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Oral Health Literacy and Its Associated Factors of Primary School Students in Chiang Rai, Thailand

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Abstract

Objectives: To explore the level of oral health literacy (OHL) and identify factors related to the OHL of primary school students in Muang District, Chiang Rai Province, Thailand.

Methods: A cross-sectional study was conducted from May to September 2022, involving 351 Grade 6 students aged 11-12 years and their parents from 13 schools. Participants were selected using quota random sampling. Data were collected through questionnaires, with independent variables categorized according to Sørensen's classification: personal factors, situational factors, and societal and environmental factors. Additionally, the Test of Functional Health Literacy in Dentistry for Primary School Children (P-TOFHLiD) was used to assess OHL. Data analysis was performed in three stages: descriptive statistics, bivariate analysis, and multilevel logistic regression analysis.

Results: 55.8% of the sample had adequate OHL. Multilevel logistic regression further revealed that individual-level factors were significant predictors of adequate OHL. Students with a GPA of 3.00 or higher OR=2.386, 95% CI: 1.368-5.882), parental income (OR 2.233, 95% CI: 1.244-4.008), and participation in academic clubs (OR=3.409, 95% CI: 1.139-10.206) were associated with adequate OHL. School-level factors did not show a statistically significant relationship with OHL.

Conclusions: The findings highlight the impact of academic achievement, family socio-economic status, and learning environments on students' OHL. These insights can guide policymakers in designing targeted school-based OHL programs and inclusive, skill-based communication strategies for diverse student populations.

Keywords: adolescence, factors, oral health literacy, student

Introduction

Health literacy developed through effective education, empowers people to use health information for informed choices and basic health maintenance. Supporting public policies and environmental changes further enhances health literacy and encourages healthier behaviors. Health literacy is crucial for improving individual and community health outcomes and reducing disparities, empowering people to manage their health effectively.[1,2]

"Oral health" is a critical component of overall well-being. Common risk factors for oral diseases, like excessive sugar intake, also contribute to chronic non-communicable diseases (NCDs), which are a major health concern 85% of 12-year-old Thai children face daily disruptions from oral health issues, with 36% experiencing moderate to severe problems. Dental caries were identified as the most impactful in terms of size and severity.[3] Despite over two decades of oral health promotion activities by the Department of Health, Ministry of Public Health Thailand since 1998[4], tooth decay continues to be the main issue impacting Thai students' quality of life.

Sørensen's classification is a model developed through a systematic review of the literature that presents a comprehensive conceptual framework for understanding health literacy. It outlines the key processes of health literacy–accessing, understanding, evaluating, and applying health information across different stages of life. The framework enables a nuanced analysis of an individual's ability to manage their own health and classifies the determinants of health literacy into three levels: Personal factors, Situational factors, and Societal and environmental factors.[5]

Most oral health literacy (OHL) studies have focused on the elderly, adults, or parents, with limited research on elementary school children.[6] This is defined as "simply as the ability to understand health information and to understand that actions taken in youth affect health later in life, combined with the ability to access valid health information."[7] A 2020 study found that 12-year-olds with lower OHL are twice as likely to develop caries lesions compared to their peers with higher literacy levels.[8]

School-age children are at a crucial developmental stage, forming their discipline, personality, and behavior while also learning a key self-care skill.[9] Research on health literacy, particularly OHL among elementary school students in Thailand, is limited. This study aims to assess OHL and identify influencing factors, with the goal of improving oral health and quality of life for primary school children. The aim of this study was to identify the factors impacting OHL and devise the research framework based on the classification provided by Sorensen (2012).[5]

Materials and Methods

This study was reviewed by the Ethics Review Board in Human Research. Faculty of Dentistry, Chiang Mai University No. 23/2565. This cross-sectional study hypothesized that certain factors influence OHL by categorizing the independent variables into three levels, in accordance with Sørensen's classification.[5] which classifies the determinants of health literacy into three levels:

