education	123 (37.7%)	203 (62.3%)	
Age group in years				Mother's education			
14–15	30 (23.8%)	96 (76.2%)	0.831	Low education	70 (16.2%)	362 (83.8%)	< 0.001
16–17	98 (26.1%)	277 (73.9%)		High education	112 (38.6%)	178 (61.4%)	
18–19	54 (24.4%)	167 (75.6%)					
Class/grade				Father's occupation			
9–10	87 (22.5%)	300 (77.5%)	0.070	Merchant	45 (22.1%)	159 (77.9%)	0.368
11–12	95 (28.4%)	240 (71.6%)		Government employee	57 (29.5%)	136 (70.5%)	
				Farmer	46 (24.0%)	146 (76.0%)	
				Other	34 (25.6%)	99 (74.4%)	
School type				Mother's occupation			
Public	83 (19.8%)	337 (80.2%)	< 0.001	Merchant	43 (24.7%)	131 (75.3%)	0.030
Private	99 (32.8%)	203 (67.2%)		Government employee	44 (36.1%)	78 (63.9%)	
				Farmer	11 (18.3%)	49 (81.7%)	
				Housewife	79 (23.4%)	258 (76.6%)	
				Other	5 (17.2%)	24 (82.8%)	
Place of origin (primary school background)				Household average monthly income			
Urban	149 (26.1%)	421 (73.9%)	0.294	Low income	26 (7.4%)	327 (92.6%)	< 0.001
Rural	33 (21.7%)	119 (78.3%)		Middle income	79 (42.2%)	108 (57.8%)	
				High income	77 (42.3%)	105 (57.7%)	
Living arrangement				Family member health professional			
Live with parents	139 (27.9%)	360 (72.1%)	0.269	Yes	46 (31.3%)	101 (68.7%)	0.057
Live with siblings	16 (19.5%)	66 (80.5%)		No	136 (23.7%)	439 (76.3%)	
Live alone renting room	6 (17.1%)	29 (82.9%)		Access to health services			0.053
With friends renting room	5 (20.8%)	19 (79.2%)		Yes, properly	70 (29.7%)	166 (70.3%)	
Live with relatives	11 (18.0%)	50 (82.0%)		Yes, to some extent	76 (25.3%)	224 (74.7%)	
Other	5 (23.8%)	16 (76.2%)		No	36 (19.4%)	150 (80.6%)	
Ethnicity				Internet access and use			
Oromo	142 (26.1%)	403 (73.9%)	0.794	Yes	173 (38.2%)	280 (61.8%)	< 0.001
Amhara	10 (22.7%)	34 (77.3%)		No	9 (3.3%)	260 (96.7%)	
Gurage	6 (26.1%)	17 (73.9%)					
Other	24 (21.8%)	86 (78.2%)					
Religious affiliation				Interest to learn about health			
Islam	94 (24.2%)	295 (75.8%)	0.349	Yes very interested	171 (31.1%)	378 (68.9%)	< 0.001
Orthodox	48 (25.4%)	141 (74.6%)		Not very interested	11 (6.4%)	162 (93.6%)	
Protestant	34 (26.0%)	97 (74.0%)					
Other	6 (46.2%)	7 (53.8%)					
Academic performance				Self-perceived health status			
Low performance	9 (4.9%)	174 (95.1%)	< 0.001	Good health	140 (25.5%)	410 (74.5%)	0.945
High performance	173 (32.1%)	366 (67.9%)		Moderate health	37 (24.7%)	113 (75.3%)	
				Poor health	5 (22.7%)	17 (77.3%)	
Current parents' marital status				Health experience			
Married	148 (26.9%)	403 (73.1%)	0.297	Rare problems	139 (26.6%)	384 (73.4%)	0.153
Divorced	17 (19.1%)	72 (80.9%)		Occasional problem	32 (19.6%)	131 (80.4%)	
Widowed	12 (19.4%)	50 (80.6%)		Frequent problems	11 (30.6%)	25 (69.4%)	
Other	5 (25.0%)	15 (75.0%)		Outlook on life/futurity			< 0.001
				Negative	20 (13.7%)	126 (86.3%)	
				Positive	162 (28.1%)	414 (71.9%)	

