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Prevalence and Associated Factors of Limited Health Literacy: A Cross-Sectional Study in Kalutara District of Sri Lanka

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Abstract

Health literacy is a key determinant of health. Despite its importance, research on health literacy in Sri Lanka is sparse, and the existing evidence is inconclusive. This study assessed the prevalence and associated factors of Limited Health Literacy (LHL) among adults in the Kalutara district of Sri Lanka. Before conducting the study, the HLS-EU-Q47 questionnaire was translated into Sinhala, adapted, and validated for use in Sri Lanka. The validation study and cross-sectional study recruited 247 and 781 participants, respectively. Data were collected through a household survey using an interviewer-administered questionnaire. Multiple logistic regression was employed to assess the associated factors. The prevalence of limited health literacy was 63.8%, and it was significantly associated with lower family income, physical inactivity, betel chewing, habit of adding salt when cooking rice, poor self-reported health status, unmet healthcare needs, limited participation in health screening, and being uninsured for health. The high prevalence of LHL warrants urgent action on improving health literacy in Sri Lanka. The findings of this study indicate the potential link between health literacy and several public health concerns in Sri Lanka, including low health screening coverage, low physical activity, high salt consumption and betel chewing. Interventions to improve health literacy could be beneficial when addressing these issues.

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Introduction

Health literacy is defined as “a link to literacy and entails people’s knowledge, motivation, and competences to access, understand, appraise, and apply health information to make judgments and take decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the life course” (Sørensen et al., 2012). Health literacy is recognized as a strong predictor of the health status of individuals as well as communities (Nutbeam & Lloyd, 2021). Besides its

health impacts, health literacy is strongly linked with the economic burden of healthcare systems(Dukić et al., 2013; Tannous et al., 2021). An increasing amount of research has focused on the prevalence of Limited Health Literacy (LHL)(Rajah et al., 2019; Sørensen et al., 2015), which includes individuals with reduced health literacy skills. Systematic reviews indicate that LHL is a widespread public health concern globally, although prevalence estimates vary considerably across regions due to differences in populations and measurement tools (Baccolini et al., 2021; de Jesus et al., 2024; Rajah et al., 2019). The evidence on health literacy in Sri Lanka is limited and requires further exploration. Denuwara and Gunawardena(2017) reported 32.5% of LHL among teachers in Sri Lanka. A recent study on health literacy in Sri Lanka has estimated that 15.4% of the adult population has LHL (Wijesinghe et al., 2025). Although Sri Lanka has sustained a higher general literacy rate (Department of Census and Statistics, Sri Lanka, 2025b) over the past few decades, the above evidence indicates that health literacy among the population is inadequate. This may be due to the complexity of the concept of health literacy compared to general literacy. General literacy measures the ability to read and write a simple sentence with understanding. It reflects the coverage of primary education and basic learning skills. Sri Lanka has long-standing free education and high primary education coverage. However, health literacy extends beyond basic reading and writing skills. It requires the ability to interpret information, make informed decisions, and act appropriately. These competencies depend not only on education but also on broader factors such as economic conditions, the accessibility of health services, the availability of trained health staff, and language barriers. Sri Lanka is still in the process of developing these aspects; therefore, the level of health literacy is likely to remain suboptimal.

Due to its multifaceted nature, health literacy is associated with several health and non-health factors. Commonly identified demographic and socioeconomic factors include gender (Chakraverty et al., 2022), age (Kwon & Kwon, 2025), level of education (Gonçalves-Fernández & Pino-Juste, 2025), and income (Huh & Song, 2025). Furthermore, a growing body of evidence consistently confirms the strong relationship between LHL and harmful behaviors, including smoking (Tao et al., 2025), physical inactivity (Bae et al., 2025), and unhealthy dietary patterns (Elemile et al., 2025). LHL is also linked with poor health outcomes, such as poor control of chronic diseases(Chen et al., 2024; Dey et al., 2025; Magnani et al., 2018), higher hospital readmission rates (Shahid et al., 2022), and higher mortality rates (Fan et al., 2021).

Assessing the level of health literacy and its associated factors is vital for understanding the current situation and planning for effective health interventions. Health literacy can be measured with several tools, such as the Test of Functional Health Literacy in Adults (TOFHLA) (Parker et al., 1995), Rapid Estimate of Adult Literacy in Medicine (REALM) (Davis et al., 1993), the Newest Vital Sign (NVS) (Weiss et al., 2005) and the European Health Literacy Survey Questionnaire (HLS-EU-Q47) (Sørensen et al., 2013). None of these instruments had been validated for use in the Sri Lankan context at the time of this study. The HLS-EU Consortium developed the HLS-EU-Q47 questionnaire based on the HLS-EU conceptual model. This model consists of three domains and four competencies. The three domains are healthcare health literacy, disease prevention health literacy, and health promotion health literacy. Accessing, understanding, appraising, and applying health information are the four competencies(Sørensen et al., 2013). The tool was initially used for the European Health Literacy Survey in 2011(Sørensen et al., 2015), and later it was translated into many languages and validated in many countries, including India (D Souza & Van den Broucke, 2019), Japan (Nakayama et al., 2015), and several East Asian countries (Duong et al., 2017).