1. **Personal factors:** age[5], gender[5], ethnicity[5], income[8,10], cultural background[11], Sickness experience and use of health care system services[5,12], general knowledge (Grade or GPA)[5,13]

2. **Situational factors:** parental gender[14], parental economic status[8], parental education level[5,15-17], friend and teacher[14], use of media[18]

3. **Societal and environmental factors:** culture and language[5,11], environmental and political policy[5,19,20]

The study included sixth-grade students from public, private, and municipal schools in Mueang District, Chiang Rai Province, during the 2022 academic year. The required sample size was calculated using the Krejcie and Morgan formula[21] with known population size : $n=X^2Np(1-p) / [e^2(N-1) + X^2p(1-p)]$, when N=2,988, $X^2=3.841$ (df=1, 95% confidence level), $p=0.5$, and e=0.05. The calculation resulted in a required sample size of 341 participants. Quota random sampling was employed to ensure proportional representation across different school types.

The sampling process was conducted in two stages. First, schools were categorized by type–public, private, and municipal–and by the number of enrolled students. They were then further stratified by size: extra-large, large, medium, and small. Schools were randomly selected within each stratum, proportional to student enrollment. As a result, the final sample included 1 extra-large public school, 1 large public school, 4 medium-sized public schools, 4 small public schools, 1 extra-large private school, 1 small private school, and 1 municipal school. Within the selected schools, sixth-grade students were then randomly chosen from classrooms to participate in

the study. The inclusion criteria specified students who were currently enrolled in the sixth grade during the 2022 academic year, attended public, private, or municipal schools in Muang District, Chiang Rai Province, and were willing to participate, along with parental consent. Schools without sixth-grade students were excluded from the study.

A three-part questionnaire was used for data collection, with Part 1 focusing on student demographics like gender, age, income, GPA, cultural background, language skills, illness history, and healthcare use. The questionnaires, completed by students, were validated for content by three experts (IOC=0.98).

Part 2 of the questionnaire covered the demographic details of participants' parents, including gender, socioeconomic status, and education level. Parents completed this section, and its content validity was confirmed by three experts (IOC=1.0).

Part 3 used the Test of Functional Health Literacy in Dentistry for Primary School Children (P-TOFHLiD) to evaluate students' basic OHL. The test is a specialized assessment tool developed by Thai dentists to evaluate OHL among school-aged children. Targeting students aged 11-14 years, the test is designed to mirror standard school-based assessments, making it both familiar and accessible to its intended audience. Its primary aim is to measure functional, or basic OHL.[22]

The P-TOFHLiD employs a fluid cognitive format that challenges students to apply a combination of existing skills to solve novel or unfamiliar problems. It assesses their ability to comprehend oral health-related texts, identify key messages, and select appropriate responses. The test covers four core topics: (1) knowledge of oral organs, (2) knowledge of dental caries, (3) knowledge of oral health care, and (4) foods contributing to tooth decay. It consists of 26 items, with a total possible score of 26 points. The tool demonstrates good internal consistency, as indicated by a Cronbach's alpha coefficient of 0.808. A score of 21 or higher is considered indicative of adequate OHL, with reported sensitivity and specificity values of 0.649 and 0.587, respectively.[22] This instrument has undergone a rigorous validation process and has been tested with children in urban, semi-urban, and semi-rural settings–contexts that reflect the demographic characteristics of the current study population. In addition to its diagnostic capabilities, the tool effectively classifies OHL levels, supporting the aims of this research. Notably, it was used in the 2020 *School Oral Health Promotion Program Evaluation Research Project* conducted by the Dental Health Office, Department of Health, Ministry of Public Health, which assessed students in Grades 5 and 6 across 12 health service centers.[23] Consequently, the results obtained from sixth-grade students in Muang District, Chiang Rai Province, can be reliably compared with existing national data collected using the same instrument.

