

Original Research Article

Oral Health Literacy of Adolescents of Tamil Nadu, India

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Abstract: In India, prevalence of dental caries is increasing due to changes in the country's economy and diet. Oral health education and oral health services are not well established and the Government of India is currently in the process of improving oral health services. Oral health promotion with an oral health literacy approach is an economical way for developing countries like India to achieve better oral health outcomes. The study aim was to measure the oral health literacy of the adolescent population of Tamil Nadu, a southern state of India. The aim was addressed by a quantitative cross-sectional study measuring the oral health literacy using a self-administered survey in 974 adolescent school students (12-15 year-olds) from both rural and urban areas of Tamil Nadu, India. The descriptive analyses, chi-square tests and multiple linear regression analysis were performed using SPSS software. The oral health literacy survey indicated that only 8.1% of adolescent participants had good oral health literacy skills to prevent and manage dental caries and about 35% of the participants had poor oral health literacy skills to prevent dental caries. Multiple regression analyses indicated factors such as gender, mother's education, type of school attended and Caste were significant predictors of oral health literacy. Scheduled Caste and Tribe populations attending public schools in rural areas were identified as the most vulnerable populations to be affected by dental caries. Oral health policies and oral health literacy intervention should be targeted to these adolescent populations in the Tamil Nadu region.

Keywords: Oral health literacy, Health literacy, oral health education, Tamil Nadu, Oral health promotion, Adolescent's oral health, Dental caries, quantitative study

INTRODUCTION

The Australian Bureau of investigation defines health literacy as "The knowledge and skills required to understand and use information relating to health issues such as drugs and alcohol, disease prevention and treatment, safety and accident prevention, first aid, emergencies, and staying healthy"(1p.5). The same definition applies even to oral health issues. Improved oral health literacy is essentially an outcome of good oral health promotion. Nutbeam commenting on the history of health education programmes noted that the health promotion programmes of the 1970 s were found to be effective only among an educated and economically advantaged population [2]. Nutbeam indicated that traditional health promotion techniques did not achieve the expected outcome at the individual level. Recent epidemiological analyses undertaken in the most developed countries indicated that health status is not influenced by individual characteristics and behavioural patterns but determined by social, environmental and economic circumstances [2]. In developed countries, oral health literacy is now

considered as a new determinant for deciding oral health outcomes and to achieve outcomes at the individual level [3].

In India, the prevalence of dental caries and other oral health issues are increasing while the Indian population is adopting a westernised diet with little awareness of how to prevent dental caries and gingivitis. The Indian Government is currently introducing policies to improve oral health outcomes of the Indian population. Health literacy based oral health promotion initiatives would be a better option for India rather than adopting other traditional oral health promotion techniques which had already failed to achieve changes which are sustainable over time in developed countries [2].

Oral health literacy could be best improved by a proper oral health promotion which starts in preschool years [4]. Oral health literacy education should ideally start at home and parents should play a major role in modifying a child's attitude and behaviour similarly to

how a child learns a language. But for developing countries such as India, the general language literacy rate is comparatively low and oral health awareness is considerably lower, hence it is harder for parents to influence and improve a child's oral health literacy. The current research measures the adolescents' ability to prevent dental caries by applying oral health literacy skills achieved in childhood. Currently, oral health services in India are very limited and are comprised primarily of private clinics with few public hospitals. There are no organised school dental services available to prevent dental caries and treat dental caries in the early stage of disease. The best way to prevent dental caries is by improving oral health literacy [5]. Even though a few Indian studies have reported adolescents' knowledge and attitudes regarding oral health [6], an oral health literacy perspective on oral health promotion is still a new concept in the Indian literature. In the current study, the oral health literacy of the Tamil Nadu adolescent population was measured by a cross-sectional quantitative study using a self-administered questionnaire.

METHODS AND METHODOLOGY

Ethical approvals for the study were received from the Human Ethics Committee, University of Canterbury, New Zealand and Institution Ethics committee, Sree Balaji Dental University, Tamil Nadu. After ethical approvals were received, the participants for this study were recruited from the state of Tamil Nadu in India. The school students were selected for the study if they were aged 12-15 years and attending private or public school located in rural and urban parts of Tamil Nadu. The urban school participants were selected from the Chennai city and rural participants from the Thanjavur district. The schools and the classrooms within each school were randomly selected. Four schools in the urban area and eight schools from the rural area gave permission to recruit participants.