Given its widespread use, especially in Asian countries and the comprehensive approach in the tool development process, the HLS-EU-Q47 questionnaire was selected for use in this study. Given the public health importance of health literacy and the limited evidence available in Sri Lanka, this study aimed to assess the level of health literacy among adults in Sri Lanka and identify the demographic, socioeconomic, behavioral, and health-seeking behavior-related factors associated with LHL.

Methods

This study adapted and validated the HLS-EU-Q-47 Questionnaire before using it for the cross-sectional study to assess the prevalence of LHL and associated factors among adults in the Kalutara district.

Phase 1. Validation of HLS-EU-Q 47 Questionnaire

A gold standard test to assess health literacy is not available. Hence, the triangulation method was used. Hence, the triangulation method was used by applying several validation techniques. The questionnaire was translated from English to Sinhala using the forward and backward translation methods. The modified Delphi technique (McKenna, 1994) was employed for the cultural adaptation of the translated HLS-EU-Q 47 questionnaire. The experts who participated in this activity conducted two iterations before finalizing the adaptation process. The adapted HLS-EU-Q-47 questionnaire was pretested among 20 adults. A group of individuals from the public, healthcare professionals, and a sociologist assessed face validity to evaluate the tool's relevance for health literacy assessment. Content validity was reviewed by a panel of experts from public health, clinical practice, sociology, and communication sectors who were not involved in the translation process. The same panel assessed the content validity, focusing on wording, arrangement, appropriateness, and acceptability in the local context. A cross-sectional validation study was conducted in a selected Medical Officer of Health (MOH) area in a different district (Colombo district) to assess the construct validity of the HLS-EU-Q47 questionnaire. We recruited 247 adults for this component, and the construct validity was assessed employing confirmatory factor analysis (CFA). Model fit indices and factor loading ranges are presented in the results section, and the complete item-level factor loading table is provided in Appendix A. Internal consistency and test-retest reliability were measured to assess the reliability of the Sinhala version of the HLS-EU-Q47 tool.

Phase 2: Assessing health literacy and associated factors

A descriptive cross-sectional study was conducted to assess the prevalence of LHL and associated factors among adults aged 25-59 years in the Kalutara district, Sri Lanka. Kalutara is one of the three districts of the Western Province of Sri Lanka, covering 1598 km2 (Department of Census and Statistics, Sri Lanka, 2021). Nearly 9% of the 1.2 million population lives in urban areas, while 88% lives in rural areas. The estate sector of the district mainly consists of rubber and lowland tea plantations, where the remaining 3% of the district population lives (Department of Census and Statistics, 2012). In comparison with the urban and rural populations, the socio-economic and health status of the estate population in the country is poor (Periyasamy, 2018).

After adjusting for the design effect (2) and non-response rate (5%), the final calculated sample size was 810. A stratified multistage cluster sampling method was used in this study. In order to obtain a representative sample, 5, 42, and 2 clusters were selected from the urban, rural, and estate sectors, respectively. The cluster size was 17, and the primary sampling unit was 'Grama Niladhari Division', which is the smallest administrative division in Sri Lanka(Cabinet Office of Sri Lanka, 2016). Figure 1 demonstrates the sampling procedure of the cross-sectional study.

The data collection tool was an interviewer-administered questionnaire that consisted of two main parts. Part A was the validated HLS-EU-Q 47 questionnaire. Part B was the questionnaire used to assess the associated factors of health literacy.

Measurement of variables

Part B of the questionnaire was developed and subjected to judgmental validity and test-retest reliability assessments. The complete list of variables, their scales and methods of measurement are described in Appendix B. A summary of the approach to measurement of variables is outlined below.

- **Demographic factors and socio-economic variables**.
  Age was recorded in completed years. Sex, ethnicity, religion, marital status, educational level, literacy level in English, occupation, details of the spouse (where applicable), and household income were self-reported according to predefined categorical variables.
- **Media and Communication related variables**
  Availability of communication facilities at home, types of media used, barriers to using the internet, purpose and frequency of using the internet, and the platforms used for receiving health information were measured using structured responses. The types of social media used were recorded as a binary (yes/No) response.