Statistical analysis

The data collected through self-administered questionnaires were analyzed using IBM SPSS Statistics, Version 26.0. The analysis was conducted in three main stages as follows:

1. Descriptive statistics

Descriptive statistics including frequency, percentage, mean, and standard deviation were used to describe the general characteristics of the participants. These included gender, age, ethnicity, type of school, household income, parental education, and scores of OHL, measured using the P-TOFHLiD tool.

2. Bivariate analysis

The Chi-square test was employed to examine the initial associations between each independent variable and the level of OHL, categorized as either adequate or inadequate. A significance level of $p<0.05$ was used as the criterion for statistical significance.

3. Multilevel logistic regression analysis

To better assess the relationship between the independent variables and OHL within the hierarchical structure of the data, a multilevel logistic regression model was employed. Variables found to be significantly associated with OHL in the bivariate analysis (Chi-square test) were included in the multilevel model. The model was structured across two levels:

Level 1 (Individual level): Included personal variables such as student gender, grade point average (GPA), history of dental check-ups within the past year, household income, and parental education level.

Level 2 (School level): Included contextual variables such as school location and type of school affiliation.

The final results were reported as Odd Ratios (OR) with 95% Confidence Intervals (95% CI) to indicate the strength and direction of association between the indepen-

dent variables and the level of OHL.

Results

Table 1 shows that the sample had a nearly equal gender distribution, with females at 50.7% and males at 49.3%. Most participants were 11-12 years old (92.6%), and 91.6% were Thai. Among parents, 62.5% were female. Parents are predominantly split between below-high school education (38.1%) and a bachelor's degree or higher (39.1%). Nearly half of the parents are aged 40-49 years (46.5%), and Nearly half of the parents are involved in personal business or freelance work (49.8%), while 33.4% are employed as government or company employees. Most students attend public schools (61.8%), with smaller numbers from private schools (17.4%) and municipal schools (20.8%). Five schools located in urban areas accounted for a total of 207 students (51%), while eight schools in rural areas comprised 144 students (49%).

Table 2 shows OHL scores for students from different school types, divided into four parts: 1) Knowledge of oral organs, 2) Knowledge of dental caries, 3) Knowledge of oral health care, and 4) Foods contributing to tooth decay. This table revealed that scores among the sample were either equal to or greater than 21 points, indicating that 196 individuals (55.8%) demonstrated adequate OHL, while 155 individuals (44.2%) exhibited inadequacy. The lowest total score observed within the sample group was 5 points, with the highest reaching 26 points, and the mean score was 20.2 points. Notably, the part foods contributing to tooth decay received the lowest average score of 3.5 points out of a potential 6 points, consistent with both the overall average total score and the average scores across different school types. When categorized by school type, the results of the health literacy assessment using the P-TOFHLiD tool revealed that municipal school students had the highest average score (22.2±2.6), followed by private school students (20.8±3.5), and public-school students (19.4±4.0). This trend was consistent across all four parts of OHL, with municipal school students scoring the highest in all part, while public school students consistently had the lowest average scores.

Table 3 identifies factors that were significantly associated with OHL. Among the **personal factors,** significant variables included student gender, student GPA, and having had a dental check-up within the past year. **Situational factors** that showed significant associations included parental gender, parental education level, parental monthly income, receipt of health knowledge through two-way communication, and participation in academic clubs. Additionally, the only **societal and environmental factor** found to be significantly associated with OHL was the use of the Thai language in everyday communication ($p<0.05$).

Table 4 presents the results of the multilevel logistic regression analysis, conducted using a fixed effects model, to identify factors associated with OHL among Grade 6 students. The analysis was conducted in two models. **Model 1** included both school-level and individual-level variables, while **Model 2** examined only individual-level variables.

Model 1: Combined school- and individual-level analysis

The results indicated that, after controlling for other factors, only individual-level variables were significantly associated with OHL. Notably, students with a GPA of 3.00 or higher were three times more likely to demonstrate adequate OHL compared to those with lower GPAs ($p=0.007$, OR=3.082, 95% CI=1.369-6.941), highlighting a positive association between academic performance and OHL.