Table 4 Factors Predicting HL Among the Respondents (n = 722)

Characteristics	HL Status		COR, 95% CI	AOR, 95% CI
	Adequate Freq. (%)	Inadequate Freq. (%)		
School type				
Public	83 (19.8%)	337 (80.2%)	1	1
Private	99 (32.8%)	203 (67.2%)	1.980 (1.410, 2.781)*	0.683 (0.414, 1.127)
Father's education				
Low education	59 (14.9%)	337 (85.1%)	1	1
High education	123 (37.7%)	203 (62.3%)	3.461 (2.425, 4.940)*	1.824 (1.126, 2.954)***
Mother's education				
Low education	70 (16.2%)	362 (83.8%)	1	1
High education	112 (38.6%)	178 (61.4%)	3.254 (2.297, 4.610)*	1.942 (1.154, 3.268)***
Mother's occupation				
Merchant	43 (24.7%)	131 (75.3%)	1	1
Government employee	44 (36.1%)	78 (63.9%)	1.719 (1.037, 2.848)***	0.858 (0.451, 1.635)
Farmer	11 (18.3%)	49 (81.7%)	0.684 (0.327, 1.432)	1.182 (0.465, 3.008)
Housewife	79 (23.4%)	258 (76.6%)	0.933 (0.609, 1.429)	0.882 (0.516, 1.510)
Other	5 (17.2%)	24 (82.8%)	0.635 (0.228, 1.766)	0.597 (0.168, 2.117)
Household's monthly income				
Low income	26 (7.4%)	327 (92.6%)	1	1
Middle income	79 (42.2%)	108 (57.8%)	9.200 (5.615, 15.072)*	3.819 (2.197, 6.636)*
High income	77 (42.3%)	105 (57.7%)	9.223 (5.617, 15.145)*	4.583 (2.582, 8.137)*
Academic performance				
Low performance	9 (4.9%)	174 (95.1%)	1	1
High performance	173 (32.1%)	366 (67.9%)	9.138 (4.565, 18.292)*	3.275 (1.472, 7.285)**
Access to health services				
Yes, properly	70 (29.7%)	166 (70.3%)	1	1
Yes, to some extent	76 (25.3%)	224 (74.7%)	0.805 (0.549, 1.179)	1.201 (0.744, 1.939)
No	36 (19.4%)	150 (80.6%)	0.569 (0.360, 0.900)***	0.903 (0.511, 1.595)
Internet access and use				
Yes	173 (38.2%)	280 (61.8%)	1	1
No	9 (3.3%)	260 (96.7%)	0.056 (0.028, 0.112)*	0.146 (0.069, 0.309)*
Interest to learn about health				
Yes very interested	171 (31.1%)	378 (68.9%)	1	1
Not very interested	11 (6.4%)	162 (93.6%)	0.150 (0.079, 0.284)*	0.196 (0.096, 0.401)*
Outlook on life/futurity				
Negative	20 (13.7%)	126 (86.3%)	1	1
Positive	162 (28.1%)	414 (71.9%)	2.465 (1.487, 4.087)*	1.948 (1.060, 3.582)***

Notes: 1=Indicator for reference group, *Significant at < 0.001, **Significant at < 0.005, and ***Significant at < 0.04.

Abbreviations: CI: Confidence interval; COR: Crude odds ratio; AOR: Adjusted odds ratio.

(AOR=1.824, 95% CI = 1.126, 2.954). Similarly, respondents having mothers with high education were 1.942 times more likely to have adequate HL compared to those with mothers having low education (AOR=1.942, 95% CI = 1.154, 3.268). As well, compared to respondents from households with low monthly income, those from households with middle and high income were more likely to have adequate HL (AOR=3.819, 95% CI = 2.197, 6.636 and AOR = 4.583, 95% CI = 2.582, 8.137, respectively). Respondents with high academic performance were also more likely to have adequate HL status compared to those with low academic performance (AOR=3.275, 95% CI = 1.472, 7.285). In addition, positive outlook on life/futurity was associated with higher HL (AOR=1.948, CI = 1.060, 3.582). Respondents without Internet

access were less likely to have adequate HL, with odds of adequate HL being 0.146 times the odds for those who had access to and use Internet (AOR=0.146, 95% CI = 0.069, 0.309). As well, respondents with low interest in learning about health were 80.4% less likely to have adequate HL compared to those who had high interest to learn about health (AOR=0.196, 95%CI= 0.096, 0.401) (see [Supplementary material, SM1 \(Tables S1–S4\)](#)).