Sample size was determined by power analysis using the formula $(n=Z^2P(1-p)/d^2)$, the level of confidence ($Z=1.96$; 95%), assumed prevalence ($P=0.5$) and precision ($d=0.05$). The estimated sample size was 392 and it was decided to recruit 400 participants from rural and urban areas separately to allow analyses to be undertaken at this level. The questionnaire was a self-administered survey which took less than ten minutes for students to complete. Informed consent was obtained through a signed consent form from both the parents and the participants. The survey was anonymous and a unique code number was given to each participant.

Oral health literacy is not just having an ability to read and write oral health related words. Oral health literacy is a having a set of skills to prevent and self-manage oral health diseases. Nutbeam noted that even if the concept of oral health literacy remains constant, different measurement tools will be required at different

ages and stages of life [7]. Hence, the level of oral health literacy expected in adolescence should be different from that expected in adults. Adolescents are expected to have a certain set of oral health literacy skills to prevent dental caries. The current study was intended to measure adolescents' oral health literacy with regards to dental caries and hence, the validated measuring tools such as REALD-30 [5], REALD-99 [8], TOFHLID [9] and OHLI [10] which measure adults' oral health literacy were not appropriate for the adolescent population. Because of this the authors developed a functional oral health literacy instrument which focuses specifically on oral health literacy skills expected among the Indian school adolescent population to prevent dental caries. As indicated by Nutbeam, health literacy is an outcome in the individual due to the impact of health promotion [7]. Therefore, the nature of health services available as well as other health promotion activities supported by Government policy has a pronounced impact on an individual's level of health literacy. This was taken into account while developing the questionnaire so that items were meaningful and relevant to Indian 12-15 year old school students.

Priston and Searle noted there are five domains in health literacy namely: health promotion, health protection, disease prevention, health care maintenance and system navigation [11]. Thus the questionnaire developed in the current study included items that related to: basic health knowledge that is expected to be known to prevent dental caries, comprehensive knowledge that is required to understand health care instructions, oral health behaviours and attitudes that the students are likely to have, and questions on self-management of oral health issues and towards seeking help when it is needed. The items used in the questionnaire were taken from a number of different questionnaires and the questionnaire that was developed was validated by pilot testing with 100 adolescents. The basic oral health knowledge items relevant to adolescence were taken from Ludke's oral health literacy questionnaire [12], attitude and behaviour questions and sociodemographic details were taken from the WHO's knowledge attitude and practice questionnaire for children [13, 14]. The new comprehensive questions were developed using the past oral health literacy questionnaire as a reference [12, 15]. The questionnaire had six parts with a total correct score of 50. A participant who scored 50 would have answered every question correctly. A participant who scored zero would have answered every question incorrectly.

The scoring schema is detailed in Table 1 with examples.

- Sociodemographic details: 6 Items (1-6), not scored;
- Basic oral health knowledge: 6 Items (7-12; Score 12)

- Oral health behaviour: 4 Items (13-16; Score 12)
- Self-management of diseases: 3 Items (17-19; Score 6)
- Oral health attitudes: 5 Items (20-25; Score 10)
- Comprehensive knowledge: 5 Items (26-30; Score 10)

The English questionnaire was forward translated to a Tamil version by a Tamil language specialist and the translated Tamil version was backward translated into English. The similarities between two versions of the English questionnaire were confirmed by the research team. The developed questionnaire was pilot tested to check the clarity of items and instructions, to find any frequently misunderstood questions and to ascertain the participants' opinions regarding the length of the questionnaire. The pilot questionnaire was designed with both Tamil and English languages to get feedback from students on both English and Tamil versions. The

binary response questions were modified into a Likert scale for the attitude component based on the pilot survey results. Abbreviations were added to the caste categories in the final version as some participants in the pilot survey did not understand the full form. The final questionnaire was printed in both English and Tamil format.