- **Health status related variables**
  Self-reported health status was captured using a five-point Likert scale (very good to very bad). Chronic disease status was reported by the participants based on their awareness of the specific disease conditions they were diagnosed with.
- **Behavioral variables**
  Smoking, betel chewing, and alcohol consumption were operationalized using standard behavioral definitions (e.g., "current smoker" defined as smoking within the past 30 days). Frequency of use and attempts to quit were recorded using predefined categories. Awareness of cessation was assessed by asking participants to name at least one available service. Fruit and vegetable intake was measured as the number of days per week the participant consumed at least five portions based on WHO and national dietary guidelines. Salt intake was estimated using household salt usage per month and number of household members. Physical activity was measured as the number of days per week participants engaged in ≥30 minutes of moderate-intensity activity in line with WHO recommendations.
- **Health-seeking behavior**
  Type of healthcare sought; type of institutions visited; use of supportive cultural or religious practices; and participation in screening programs were recorded using predefined categories. Unmet healthcare need was assessed using a single validated question about the inability to obtain needed care in the past six months, followed by reasons for the unmet need.

  All the responses were recorded by an interviewer as reported by the participants. Hence, all the factors associated with LHL must be considered self-reported.

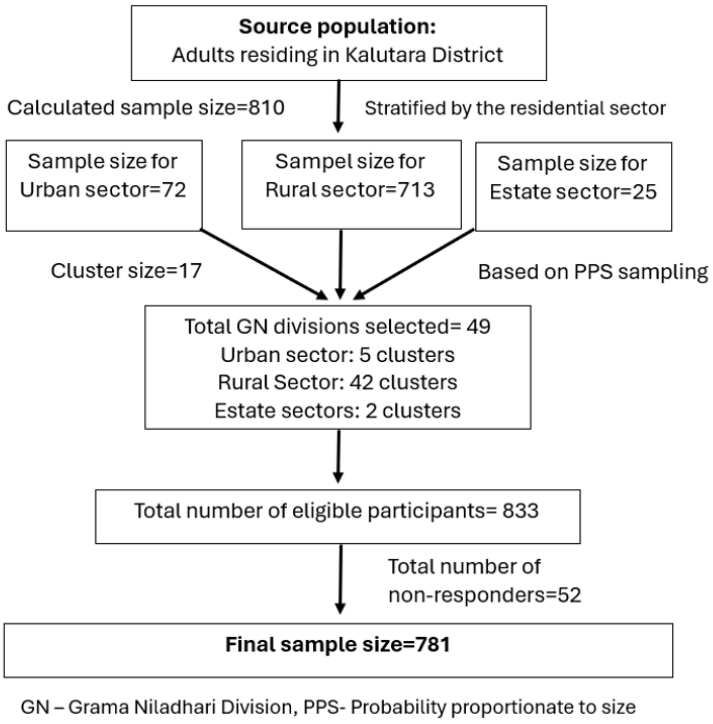

Figure 1: Sampling flow chart of the cross-sectional study

Data analysis

The score generated from the Likert scale of the HLS-EU-Q47 questionnaire was used to calculate the health literacy index based on the formula provided by the HLS-EU Consortium (HLS-EU Consortium, 2012)

Formula for the calculation of the Health Literacy Index

$$Index = (Mean - 1) \times (\frac{50}{3})$$

Index- Specific index calculated
Mean - Mean of all participating items for each Individual
1 – The minimal possible value of the mean (leads to a minimum value of the index of 0)
3- The range of the mean
50- The chosen maximum value of the new metric

Different health literacy levels can be calculated using the above scores. The threshold values and levels of health literacy are:

1. Inadequate health literacy = 0 to 25 points
2. Problematic health literacy = 25.1 to 33 points
3. Sufficient health literacy =33.1 to 42 points
4. Excellent health literacy =42.1 to 50 points

With the combination of inadequate health literacy and Problematic health literacy, a new parameter has been developed, called "Limited Health Literacy".

Bivariate analysis was carried out to assess the associated factors of LHL. Responses to each variable considered for bivariate analysis were grouped into two categories. The chi-square test was performed to assess the significance of these associations. Logistic Regression (LR) was used for multivariate analysis. The dependent variable used in the LR analysis was limited health literacy. The independent variables were selected considering the following factors.

1. All the variables with a p-value less than 0.2.
2. The association was biologically and/or logically explainable.
3. Those commonly identified by other studies.

The backward elimination method was employed to perform the LR analysis. It retained the maximum number of variables in the model and displayed the best model fitting. The Omnibus test, Nagelkerke R-Squared test, and Hosmer-Lemeshow test were performed to assess the fitness of the LR model. IBM SPSS Statistics (Statistical Products and Service Solutions) software version 23.0 and Linear Structural Relations (LISREL) software version 9.1 were used for data analysis.

Ethics

Ethical approval for this study was obtained from the Ethics Review Committee of the National Institute of Health Sciences (NIHS). All steps and procedures adhered to the ethical review committee and the principles outlined in the Declaration of Helsinki. The purpose of the study, procedures, potential risks, and benefits were clearly explained before obtaining the written informed consent form from each participant. Participation in the study was entirely voluntary. Participants were informed that they have the right to withdraw from the study at any point without any consequences.

Confidentiality and anonymity were strictly maintained throughout the study. Personal identification data were not collected in this study, and all data were stored securely with password protection. No financial or other incentives were offered, and no disadvantages were associated with participation and refusal.