All of the factors combined (the model) explained 44.7% (Nagelkerke R^2) of the variability in the HL among the respondents, and Hosmer and Lemeshow Test yielded a p-value of 0.264, suggesting that the model fits the data well. Additionally, none of the independent variables yielded a VIF value greater than 10 or a tolerance value less than 0.1, indicating no multicollinearity problem between the variables. VIFs values of the considered independent variables ranged from 1.051 to 1.570 and tolerance values ranged from 0.637 to 0.952 (See [Supplementary material, SM2 \(Table S5\)](#)).

Discussion and Implications

This study aimed to examine HL profiles and disparities among adolescents in Ethiopia and ascertain the implications for developing targeted public health strategies and educational programs aimed at improving HL in this population. The study revealed widespread inadequate HL among adolescents. Only about one-quarter of the respondents had adequate HL, and this inadequacy was even more pronounced across its specific dimensions (health information competency, communication, health awareness and knowledge, decision-making and behavior, and citizenship and responsibility), with only about one-fifth to one-quarter of the respondents possessing adequate HL in these areas. In line with this finding, numerous studies from other countries reported low HL levels among adolescents; for instance, studies^{52–54} found inadequate HL among majority of their respondents. Evidence reviews on HL among young people in Africa^{36,37} as well as among populations in Ethiopia³⁸ also indicate low levels of HL. However, studies such as^{55–57} reported that majority of their respondents had good HL, contrasting with the findings of the current study. Various contextual factors, including access to friendly health information and services and availability of formal HL education within school curriculum, might account for this difference.

The current study revealed variations in HL status among adolescents based on their sociodemographic characteristics, and chi-square test showed significant relationship particularly between HL and school type, parents' (fathers' and mothers') education, mothers' occupation, household monthly income, Internet access and use, academic performance, interest in learning about health, as well as outlook on life/futurity. Adolescents who had good positions regarding these sociodemographic and related factors exhibited significantly higher levels of HL. These findings align with existing literature, which indicates that individuals' HL knowledge and competencies vary based on their contexts and characteristics, including individual, family, community, organizational, and policy-related factors.^{1,26,27}

Logistic regression analysis in the current study also revealed significant differences in HL status among adolescents based on a number of the aforesaid sociodemographic factors. For instance, adolescents whose parents had high education demonstrated high HL levels compared to those with parents of low education. This finding aligns with existing literature, which consistently identifies parents' education as a strong predictor of HL status among young people.^{54,58–60} In the current study, both parents' education levels were significant predictors, with mothers' education showing a slightly stronger association. Duplaga and Grysztar⁵⁸ also identified mother's education as a stronger predictor of HL among adolescents than father's education, and Dehghankar et al⁵⁵ reported father's education as a strong predictor of HL among adolescents. Adequate HL observed in adolescents having parents with high education may stem from these parents' increased exposure to health-related information and better employment status, enabling them to more effectively support their children's HL. And the differing association between adolescents' HL and fathers' education versus adolescents' HL and mothers' education may reflect the nature of the relationships adolescents have with each parent and related issues.

Logistic regression analysis also found that respondents from middle- and high-income households were more likely to have adequate HL compared to those from low-income households. Similarly, several studies reported that adolescents with better financial status or those whose parents have higher income status tend to have higher HL levels.^{22,61,62} This suggests that income strongly impacts HL among adolescents, and this could be through various pathways, including influencing access to services, facilities, or opportunities. Furthermore, regression analysis in the current study revealed

that adolescents without Internet accesses were less likely to have adequate HL compared to those who had access to and used the Internet. Duplaga and Grysztar⁵⁸ reported that the intensity of Internet use has no significant association with HL among adolescents. Thus, while the intensity of Internet use may not significantly impact HL among adolescents, the current study revealed that Internet access is a significant factor. However, given that most of the respondents in the current study who reported using the Internet did so primarily via mobile data, which can be costly, obtaining sufficient health information online might still be difficult for many of them.