At the school level, variables including school type (public, private, or municipal) and location (urban or rural) were not significantly associated with students' OHL ($p>0.05$).

Model 2: Individual-level analysis

When school-level variables were excluded, several individual-level factors emerged as statistically significant predictors of OHL. GPA ≥3.00 remained a significant factor ($p=0.006$, OR=2.386, 95% CI=1.368-5.882), Parental income above Thai national average was significantly associated with higher OHL ($p=0.008$, OR=2.233, 95% CI=1.244-4.008). Participation in academic clubs was also a significant predictor ($p=0.029$, OR=3.409, 95% CI=1.139-10.206).

Discussion

The primary objective of this study was to assess the level of OHL among Grade 6 students in Mueang District, Chiang Rai Province, and to identify the factors

Table 1: Characteristics of the participants (n=351).

Characteristics		n	%
Student gender	Male	173	49.3
	Female	178	50.7
Student age	9-10 years	13	3.7
	11-12 years	324	92.6
	13-16 years	13	3.7
Student ethnicity	Thai	318	91.6
	Other	29	8.4
Parental gender	Male	131	37.5
	Female	218	62.5
Parental age	< 40 years	98	34.5
	40-49 years	132	46.5
	50 years and above	54	19.0
Parental education level	Below high school	131	38.1
	High school/Vocational certificate	53	15.5
	Diploma/High vocational certificate	25	7.3
	Bachelor's Degree and Above	134	39.1
Parental occupation	Government/Company employee	114	33.4
	Personal business/Freelancer	170	49.8
	Agriculture/Not working	57	16.8
Type of school	Public schools (10 schools)	217	61.8
	Private schools (2 schools)	61	17.4
	Municipal school (1 school)	73	20.8
Location of school	Urban (5 schools)	207	59.0
	Rural (8 schools)	144	41.0

Table 2: Oral health literacy scores (P-TOFHLiD) classified by school affiliation.

P-TOFHLiD Proficiency Area	Score	Public school (n=217)	Private school (n=61)	Municipality school (n=73)	Overall (n=351)
Part 1: Knowledge of oral organs (0-7)	Min	1	1	4	1
	Max	7	7	7	7
	Mean (SD)	6.3 (1.2)	6.6 (1.0)	6.8 (0.5)	6.5 (1.1)
Part 2: Knowledge of dental caries (0-6)	Min	0	1	3	0
	Max	6	6	6	6
	Mean (SD)	4.7 (1.3)	5.0 (1.1)	5.4 (0.7)	4.9 (1.2)
Part 3: Knowledge of oral health care (0-7)	Min	0	1	3	0
	Max	7	7	7	7
	Mean (SD)	5.1 (1.5)	5.7 (1.4)	5.9 (1.1)	5.4 (1.4)
Part 4: Foods contributing to tooth decay (6)	Min	0	0	1	0
	Max	6	6	6	6
	Mean (SD)	3.3 (1.4)	3.4 (1.4)	4.0 (1.4)	3.5 (1.4)
Total score (0-26)	Min	5	6	12	5
	Max	26	26	26	26
	Mean (SD)	19.4 (4.0)	20.8 (3.5)	22.2 (2.6)	20.2 (3.8)
Level of Oral Health Literacy					
Adequate: N (%)		101 (46.5%)	41 (67.2%)	54 (74.0%)	196 (55.8%)
Inadequate: N (%)		116 (53.5%)	20 (32.8%)	19 (26.0%)	155 (44.2%)

Table 3: Chi-Square analysis of factors related to oral health literacy levels.