Results

Validation of HLS-EU-Q 47 Questionnaire

During the cultural adaptation process, it was decided to keep all items with minor modifications in the 1st,11th, 26th, and 29th items of the tool. A total of 247 participants (females: 52.2%) were included in the validation study. Their characteristics are described in Appendix C. Convergent validity and discriminant validity were established by assessing the correlation of items within and between subscales (Appendix D).

When conducting Confirmatory Factor Analysis (CFA), the Robust Maximum Likelihood method (RML) was followed. Three model structures were tested (Table 1). The RMSEA value (0.071 or 0.075) was within the desired value limit (<0.08). The other absolute fit indices (Table 1) were not within the desired value range. The relative and parsimony model fit indices were within the desired value range. Three models demonstrated approximately similar results. However, the three-factor model is the most utilized, theoretically rational, and interpretable model. Therefore, the three-factor model was selected as the best model for the HLS-EU-Q 47 questionnaire.

Table 1. Model Fit Indices of the Three Models of the HLS-EU-Q 47 Questionnaire

Indices	Models		
	Two-factor model	Three-factor model	Four-factor model
Absolute fit indices			
χ^2	2302.21	2442.4	2253.01
df	1032	1031	1028
p	<0.001	<0.001	<0.001
RMSEA (90% CI)	0.075 (0.071-0.079)	0.075 (0.071-0.078)	0.071(0.067-0.075)
GFI	0.70	0.70	0.71
AGFI	0.67	0.68	0.69
SRMR	0.06	0.06	0.06
Relative fit indices			
CFI	0.96	0.96	0.96
NNFI	0.94	0.96	0.96
Parsimony fit indices			
PGFI	0.64	0.64	0.65
PNFI	0.88	0.88	0.88

χ^2-Satorra-Bentler scaled chi square test (desired value p> 0.05), df- Degree of freedom, p- p value, RMSEA- Root mean square error of approximation (desired value<0.08), GFI- Goodness of fit index (desired value > 0.9), AGFI- Adjusted goodness-of-fit index (desired value > 0.9), SRMR- Standardized root mean square residual (desired value < 0.05), CFI- Comparative fit index (desired value >0.95), NNFI- non-normed fit index (desired value >0.95), PGFI- Parsimony goodness-of-fit index (desired value >0.5) PNFI- Parsimonious normed fit index (desired value >0.5)

The reliability of the questionnaire was evaluated through calculations of internal consistency and test-retest reliability. In the analysis, Cronbach's alpha values for each domain were above 0.7. The minimum value was 0.853 for the disease prevention health literacy domain. When assessing test-retest reliability, the correlation coefficients (r) were 0.894, 0.891, and 0.895 in the Health Care Health Literacy, Disease Prevention Health Literacy, and Health Promotion Health Literacy domains, respectively.

Factor structure and factor loadings of the items in the Sinhala version of the HLS-EU-Q47 questionnaire are summarised in Table 2, and a detailed description of item-wise factor loadings is included in Appendix A.

Table 2. Summary of the factor loadings of the Sinhala version of the HLS-EU-Q47 questionnaire

Construct	Item	Range of factor loadings	AVE	CR
Health Care Health Literacy	Q1-Q16	0.48-0.81	0.51	0.94
Disease Prevention Health Literacy	Q17-Q31	0.49-0.82	0.50	0.93
Health Promotion Health Literacy	Q32-Q47	0.50-0.79	0.52	0.94

AVE- Average variance extracted, CR-Composite reliability

Standardized factor loadings range from 0.48-0.81 for the Healthcare Health Literacy domain, 0.49-0.82 for the Disease Prevention Health Literacy domain, and 0.5-0.79 for the Health Promotion Health Literacy domain. Average Variance Extracted (AVE) values ranged from 0.5 to 0.52 across three domains. Composite Reliability (CR) values indicated acceptable internal consistency in all three domains. Item 16 in the Healthcare Health Literacy Domain and item 25 in the Disease Prevention Health Literacy domain had factor loadings below 0.50. However, these were retained due to their theoretical importance and because overall domain reliability remained acceptable.

Health Literacy and Associated Factors

A total of 781 of 810 eligible individuals participated in this study, resulting in a response rate of 93.8%.

Demographic Characteristics

The mean age was 40.4 years (SD = 9.4), and 52.8% of the study sample were female. Basic demographic characteristics are described in Table 3.