Moreover, regression analysis in the current study found that respondents with high academic performance were more likely to have adequate HL compared to those with low academic performance. Similar findings were reported in various studies conducted in other countries. For instance, studies such as^{54,59} identified academic achievement as a predictor of HL status among adolescents, with higher academic performers demonstrating better HL levels than low performers. Additionally, the current study revealed that respondents with a low interest in learning about health were less likely to possess adequate HL compared to those with a high/strong interest. Other studies also reported significant relationship between HL and interest in health issues.^{53,55} In addition, the current study indicated that individuals with a negative outlook on life/futurity were less likely to have adequate HL, as they tend to be less motivated to acquire, develop, and practice HL.

In the current study, age, grade, and class level did not show a statistically significant association with HL. This is consistent with findings from various studies such as,^{20,52,58,60} which also reported no significant effect of age or the school grade/class on HL. However, other studies, such as^{22,55,63–65} showed significant relationships, with the younger respondents exhibiting lower HL than the older ones. As well, the current study did not find statistically significant relationship between HL and sex, in line with the study by Duplaga and Grysztar⁵⁸ that also reported no significant relationship between these factors. However, other studies from various countries indicated that gender influences HL,^{20,66,67} and studies like^{22,64,65} reported lower HL among males. The absence of statistically significant difference in HL based on age or class level, as a measure of age, and sex in the current study may stem from the lack of HL education or trainings at all school levels, and as opportunities to learn about health largely depend on their parents' health awareness and access to resources, including the Internet, in addition to health information they may receive through 'Local Science' and Biology classes at school.

The current study did not find a statistically significant association between HL and place of origin (primary school background). This finding is consistent with studies like^{15,54,58} that also reported no significant association between HL levels and place of origin. However, this contrasts with other studies; for example, a study by Wang, Hou et al⁶⁸ reported that students from rural areas exhibited lower levels of HL knowledge compared to those from urban areas. Moreover, in the current study, no statistically significant difference in HL status was observed among respondents based their self-perceived health status. This finding diverges from other studies conducted in other countries. For instance, studies such as^{15,60,69} reported that adolescents who perceived their health status as unsatisfactory had lower HL status or were less likely to possess adequate HL, while those with satisfactory self-rated health had significantly higher HL status. The difference may be attributed to various factors, such as the nature of the study populations (study settings), school curricula, access to health information, and community health programs.

To summarize and elucidate the implications, this study demonstrates that inadequate HL is widespread among adolescents and highlights significant disparities based on sociodemographic factors, including parents' education, Internet access, school type, and others. This mirrors broader issues within the general population. It reflects and also contributes to broader health inequalities in society. And the findings suggest current education curricula and public health initiatives are not effectively reaching adolescents. This study, therefore, calls for dedicated efforts to improve HL among adolescents in Ethiopia.

Across both education and public health sectors, policies must prioritize and integrate HL into school curricula, community initiatives, and healthcare systems. HL interventions must be contextually grounded and be tailored to address the unique barriers faced by adolescents from diverse sociodemographic backgrounds. There should be health education that is inclusive and provides materials that resonate with adolescents from diverse backgrounds, along with clear and concise public health messaging through accessible and engaging platforms like social media, community events, and multimedia formats. Adequate health information should be available in plain language and multiple formats

to accommodate different learning styles and reach those without regular Internet access. Efforts should start early, introducing age-appropriate curricula in early adolescence and sustaining it throughout the school years. In addition, educators, particularly, in public schools, need adequate training to effectively integrate HL into everyday instruction and support students in developing their HL.

Moreover, addressing HL among adolescents need collaboration among multiple sectors, including healthcare, education, families, community organizations, and government agencies. Therefore, interventions must engage all stakeholders. Interventions should empower parents with the knowledge and skills needed to support their children's health understanding, habits, and practices through community-based programs. To achieve the desired outcomes, there must also be supportive policies that address underlying inequalities and social determinants that indirectly or directly affect HL in adolescents and ensure equitable access to health information and resources.