Factors		Categories	Inadequate OHL (n) (%)	Adequate OHL (n) (%)	Total (n) (%)	*p*-value
Personal	Student gender	Male	93 (53.8%)	80 (46.2)	173 (49.3%)	<0.001**
		Female	62 (34.8%)	116 (65.2%)	178 (50.7%)	
	Student age	9–10 years	7 (53.8%)	6 (46.2%)	13 (3.7%)	0.123
		11-12 years	140 (43.2%)	184 (56.8%)	190 (92.3)	
		13 years or more	8 (57.1%)	6 (42.9%)	134 (4.0%)	
	Student ethnicity	Thai	135 (42.5%)	183 (57.5%)	318 (91.6%)	0.093
		Other	17 (58.6%)	12 (41.4%)	29 (8.4%)	
	GPA	≤ 2.99	39 (66.1%)	20 (33.9%)	50 (19.7%)	<0.001**
		≥ 3.00	80 (33.3%)	160 (66.7%)	248 (80.3%)	
	Had toothache experience	Never	85 (48.9%)	89 (51.1%)	174 (49.9%)	0.076
		Ever	69 (39.4%)	106 (60.6%)	175 (50.1%)	
	Had check-up with a dentist in the past year	Never	28 (60.9%)	18 (39.1%)	46 (13.1%)	0.010*
		Ever	127 (41.6%)	178 (58.4%)	305 (86.9%)	
Situational	Parental gender	Male	68 (51.9%)	63 (48.1%)	131 (37.5%)	0.020*
		Female	85 (39%)	133 (61%)	218 (62.5)	
	Parental education	≤ High School	85 (51.8%)	79 (48.2%)	112 (47.8%)	0.004*
		≥ Bachelor's degree	65 (36.3%)	114 (63.7%)	231 (52.2%)	
	Parent occupation	Government officers	25 (36.2%)	44 (63.8%)	69 (19.7%)	0.139
		Others	130 (46.1%)	152 (53.9%)	282 (80.3%)	
	Parental monthly income ($\bar{x}$ Thai people = 20,723THB)	< Average	106 (52.7%)	95 (47.3%)	201 (64.6%)	<0.001**
		≥ Average	31 (28.2%)	79 (71.8%)	110 (35.4%)	
	Type of household living arrangement	Father and/or mother	23 (51.1%)	22 (48.9%)	45 (12.8%)	0.315
		Other relatives	132 (43.1%)	174 (56.9%)	306 (87.2%)	
	Health knowledge resources	Online/offline Media	76 (51.4%)	72 (48.6%)	148 (42.2%)	0.021*
		2-Way communication	79 (38.9%)	124 (61.1%)	203 (57.8%)	
	Type of club members	Academic	5 (17.2%)	24 (82.8%)	29 (8.3%)	0.002*
		Others (sports, dance)	150 (46.6%)	172 (53.4%)	322 (91.7%)	
Societal and environmental	Had health promotion activities in school	Yes	116 (42%)	160 (58%)	276 (78.6%)	0.123
		No	39 (52%)	36 (48%)	75 (21.4%)	
	Language use in everyday communication	Thai	120 (40.3%)	178 (59.7%)	298 (84.9%)	<0.001**
		Other (Ethnic & foreign languages)	35 (66%)	18 (34%)	53 (15.1%)	

*Significant $p<0.05$ **Significant $p<0.001$

associated with their health literacy. A total of 351 students participated in the study. The results showed that 56% of the students demonstrated adequate OHL, while 44% were classified as having inadequate literacy. The mean OHL score for the entire sample was 20.2, which is lower than the average score of 21.6 reported in a previous study conducted among Grade 5 and 6 students across 12 health regions in Thailand. That study also found a higher proportion, 71.4% of students with adequate oral health literacy, using the same assessment tool, the P-TOFHLiD.[4]

The analysis showed that students' OHL scored highest in knowledge about oral organs, followed by dental caries, oral health care, and lowest in knowledge about foods that cause dental caries. Notably, the domain of knowledge about foods contributing to tooth decay consistently yielded the lowest scores among students from public, private, and municipal schools. This trend aligns with a previous study.[22] These findings highlight the need for OHL programs to address all knowledge domains, with particular emphasis on improving students' understanding of the dietary factors affecting oral health. Furthermore, additional research is warranted to investigate students' dietary behaviors related to cariogenic foods in order to

Table 4: Fixed effects from multilevel logistic regression on factors associated with oral health literacy.