Table 3. Frequency Distribution of Demographic Characteristics of Study Participants

Characteristic	Item	n	(%)
Age (Years)	25-39 years	402	52.4
	40-69 years	379	48.6
Sex	Male	369	47.2
	Female	412	52.8
Ethnicity	Sinhala	697	89.3
	Tamil	36	4.6
	Moor	47	6.0
	Burgher	1	0.1
Marial state	Never married	51	6.5
	Married	706	90.4
	Divorced	3	0.4
	Widowed	20	2.6
	Separated	1	0.1
Education	≤ Grade 8	87	11.1
	Grade 9- Grade 10	54	6.9
	GCE O/L	337	43.3
	GCE A/L	245	31.4
	Diploma	6	0.8
	Degree	51	6.5
Occupation	Unemployed	279	35.7
	Government sector	131	16.8
	Private sector	188	24.1
	Business/Self-employed	183	23.4
Monthly income (Rs[1])	≤ 25000	203	26.0
	25,001-50,000	447	57.2
	50,001 – 100,000	106	13.6
	>100,001	25	3.2

1- Sri Lankan Rupees, GCE O/L- General Certificate of Education Ordinary Level, GCE A/L- General Certificate of Education Advance Level

Health Literacy

Table 4 describes the different parameters of health literacy. The prevalence of limited health literacy of the study sample was 63.8% (n=498, 95% CI=60.3%-67.1).

Table 4. Main Indices of the General Health Literacy of the Participants

Indices	No. n=781	%	95% CI
Inadequate Health Literacy (IHL)	235	30.1	26.9%-33.4%
Problematic Health Literacy (PHL)	263	33.7	30.4%-37.1%
Limited Health literacy[1] (LHL =IHL+PHL)	**498**	**63.8**	**60.3%-67.1%**
Sufficient Health Literacy (SHL)	166	21.3	18.4%-24.3%
Excellent Health Literacy (EHL)	117	15.0	12.5%-17.7%

1-Limited health literacy was calculated by amalgamating 'Inadequate Health Literacy' and 'Problematic

Table 5 demonstrates the percentage of LHL across key socio-demographic and economic categories. The prevalence of limited LHL varied across socio-demographic and economic categories, with the highest burden observed among individuals from lower-income households (74.4%).

Table 5. Percentage of Limited Health Literacy across key socio-demographic and economic categories

Variable	Category	% of LHL
Age (years)	40 years & above	63.3%
	< 40years	64.2%
Sex	Female	61.4%
	Male	66.4%
Nationality	Non-Sinhala	65.5%
	Sinhala	63.6%
Religion	Non-Buddhist	66.3%
	Buddhist	63.4%
Civil status	Married	63.9%
	Unmarried/other	62.7%
Education	O/L or below	65.3%
	A/L and above	61.3%
Occupation	Unemployed	60.8%
	Employed	65.4%
Family income	≤Rs.25000	74.4%
	> Rs. 25000	60.0%

Factors Associated with LHL

All the variables with a p-value less than 0.2 in bivariate analysis were included in the model. Based on literature and expert opinion, a few other important variables were also included. Altogether, 20 independent variables were selected for the analysis (Table 6).

Table 6. Variables included in the logistic regression model

	Factor	Unadjusted OR	95%CI	Significance
1	Being a female	0.81	0.60-1.08	**P=0.15**
2	Income less than Rs.25000.00	1.93	1.35-2.76	**p<0.001**
3	Age >40years	0.96	0.72-1.29	P=0.80
4	Education: O/L or below	1.19	0.88-1.61	P=0.25
5	High data cost as barrier to use internet	1.28	0.93-1.76	**p=0.13**
6	Language as barrier to use internet	1.38	0.92-2.05	**p=0.11**
7	Receiving health information from newspapers frequently	1.28	0.94-1.74	**p=0.11**
8	Poor self-reported health status	2.47	1.83-3.3	**p<0.001**
9	Consume betel	1.95	1.24-3.07	**p=0.003**
10	Not having a Twitter account	2.50	0.79-7.95	**p=0.11**
11	Add salt frequently when cooking rice	2.40	1.78-3.25	**p<0.001**
12	Do exercise <5 days per week	3.63	2.55-5.15	**p<0.001**
13	Not participated to health screening during the last 6 months	4.09	2.71-6.19	**p<0.001**
14	Self-reported unmet need for health care needs	2.60	1.84-3.67	**p<0.001**
15	Not having health Insurance	1.61	1.17-2.20	**p=0.003**
16	Not having a claiming facility	0.70	0.49-1.02	**p=0.06**
17	Occupation	0.82	0.60-1.11	**P=0.20**
18	Prevalence of at least one NCD	0.87	0.64-1.19	P=0.40
19	Trust Health care staff	2.00	1.22-3.28	**P=0.005**
20	Trust newspapers	1.25	0.93-1.67	**P=0.14**