Furthermore, continuous monitoring and evaluation are necessary to assess progress, identify challenges, and refine strategies to enhance their effectiveness. Finally, as HL is not well researched in Ethiopia, further studies are needed to identify the specific factors contributing to disparities across different contexts, deepen our understanding, and develop targeted, effective interventions that benefit not only adolescents but also the general society.

Strengths and Limitations

This study is the first to examine HL among adolescents in Ethiopia utilizing an instrument tailored to the local sociocultural context. This study contributed to the limited literature on HL, particularly from Ethiopian context. The study provided crucial insights for public health policy and interventions to improve HL in adolescents. This study adhered to universal ethical guidelines in research with human subjects. However, this study is not without limitations. As it is based on self-reported data, there might be a risk of response or information bias. However, the use of validated instrument and the structuring of questions sequentially allowing one to control the other can mitigate this risk. In addition, the study's school setting may limit the generalizability of its findings to all adolescents across different contexts. Nevertheless, as the respondents were socio-demographically diverse, mirroring the characteristics of the adolescent population, as adolescents are largely in schools, and as formal HL education is currently unavailable, the HL situation observed in this study likely represents the wider adolescent population. However, establishing the factors identified in this study as causal risk factors for the disparities in HL among adolescents, requires further or follow-up studies.

Conclusion

This study shows that inadequate HL is common among adolescents. It also indicates significant disparities in HL among adolescents based on their sociodemographic and related factors, which both reflect and perpetuate health inequalities within society. To address this issue, the study calls for targeted policies and interventions that are tailored to diverse adolescent situations, that include formal HL education in schools, and ensure equitable access to health information and services.

Data Sharing Statement

All data generated and analysed during this study are included in this article and its [Supplementary material](#).

Funding

For this research, we did not receive fund from any external body.

Disclosure

The authors declare that there are no competing interests regarding this research.

References

1. Sørensen K, Van den Broucke S, Fullam J, et al. Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health*. 2012;12(1):1–13. doi:10.1186/1471-2458-12-80