Calculation of scores: The scores for each individual item were scored based on the contribution of each component towards oral health literacy. Oral health knowledge and comprehension knowledge items were scored 2 for a correct answer and 0 for an incorrect answer. For behaviour and attitude questions scores were given for a correct answer as 2 and 1 for a partially correct answer (see Table 1). The responses which reflected a negative attitude for preventing dental decay were scored as 0 and neutral responses were scored as 1.

Table 1: Calculation of scores for five components of questionnaire with examples

1. Basic Oral Health Knowledge:					
• Six individual items scored 2 or 0					
Example: What is cavity?					
Answer	Incorrect answer	Correct answer	-	-	-
score	0	2	-	-	-
2. Oral Health Behaviour:					
• One individual item scored 3, 2, 1 or 0					
• Three items with 6 sub-items within each item which is scored 0.5 each					
Example: How often do you brush your teeth?					
Answer	Never	Once a week	2-6 times a week	Once a day	2 or more times a day
score	0	0	1	2	3
3. Self- Management of Dental caries:					
• Three individual items scored based on decayed score					
Example : Do you have tooth Decay?					
Answer	Decay Score	item score	-	-	-
Yes	> 1	2 (correct)	-	-	-
No	0	2 (correct)	-	-	-
Yes	0	0 (incorrect)	-	-	-
No	3 or more	0 (incorrect)	-	-	-
4. Oral health Attitude:					
• Five individual item scored 2, 1 or 0					
Example: Brushing our teeth two times a day is not important					
Answer	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
score	0	0	1	2	2
5. Comprehension Knowledge					
• Six individual items scored 2 or 0					
Example: Kumar has to spit the cotton after one hour					
Answer	Correct Answer	Incorrect Answer	-	-	-
score	2	0	-	-	-

The scoring for self-management questions differed from other items in the questionnaire. Before scoring the individual items in the self-management

component, the responses were compared with the "Decay" scores. A binary cut-off to reflect the distinction between poor and good oral health was

decided based on the mean decay value of the total sample in the current study which was 2.03. Hence, the number of decayed teeth of 3 and above was considered a measure of poor oral health status in our sample and the severity of dental caries was compared with the adolescent's opinion on their oral health status.

The quantitative data obtained from the study were analysed using the Statistical Package for Social Sciences (SPSS version 20). Psychometric analyses was undertaken to check the validity and reliability of the developed questionnaire using both pilot and final surveys and later descriptive and correlational statistical tests were applied using the data obtained in the final survey.

RESULTS

The Cronbach's alpha test of internal consistency is the usual test for categorical questions with Likert scale options to measure the internal consistency of a questionnaire. The binary Kuder-Richardson formula is the ideal test of internal consistency for the scale items with dichotomous values. The oral health knowledge and comprehensive health knowledge were measured using 'correct' or 'incorrect' responses. The responses for these items were dichotomised into '1' for the correct answer and '0' for the incorrect answer. Hence, the Kuder-Richardson test was applied to these scale items. The behaviour, attitude and self-management components of the study questionnaire had categorical responses and the reliability was tested using the Cronbach's alpha test. Face validity, the extent at which the questionnaire is subjectively viewed a good measure of the construct was ascertained by the experts in the fields of preventive dentistry, health literacy, public health and

oral health literacy. Content validity, which demonstrates whether the content of the questionnaire is relevant to the phenomenon under study, was established by incorporating the questions frequently used in previous studies for measuring oral health knowledge, attitude and behaviour in the dental public health surveys. Concurrent validity was tested by correlating the oral health literacy scores with categories of education level attained by parents of adolescents and also based on socioeconomic status and location of the school. It was hypothesized that adolescents with poor oral health literacy would have more dental decay, parents attained less education and belong to lower socioeconomic status. The differences in means using ANCOVA test, t-test and the Pearson correlation test indicated that oral health literacy scores were correlated with parents' education, adolescent's socio-economic status and their oral health status. The Cronbach's alpha test for the final survey was slightly reduced from 0.672 to 0.651 between the pilot and the final survey. The Cronbach's alpha was between 0.458 and 0.692 for the individual components (Table 2). The self-management component had a very low Cronbach's alpha value as only three items were included to measure the self-managing skills. The overall Cronbach's alpha score is close to 0.7 which demonstrated that the internal consistency reasonable for an adolescent population.