Only nine independent variables were retained in the final model (Table 6). Participants with monthly family incomes less than Rs. 25,000 were 1.82 times more likely to have LHL (adjusted OR = 1.82; 95% CI = 1.21-2.73, p < 0.004) compared to those with income more than Rs. 25,000. Those who self-reported a poor health status were 2.36 times more likely to have LHL (adjusted OR=2.36; 95% CI=1.68-3.32, p<0.001) than those who self-reported a good health status. Participants who consume betel were 1.8 times more likely to have LHL (adjusted OR=1.8, 95% CI=1.05-3.05, p=0.03) compared to those who do not consume betel. Those who frequently add salt when cooking rice were 2.25 times more likely to have LHL (adjusted OR=2.25; 95% CI=1.46-2.91, p<0.001) than those who do not add salt. Those who were involved in physical activity less than 5 days per week were 3.5 times more likely to have LHL (adjusted OR=3.5; 95% CI=2.38-5.14, p<0.001) than participants who engaged in physical activity at least 5 days per week. Those who did not participate in a health screening program during the last six months were 4.6 times more likely to have LHL (adjusted OR=4.59; 95% CI= 2.83-7.42, p<0.001) compared to the participants who participated in at least one health screening program during the last six months. Those who did not have

health insurance were 1.57 times more likely to have LHL (adjusted OR=1.57; 95% CI=1.03-2.39, p=0.035) than participants with health insurance. Having a claim facility for health care costs was inversely associated with LHL (adjusted OR=0.55; 95% CI=0.34-0.89, p=0.015) compared to participants with a claim facility.

Table 7. Independent Variables Remained in the Final Model, and Their Significance

Independent variable[1]	B	Sig.	OR	95% CI for OR	
				Lower	Upper
Income[2]: < Rs[3]. 25000	0.60	0.004	1.82	1.21	2.73
Self-reported Health status: Poor	0.86	<0.001	2.36	1.68	3.32
Betel consumption: Yes	0.59	0.030	1.80	1.05	3.05
Add salt frequently when cooking rice: Yes	0.72	<0.001	2.07	1.46	2.91
Physical activity :< 5 days per week	1.25	<0.001	3.50	2.38	5.14
Participation in screening: No	1.52	<0.001	4.59	2.83	7.42
Self-reported unmet health care needs: Yes	0.86	<0.001	2.37	1.60	3.51
Health insurance: No	0.45	0.035	1.57	1.03	2.39
Claim facility: No	-0.60	0.015	0.55	0.34	0.89

1- Reference categories are not shown in the table, 2- Average monthly family income, 3- Sri Lankan Rupees. OR-Odds Ratio, CI- Confidence Interval

The assessment of goodness of fit of the final model was achieved by performing the Hosmer-Lemeshow goodness of fit test (H-L GOF) and the calculation of Nagelkerke R^2. The chi-square value of H-L GOF analysis for the final model was 9.8 (df =8) with a non-significant p value (p=0.27). The Nagelkerke R^2 was 0.32.

Discussion

This study validated the Sinhala version of the HLS-EU-Q 47 questionnaire for Sri Lanka and assessed the prevalence and associated factors of LHL.

Validation of the Tool

When appraising the construct validity of the HLS-EU-Q47 questionnaire, the absolute, relative, and parsimony fit indices were used to assess model fit, as used in several other studies (McDonald & Ho, 2002; Mulaik et al., 1989; Nakayama et al., 2015). The three-factor model of the HLS-EU-Q 47 tool exhibited the best model fit statistics, which is the main factor structure of the original tool (Sørensen et al., 2013). Several other validation studies of the HLS-EU-Q 47 tool have confirmed this factor structure (Nakayama et al., 2015). In contrast, the study done in several Southeast Asian countries has demonstrated the best model fit for the four-factor model (Duong et al., 2017). Nevertheless, the three-factor model was considered a meaningful and functional factor structure because it consists of disease prevention, health promotion, and healthcare-related dimensions representing the original HLS-EU conceptual model (Sørensen et al., 2012). The reliability of the tool was tested by internal consistency by assessing Cronbach's alpha coefficient and test-retest reliability (Abramson & Abramson, 1999). In the present study, all three main domains and the tool received Cronbach's alpha values exceeding Nunnally's criterion of 0.7 (Nunnally, 1994). Notably, this result is consistent with the values obtained in the original HLS-EU study (Cronbach's alphas 0.87 to 0.97) (HLS-EU Consortium, 2012) and the values in the study conducted in Asian countries (Cronbach's alphas 0.94 to 0.97) (Duong et al., 2017). Most items demonstrated moderate to strong factor loading on their respective domains, supporting the structural validity of the tool. Although two items showed loadings below 0.5, they were retained due to their conceptual relevance and contribution to content validity.

Although the HLS-EU-Q47 performed well psychometrically, several cultural adaptation needs were identified when using it in South Asian settings. Originally, the questionnaire was developed in Europe, where health behaviors, communication norms, and health system navigation differ from those in Sri Lanka.

In South Asian settings, some health-related concepts are directly linked with cultural and traditional beliefs and practices, which we had to consider when adapting the tool. Some Sinhala terms required contextual rather than literal translation. These observations suggest further exploration to include items reflecting traditional practices and local barriers to the healthcare system, which would strengthen the tool's relevance in South Asia.

Overall, the findings suggest that the instrument provides a reliable and structurally sound measure of the three domains supporting its use in both research and practice.