2. Kickbusch I, Wait S, Maag D. Navigating health: the role of health literacy. 2005.
3. Asari AA, Birhanu Z, Godesso A. Adolescents' health literacy perspectives and implications. *BMC Public Health*. 2025;25(1):1233. doi:10.1186/s12889-025-22341-y
4. World Health Organization. *Health Literacy Toolkit for Low-and Middle-Income Countries: A Series of Information Sheets to Empower Communities and Strengthen Health Systems*; 2015.
5. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion Int*. 2000;15(3):259–267. doi:10.1093/heapro/15.3.259
6. Paasche-Orlow MK, Wolf MS. The causal pathways linking health literacy to health outcomes. *Ame J Health Behav*. 2007;31(1):S19–S26. doi:10.5993/AJHB.31.s1.4
7. Oo WM, Khaing W, Mya KS, Moh MM. Health literacy-is it useful in prevention of behavioral risk factors of NCDs. *Int J Res Med Sci*. 2015;3(9):2331–2336. doi:10.18203/2320-6012.ijrms20150626
8. Oo WM, Soe PP, Lwin KT. Status and determinants of health literacy: a study among adult population in selected areas of Myanmar. *Int J Community Med Public Health*. 2015;2(3):318–322. doi:10.18203/2394-6040.ijcmph20150489
9. Apfel F, Tsouros AD. Health literacy: the solid facts. *Copenhagen: World Health Organization*. 2013;15(1):3–26.
10. Baker DW, Wolf MS, Feinglass J, Thompson JA, Gazmararian JA, Huang J. Health literacy and mortality among elderly persons. *Arch Int Med*. 2007;167(14):1503–1509. doi:10.1001/archinte.167.14.1503
11. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Internal Med*. 2011;155(2):97–107. doi:10.7326/0003-4819-155-2-201107190-00005
12. Robert J. *Local Action on Health Inequalities Improving Health Literacy to Reduce Health Inequalities*, UCL Institute of Health Equity. PHE Publications Gateway; 2015.
13. Kindig DA, Panzer AM, Nielsen-Bohlman L. Health literacy: a prescription to end confusion. 2004.
14. Eichler K, Wieser S, Brügger U. The costs of limited health literacy: a systematic review. *Int J Public Health*. 2009;54:313–324. doi:10.1007/s00038-009-0058-2
15. Bhusal S, Paudel R, Gaihre M, Paudel K, Adhikari TB, Pradhan PMS. Health literacy and associated factors among undergraduates: a university-based cross-sectional study in Nepal. *PLOS Global Public Health*. 2021;1(11):e0000016. doi:10.1371/journal.pgph.0000016
16. Sawyer SM, Afifi RA, Bearinger LH, et al. Adolescence: a foundation for future health. *Lancet*. 2012;379(9826):1630–1640. doi:10.1016/S0140-6736(12)60072-5
17. Manganello JA, DeVellis RF, Davis TC, Schottler-Thal C. Development of the health literacy assessment scale for adolescents (HAS-A). *J Commun Healthcare*. 2015;8(3):172–184. doi:10.1179/1753807615Y.0000000016
18. Adewole KO, Ogunfowokan AA, Olodu M. Influence of health literacy on health promoting behaviour of adolescents with and without obesity. *Int J Africa Nurs Sci*. 2021;15:100342. doi:10.1016/j.ijans.2021.100342
19. Bröder J, Okan O, Bollweg TM, Bruland D, Pinheiro P, Bauer U. Child and youth health literacy: a conceptual analysis and proposed target-group-centred definition. *Int J Environ Res Public Health*. 2019;16(18):3417. doi:10.3390/ijerph16183417
20. Rababah JA, Al-Hammouri MM, Drew BL, Aldalaykeh M. Health literacy: exploring disparities among college students. *BMC Public Health*. 2019;19:1–11. doi:10.1186/s12889-019-7781-2
21. Chang LC. Health literacy, self-reported status and health promoting behaviours for adolescents in Taiwan. *J Clin Nurs*. 2011;20(1-2):190–196. doi:10.1111/j.1365-2702.2009.03181.x
22. Fleary SA, Joseph P, Pappagianopoulos JE. Adolescent health literacy and health behaviors: a systematic review. *J Adolescence*. 2018;62:116–127. doi:10.1016/j.adolescence.2017.11.010
23. World Health Organization. The World Health Report 2002: reducing risks, promoting healthy life. World Health Organization; 2002.
24. World Health Organization. The World Health Report 2003: shaping the future. World Health Organization; 2003.
25. Bröder J, Okan O, Bauer U, et al. Health literacy in childhood and youth: a systematic review of definitions and models. *BMC Public Health*. 2017;17(1):1–25. doi:10.1186/s12889-016-3954-4
26. Manganello JA. Health literacy and adolescents: a framework and agenda for future research. *Health Educ Res*. 2008;23(5):840–847. doi:10.1093/her/cym069
27. Nutbeam D. The evolving concept of health literacy. *Soc Sci Med*. 2008;67(12):2072–2078. doi:10.1016/j.socscimed.2008.09.050
28. Levin-Zamir D, Leung AYM, Dodson S, Rowlands G. Health literacy in selected populations: individuals, families, and communities from the international and cultural perspective. *Info Services Use*. 2017;37(2):131–151. doi:10.3233/ISU-170834
29. Fairbrother H, Curtis P, Goyder E. Making health information meaningful: children's health literacy practices. *SSM-Popul Health*. 2016;2:476–484. doi:10.1016/j.ssmph.2016.06.005
30. Zarcadoolas C, Pleasant A, Greer DS. Understanding health literacy: an expanded model. *Health Promotion Int*. 2005;20(2):195–203. doi:10.1093/heapro/dah609
31. Guo S, Armstrong R, Waters E, et al. Quality of health literacy instruments used in children and adolescents: a systematic review. *BMJ Open*. 2018;8(6):e020080. doi:10.1136/bmjopen-2017-020080
32. Domanska OM, Bollweg TM, Loer A-K, Holmberg C, Schenk L, Jordan S. Development and psychometric properties of a questionnaire assessing self-reported generic health literacy in adolescence. *Int J Environ Res Public Health*. 2020;17(8):2860. doi:10.3390/ijerph17082860
33. Fleary SA, Freund KM, Nigg CR. Development and validation of assessments of adolescent health literacy: a Rasch measurement model approach. *BMC Public Health*. 2022;22(1):585. doi:10.1186/s12889-022-12924-4
34. Ghanbari S, Ramezankhani A, Montazeri A, Mehrabi Y. Health literacy measure for adolescents (HELMA): development and psychometric properties. *PLoS One*. 2016;11(2):e0149202. doi:10.1371/journal.pone.0149202
35. Dowse R. The limitations of current health literacy measures for use in developing countries. *J Commun Healthcare*. 2016;9(1):4–6. doi:10.1080/17538068.2016.1147742
36. Amanu AA, Birhanu Z, Godesso A. Health literacy among young people in Africa: evidence synthesis. *Risk Manag Healthc Policy*. 2023;16:425–437. doi:10.2147/RMHP.S399196
37. Amanu A, Birhanu Z, Godesso A. Sexual and reproductive health literacy among young people in Sub-Saharan Africa: evidence synthesis and implications. *Glob Health Action*. 2023;16(1):2279841. doi:10.1080/16549716.2023.2279841