Factors	Model 1			Model 2		
	OR	OR (95% CI)	*p*-value	OR	OR (95% CI)	*p*-value
Intercept	0.067	0.010-0.463	0.006	0.060	0.018-0.201	<0.001
School level						
Urban school	1.030	0.370-2.866	0.955	-	-	-
Rural school (ref)	-	-	-	-	-	-
Public school	1.468	0.423-5.099	0.544	-	-	-
Private school	0.785	0.207-2.985	0.722	-	-	-
Municipality school(ref)	-	-	-	-	-	-
Individual level						
Student gender (Female)	1.372	0.772-2.439	0.280	1.309	0.746-2.299	0.344
Student's GPA (3.00 or above)	3.082	1.369-6.941	0.007**	2.386	1.368-5.882	0.006**
Had check-up with a dentist in the past one-year (Yes)	1.981	0.865-4.534	0.105	2.054	0.908-4.644	0.083
Parental gender (Female)	1.586	0.884-2.847	0.121	1.542	0.870-2.730	0.136
Parental educational level (≥ High school)	1.064	0.605-1.941	0.502	1.090	0.619-1.921	0.762
Parental income (> Thai average)	1.876	0.955-3.683	0.068	2.233	1.24 4-4.008	0.008**
Health knowledge resources (2-way communication)	1.319	0.756-2.300	0.328	1.353	0.782-2.342	0.276
Type of club members (Academic)	2.648	0.836-8.391	0.098	3.409	1.139-10.206	0.029*
Language use (Thai)	1.806	0.782-4.170	0.166	1.982	0.891-4.408	0.93

*Significant $p<0.05$ **Significant $p<0.001$

better understand the link between their knowledge in this area and actual consumption practices.

According to the factors associated with OHL, the findings showed that personal factors, especially having a Grade Point Average (GPA) of 3.00 or higher, were significantly associated with higher OHL scores. This result is consistent with previous studies.[12,13,24] In this study, all participants were Grade 6 students with the same level of formal education; therefore, academic performance, as reflected by GPA, serves as a key indicator of individual educational achievement, which may influence health literacy. Students with stronger academic performance are more likely to effectively access, comprehend, and apply health-related information. Female students demonstrated higher levels of OHL, consistent with the broader observation that females often exhibit greater interest in health-related matters compared to males.[25-27] However, after controlling for other variables in the multilevel analysis, this association was not statistically significant. This may be due to the developmental stage of the sample population, as students at this age typically show limited interest in health issues. Additionally, variations in parenting styles may also contribute to these findings.[28] Furthermore, variables related to illness experience and health service utilization, particularly dental service use, did not show a statistically significant association with OHL. This finding aligns with previous studies conducted among older adults in both the United States and Thailand, which similarly concluded that dental service use was not a significant predictor of OHL.[15,29] A likely explanation lies in the accessibility and comprehensiveness of Thailand's public health system, which routinely provides dental services and oral health education through school-based programs.[30] These services ensure that students across different literacy levels receive equitable access to oral health care and information. Therefore, differences in health literacy appear to be influenced primarily by personal factors, especially educatiaonal attainment.

Among the situational factors, Parental gender, education level, and income were initially found to be significantly associated with students' oral health literacy (OHL). However, upon further analysis, parental income emerged as the only direct and significant predictor. Families with higher income levels are more likely to provide enriched learning environments and resources, thereby increasing children's access to information,