The prevalence of Limited Health Literacy

The prevalence of limited health literacy in the current study was 63.8%. In the study conducted among teachers in the Colombo District using the same tool (HLS-EU-Q-47), the prevalence of LHL was 32.5% (Denuwara & Gunawardena, 2017). A recently published study indicates that 15.4 % of 18-49-year-olds in Sri Lanka have LHL (Wijesinghe et al., 2025). The latter used the 16-item version of the European Health Literacy Survey Questionnaire (HLS-EU-Q16). The observed discrepancies are difficult to interpret due to the heterogeneity of the study population and the tools used. The systematic review conducted by Rajah et al (2019) supports the observed wide variation and concluded that the prevalence of LHL in Southeast Asian countries ranges from 1.6% to 99.5%.

Factors associated with LHL

This study examined the association between LHL and several socio-demographic and economic factors. Age was not significantly associated with LHL in this study, which aligns with previous studies from Sri Lanka (Denuwara & Gunawardena, 2017; Wijesinghe et al., 2025). In contrast, evidence from international studies indicates that LHL is associated with age, especially among elderly groups (Lima et al., 2024). The elderly groups above the age of 70 years were not included in the above studies conducted in Sri Lanka, which might be an explanation for the observed discrepancy with international studies. Consistent with previous findings in Sri Lanka, we also could not elicit a significant association of LHL and sex. Literacy rates and secondary education levels do not demonstrate noticeable disparities between males and females in Sri Lanka (Department of Census and Statistics, Sri Lanka, 2025b; World Bank, 2025). Health literacy may also follow a similar pattern, though several international studies have reported noticeable disparities in health literacy based on sex (Gonçalves-Fernández & Pino-Juste, 2025; Hearn et al., 2024).

Self-reported monthly family income less than Rs 25,000 was significantly associated with LHL, which is in agreement with available evidence (Denuwara & Gunawardena, 2017; Rajah et al., 2019; Shehadeh-Sheeny et al., 2013; Svendsen et al., 2020). Among the correlates of health literacy, education is frequently identified as an important factor in global research (Gonçalves-Fernández & Pino-Juste, 2025; Joveini et al., 2019; McClintock et al., 2017; Yiğitalp et al., 2021). Despite this, education was not significantly associated with LHL in the present study. Almost 90% (88.9%) of the study sample are educated at least up to grade 9, and Sri Lanka is a country that has a literacy rate above 90% (Department of Census and Statistics, Sri Lanka, 2025a). When overall education levels and coverage are high, they may not play a significant role in differentiating health literacy levels in that community. Similarly, several studies conducted in Asian countries, including Sri Lanka, have reported comparable results (Duong et al., 2015; Kayupova et al., 2017; Wijesinghe et al., 2025).

The present study considered several behavioral factors when assessing associated factors of LHL. The empirical evidence suggests that a higher rate of smoking (Fawns-Ritchie et al., 2018; Stewart et al., 2013) and alcohol consumption (Zanobini et al., 2024) are significantly associated with LHL. In contrast, the present study did not demonstrate such an association with smoking or alcohol consumption. The possibility of underestimation of these conditions due to stigma while self-reporting cannot be excluded. Whereas betel chewing may be better estimated because it is attached to culture in Sri Lanka and has less stigma (Somatunga et al., 2012). Notably, betel chewing demonstrated a significant association with LHL in the present study. A study conducted in Italy among male immigrants from the Indian subcontinent has reported a similar association between LHL and betel chewing (Petti & Warnakulasuriya, 2018). When considering diet-related factors, people with LHL were more likely to report adding salt frequently when cooking rice, which is one of the contributing factors for high salt consumption in Sri Lanka (Jayatilleke et al., 2020; Jayatissa et al., 2021). However, a systematic review on the relationship of health literacy and salt intake has shown mixed and inconsistent findings (Mohd Isa et al., 2021). Physical inactivity is a well-established risk factor for many adverse health outcomes (Ding et al., 2025). Our analysis revealed that individuals with LHL reported low physical activity levels, which is consistent with several other studies

(Buja et al., 2020; Lim et al., 2021). However, due to the cross-sectional design of our study, the direction of this association cannot be established.

Individuals with LHL reported lower participation in the health screening programs. Health screening services obtained from both the government and the private sector were considered in this assessment. Yet, the impact of underreporting linked with social desirability bias and recall bias cannot be fully excluded due to the nature of self-reported information (Althubaiti, 2016). On the other hand, this association should be interpreted cautiously, as cross-sectional data cannot be used to infer causality. This finding is compatible with studies conducted by Baccolini et al. (2022) and Poon et al. (2023). The prevalence of self-reported unmet healthcare needs was significantly associated with LHL. Similarly, Levy and Janke (2016) have reported that people with LHL reported unmet healthcare needs, even if they wanted to. However, the temporal relationship of this finding cannot be established.