38. Amanu AA, Godesso A, Birhanu Z. Health literacy in Ethiopia: evidence synthesis and implications. *J Multidiscip Healthc.* **2023**;16:4071–4089. doi:10.2147/JMDH.S440406
39. Amoah PA, Phillips DR. Health literacy and health: rethinking the strategies for universal health coverage in Ghana. *Public Health.* **2018**;159:40–49. doi:10.1016/j.puhe.2018.03.002
40. Fmoh E. National Strategic Action Plan (NSAP) for Prevention and Control of Noncommunicable Diseases in Ethiopia (2014-2016). *Ministry of Health.* **2015**.
41. United Nations WU. *The United Nations Interagency Task Force on the Prevention and Control of Non-Communicable Diseases: Joint Mission, Ethiopia 13–17 November 2017, Addis Ababa.* Geneva: World Health Organization; **2018**.
42. Asari AA, Ameyu G, Birhanu Z. Development and validation of an adolescent health literacy scale in Ethiopia: a mixed methods approach. *PLoS One.* **2025**;20(8):e0329184.
43. Israel GD. Determining sample size. **1992**.
44. Bryman A. *Social Research Methods.* Oxford university press; **2016**.
45. Bolarinwa OA. Sample size estimation for health and social science researchers: the principles and considerations for different study designs. *Niger Postgraduate Med J.* **2020**;27(2):67–75. doi:10.4103/npmj.npmj_19_20
46. Hazra A, Gogtay N. Biostatistics series module 5: determining sample size. *Ind J Dermatol.* **2016**;61(5):496–504. doi:10.4103/0019-5154.190119
47. Andrade C. Sample size and its importance in research. *Indian J Psychol Med.* **2020**;42(1):102–103. doi:10.4103/IJPSYM.IJPSYM_504_19
48. Monette DR, Sullivan TJ, DeJong CR. *Applied Social Research: A Tool for the Human Services.* **2002**.
49. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). *Eur J Public Health.* **2015**;25(6):1053–1058. doi:10.1093/eurpub/ckv043
50. Pelikan JM, Link T, Straßmayr C, et al. Measuring comprehensive, general health literacy in the general adult population: the development and validation of the HLS19-Q12 instrument in seventeen countries. *Int J Environ Res Public Health.* **2022**;19(21):14129. doi:10.3390/ijerph192114129
51. Ashcroft RE. The declaration of Helsinki. *The Oxford Textbook of Clinical Research Ethics.* **2008**;141–148.
52. Khajouei R, Salehi F. Health literacy among Iranian high school students. *Ame J Health Behav.* **2017**;41(2):215–222. doi:10.5993/AJHB.41.2.13
53. Saeedi F, Panahi R, Osmani F. The survey of health literacy and factors influencing it among high school students in Tehran, 2016. *Health Edu Health Promotion.* **2016**;4(2):49–59.
54. Ye X-H, Yang Y, Gao Y-H, Chen S-D, Xu Y. Status and determinants of health literacy among adolescents in Guangdong, China. *Asian Pac J Cancer Prev.* **2014**;15(20):8735–8740. doi:10.7314/APJCP.2014.15.20.8735
55. Dehghankar L, Panahi R, Kekefallah L, Hosseini N, Hasannia E. The study of health literacy and its related factors among female students at high schools in Qazvin. *J Health Lit.* **2019**;4(2):18–26.
56. Saeedi Koupai M, Motaghi M. Comparing health literacy in high school female students and their mothers regarding women's health. *J Health Lit.* **2017**;1(4):220–229.
57. Ghaddar SF, Valerio MA, Garcia CM, Hansen L. Adolescent health literacy: the importance of credible sources for online health information. *J Sch Health.* **2012**;82(1):28–36. doi:10.1111/j.1746-1561.2011.00664.x