educational materials, and supportive settings that facilitate the development of adequate OHL. Students whose parents had higher income levels and those who participated in academic clubs were 1.8 times and 2.6 times more likely, respectively, to exhibit adequate OHL. Parents with higher income levels can enhance their children's health literacy by providing access to enriched learning environments and educational resources that foster critical thinking and communication skills. Additionally, higher socioeconomic status is associated with better access to healthcare services and health education, which supports children's ability to understand and apply health information effectively. This relationship has been supported by Manganello (2008), who identified parental income as a significant predictor of adolescent health literacy, particularly due to its influence on access to health information and communication with healthcare providers.[20] Participation in academic clubs promotes reading, inquiry, and critical thinking skills that improve students' capacity to evaluate the accuracy of health information.[31] This finding aligns with Bandura's social learning theory, which emphasizes the role of enriched environments in developing knowledge and skills.[32] Health-related communication within these settings further contributes to improved OHL.[33] Consistent with prior research, structured extracurricular activities have been shown to support cognitive and social development, leading to better health-related decision-making.[34] Therefore, academic clubs play a vital role in equipping students with the competencies required to make informed health decisions and to develop overall health literacy.

However, the number of academic club participants in this study was relatively small, likely due to the limited availability of such clubs in some sampled schools. Academic clubs are typically offered only in private schools, municipal schools, or large urban public schools, reflecting broader social inequalities that influence students' opportunities for developing health literacy. Social and environmental factors were not found to be significantly associated with students' OHL in this study. One possible explanation is that, despite growing global interest and an increasing number of studies on health literacy, relatively few have focused on government policy implementation and the evaluation of health literacy strategies.[35] This highlights the need for further research to develop concrete and actionable policies aimed at promoting OHL at the systemic level.

In the multilevel analysis, individual-level factors, namely GPA, parental income, and participation in academic clubs, emerged as the most prominent determinants of OHL among students, whereas school-level factors did not demonstrate statistically significant associations. This finding may reflect systemic limitations within the Thai context, where national strategies to promote health literacy remain underdeveloped and lack clear direction, particularly in areas such as policy implementation, school-based initiatives, learning environments, and standardized national health promotion programs. These limitations may result in an inadequate response to the diverse needs of specific population groups.

Moreover, the current level of social infrastructure and support systems appears insufficient to effectively foster OHL among students. Future efforts should prioritize the development of high-quality health communication strategies that are inclusive and accessible to diverse populations. This includes strengthening the professional and communication competencies of frontline health workers and empowering the public with practical skills to access, understand, critically evaluate, and apply health information. These capabilities are essential for enhancing functional health literacy and supporting informed health decision-making in the long term.[36]

A key strength of this study is the use of the validated P-TOFHLiD instrument, specifically designed for Thai primary school children, ensuring contextual relevance and measurement reliability. The application of Sorensen's health literacy framework allowed for a multidimensional analysis of personal, situational, and societal factors. A diverse sample, multivariate and multi-level analysis further enhanced the robustness and applicability of the findings for improving OHL in adolescents. However, the cross-sectional design limits causal inferences. The study's focus on a single district may affect generalizability, and reliance on self-reported data introduces potential bias. Additionally, while predictors of OHL were identified, actual behavioral outcomes and broader sociocultural influences warrant further exploration.

Conclusions

This study aimed to identify the factors influencing OHL among sixth-grade students in Mueang District,

Chiang Rai Province. The findings revealed variations in literacy levels associated with academic performance (GPA), parental income, and participation in academic clubs. These results have implications for the development of more effective oral health promotion strategies targeting school-aged children. Accordingly, education policymakers and public health planners in other regions may apply these insights to design targeted oral health promotion programs within primary schools. In particular, integrating oral health education into the core curriculum and supporting extracurricular academic activities may help improve students' functional health literacy nationwide.

However, regional differences in language, culture, and school resources may limit the generalizability of these findings. Therefore, further research is recommended across diverse Thai populations to validate and expand upon these results.

List of Abbreviations:

OHL: Oral health literacy

GPA: Grade Point Average

IOC: The Index of Item-Objective Congruence

P-TOFHLiD: Test of Functional of Health Literacy in Dentistry for Primary school children

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Conflict of Interest

The authors declare no conflict of interest.

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Statement of Ethics

This study was reviewed by the Ethics Review Board in Human Research. Faculty of Dentistry Chiang Mai University (No. 23/2565) on April 29, 2022. Study participants have given their written informed consent.

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