Having health insurance was inversely associated with LHL among participants. This association may reflect the underlying socioeconomic or occupational factors, though its causality cannot be determined. A study conducted in the USA has reported that people with limited health literacy are more likely to be uninsured (Sentell, 2012). However, the healthcare systems in the two countries are less comparable. On the other hand, one in five (20.9%) participants in the study had the option of having their medical bills covered through their workplace, and they were more likely to have LHL, which is difficult to explain with available evidence.

Poor self-reported health status was significantly associated with LHL, which is compatible with the previous studies (Chang, 2011; Protheroe et al., 2017). However, the self-reported prevalence of common NCDs was not significantly associated with LHL in this study. This result contradicts the published literature, which reported a significant association between LHL and NCDs (Khatiwada et al., 2022; Rahimi et al., 2024; Tajdar et al., 2021). One possible explanation for the above would be that the individuals with LHL might not have revealed their health conditions due to stigma and related factors. This remains theoretical and cannot be confirmed within the limitations of a cross-sectional study design. Emerging evidence suggests that patients with chronic NCDs tend to conceal their condition due to the stigma associated with these diseases (Akyirem & Ekpor, 2024; Rai et al., 2020). Furthermore, our sample size may not be sufficient to include an adequate number of participants with some NCDs to provide adequate statistical power. Hence, conclusions must be drawn with caution.

Policy and practice implications

The high prevalence of limited health literacy identified in this study underscores the urgent need for targeted interventions to improve health literacy among adults. Despite the country's high general literacy rate, the findings suggest that a substantial proportion of the population experiences difficulties in accessing, understanding, appraising, and applying health information to make informed decisions and take appropriate actions regarding their health. The association of LHL with low household income indicates that certain population groups are disproportionately affected, highlighting the need for policies that address social and economic inequalities. The associations observed between LHL and behavioral factors further emphasize the need for culturally sensitive and innovative health communication strategies. Lower participation in health screening programs and high self-reported unmet need among individuals with LHL indicate potential gaps in health navigation systems and community awareness. The national-level health screening programs such as The Well Woman program, Health Living Centers, and the oral cancer screening program may need to revise their strategies to incorporate more health literacy-related concepts. Improving health navigation, using clearer, more supportive signage, and developing health education materials in simple, plain language may address these barriers. Integrating health literacy training into routine capacity building programs may help bridge gaps in understanding and improve patient engagement. In conclusion, health literacy should be considered in the development of policies and programs across both health and non-health sectors to promote equitable access to health information and services.

Strengths and Limitations

One strength of this study is the use of a representative sample from the Kalutara district, which included divisional secretariats representing the population of all three sectors - urban, rural and estate. The present study used a validated, globally accepted tool to measure health literacy, enabling cross-country comparisons. Conversely, one limitation of this study is the use of multiple-choice questions to capture associated factors, which, by nature, limit the context of the answers. The inability to establish causality due to the nature of a cross-sectional study design is a limitation of our study. Furthermore, several

associated factors in this study, which were self-reported, could lead to social desirability and recall bias, particularly for behaviors that carry stigma, which may have led to under-reporting and potentially attenuated some associations. Although the sample was representative of the Kalutara district and urban, rural and estate sectors, the findings may not be fully generalizable to the entire Sri Lankan population. The tool was originally developed in Europe, and it has been used widely in Asia lately. All the items of the tool are applied to the local context. Nevertheless, it would have been better if it included some items related to traditional beliefs and practices related to health in the local context, because a considerable proportion of people follow those practices for their health needs. Therefore, future research is warranted to capture these aspects related to health literacy.

Conclusion

Despite Sri Lanka's high literacy rate, health literacy remains low, requiring urgent action. Furthermore, the identified associated factors of this study indicate the possible links between health literacy and key public health issues in Sri Lanka. Although the causality of these associations cannot be established due to the study design, our findings necessitate further exploration and the inclusion of health literacy concepts in public health interventions that focus on promoting physical activity, improving health screening coverage, reducing salt consumption, and discouraging betel chewing.

Author Contributions:

SW and SS conceptualized and developed the initial protocol. SW, US, and SS reviewed and developed the detailed protocol and data collection instruments. SW handled the data collection, entering, cleaning, and analysis process. US and SS reviewed and supervised each step of this process. SW, US, and SS developed and edited the manuscript, and all authors have seen and approved the final text.

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Institutional Review Board Statement

The Authors followed the principles recommended by the Declaration of Helsinki for medical research involving human subjects. Ethics approval was obtained from the Ethics Review Committee of the National Institute of Health Sciences (NIHS), Kalutara, Sri Lanka (NIHS/ERC/18/09R).

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Competing interests

The authors declare that no competing interests.

Appendix

Appendix A: Detailed item-level factor loadings for the three-factor structure of the Sinhala version of HLS-EU-Q47

Appendix B: Variables used in the “associated factors of the health literacy questionnaire”

Appendix C: Basic characteristics of the study sample: Validation Study

Appendix D: Convergent validity and discriminant validity

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