58. Duplaga M, Grysztar M. Socio-economic determinants of health literacy in high school students: a cross-sectional study. *Int J Environ Res Public Health.* **2021**;18(22):12231. doi:10.3390/ijerph182212231
59. Wu AD, Begoray DL, MacDonald M, et al. Developing and evaluating a relevant and feasible instrument for measuring health literacy of Canadian high school students. *Health Promotion Int.* **2010**;25(4):444–452. doi:10.1093/heapro/daq032
60. Evans A-Y, Anthony E, Gabriel G. Comprehensive health literacy among undergraduates: a Ghanaian university-based cross-sectional study. *HLP.* **2019**;3(4):e227–e237. doi:10.3928/24748307-20190903-01
61. Zhang Y, Zhang F, Hu P, et al. Exploring health literacy in nursing students of Chongqing, China: a cross-sectional survey using the health literacy questionnaire. *Lancet.* **2016**;388:S99. doi:10.1016/S0140-6736(16)32026-8
62. Zhang Y, Zhang F, Hu P, et al. Exploring health literacy in medical university students of Chongqing, China: a cross-sectional study. *PLoS One.* **2016**;11(4):e0152547. doi:10.1371/journal.pone.0152547
63. Vashe A, Sekaran VC, Chandnani DG, Moganadass K, Saghadevan S, Saghadevan S. Psychometric properties of health literacy measure for adolescents (HELMA) and predictors of health literacy among youth from Malaysia and Sri Lanka. *J Turkish Sci Educ.* **2022**;19(4):1206–1221. doi:10.36681/tused.2022.170
64. Paakkari O, Torppa M, Villberg J, Kannas L, Paakkari L. Subjective health literacy among school-aged children. *Health Educ.* **2018**;118(2):182–195. doi:10.1108/HE-02-2017-0014
65. Sukys S, Trinkuniene L, Tilindiene I. Subjective health literacy among school-aged children: First evidence from Lithuania. *Int J Environ Res Public Health.* **2019**;16(18):3397. doi:10.3390/ijerph16183397
66. Clouston SA, Manganello JA, Richards M. A life course approach to health literacy: the role of gender, educational attainment and lifetime cognitive capability. *Age Ageing.* **2017**;46(3):493–499. doi:10.1093/ageing/afw229
67. Loer A-KM, Domanska OM, Stock C, Jordan S. Subjective generic health literacy and its associated factors among adolescents: results of a population-based online survey in Germany. *Int J Environ Res Public Health.* **2020**;17(22):8682. doi:10.3390/ijerph17228682
68. Wang W, Hou Y, Hu N, et al. A cross-sectional study on health-related knowledge and its predictors among Chinese vocational college students. *BMJ Open.* **2014**;4(10):e005182. doi:10.1136/bmjopen-2014-005182
69. Azlan AA, Hamzah MR, Tham JS, Ayub SH, Ahmad AL, Mohamad E. Associations between health literacy and sociodemographic factors: a cross-sectional study in Malaysia utilising the HLS-M-Q18. *Int J Environ Res Public Health.* **2021**;18(9):4860. doi:10.3390/ijerph18094860

Journal of Multidisciplinary Healthcare

Publish your work in this journal

The Journal of Multidisciplinary Healthcare is an international, peer-reviewed open-access journal that aims to represent and publish research in healthcare areas delivered by practitioners of different disciplines. This includes studies and reviews conducted by multidisciplinary teams as well as research which evaluates the results or conduct of such teams or healthcare processes in general. The journal covers a very wide range of areas and welcomes submissions from practitioners at all levels, from all over the world. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/journal-of-multidisciplinary-healthcare-journal>

Dovepress
Taylor & Francis Group