The final sample of participants (n=974) was higher than the proposed sample (n=800) because every student within selected classes participated in the survey as it was decided it would be unethical to exclude participants from the selected classes which also included an oral health examination in addition to completion of the questionnaire.

Table 2: Reliability Test

Item	Cronbach's alpha	Binary Kuder-Richardson
Pilot Test (complete questionnaire)	0.672	-
Final survey (complete questionnaire)	0.651	-
Basic Oral Health Knowledge	-	0.538
Behaviour	0.631	-
Attitude	0.512	-
Self-Management Skill	0.458	-
Comprehension Knowledge	-	0.692

The mean oral health literacy score (Table 3) is normally distributed with a mean score of 32.27 and the standard deviation is 5.27 (Range: 33.50). The mean score is almost equal to the median score (32.26), which are expected given the normal distribution of mean scores. The OHL mean score was slightly higher for female participants (32.36) compared to male participants (31.89) and the result was statistically significant. The adolescents who were 14 years of age had a higher score (32.37) compared to other younger age groups.

The mean OHL score for adolescents whose parents had university education was comparatively higher (34.50) than other educational achievement categories, for example, it was higher than the participants' scores who did not know their parents' education qualifications (30.5) and those who reported their parents' education level less than 8th standard had a lower score (31.00). The mean score for participants who reported not having a father or male guardian (30.87) was noticeably lower than for participants who reported do not have a mother or female guardian (32.12) living with them. This result suggests that the

mother's education level has a greater impact on an adolescent's oral health literacy.

The rural school participants (31.50) scored lower than urban school participants (32.70) and private school participants (32.96) scored higher than the public school participants (31.15).

The oral health literacy scores were divided into three categories based on the literature [5, 10], the difficulty of the questionnaire and scores needed to prevent and manage dental caries. The raw oral health literacy scores were categorised into poor (<30; n=342), moderate (31-40; n= 551) and good (41-50; n=81). This categorical understanding was needed to classify the population at risk in preventing dental decay based on oral health literacy.

Table 3: Total Oral Health Literacy Scores and Sociodemographic Variables

Category	Frequency	Oral health Literacy Total Score			
	N (%)	Mean	Standard deviation	Median	Range (0 – 50)
All	974 (100)	32.10	5.77	32.25	33.50
Gender					
Male	542 (55.6)	31.89	5.463	31.87	31.50
Female	432 (44.4)	32.36	6.13	32.62	33.50
Age					
12 years	23 (2.4)	31.17	4.749	31.50	16.75
13 years	224 (23.0)	31.96	5.92	32.25	29.50
14 years	529 (54.3)	32.37	5.82	32.50	33.00
15 years	198 (20.3)	31.65	5.54	31.50	32.75
Father's/Male Guardian's highest level of education					
8 th standard	258 (26.5)	30.45	5.19	30.50	29.25
10 th standard	228 (23.4)	31.81	5.25	31.87	28.25
12 th standard	108 (11.1)	32.02	5.44	32.00	27.25
University	274 (28.1)	34.55	5.79	34.75	29.00
No Father/guardian	32 (3.3)	30.29	6.22	31.50	28.00
Don't Know	74 (7.6)	30.57	6.47	31.12	27.25
Mother's/Female Guardian's highest level of education					
8 th standard	336 (34.5)	30.90	5.37	31.00	32.25
10 th standard	181 (18.6)	31.89	5.24	31.50	24.75
12 th standard	129 (13.2)	32.46	5.75	32.50	28.75
University	210 (21.6)	34.76	5.83	34.87	29.00
No Mother/Guardian	15 (1.5)	30.85	5.70	32.75	20.75
Don't Know	103 (10.6)	30.67	6.06	31.25	30.75
Community					
Forward Caste	60 (6.2)	34.85	6.22	34.75	26.50
Backward Caste	443 (45.5)	33.03	5.40	33.00	28.00
Most Backward	198 (20.3)	32.17	5.68	32.75	32.00
Scheduled Caste/Tribes	273 (28.0)	29.93	5.65	30.00	27.25
Geography and Type of school					
Rural School	516 (53.0)	31.50	5.57	32.00	29.75
Urban School	458 (47.0)	32.70	5.934	32.75	33.50
Private School	509(52.3)	32.96	6.039	33.25	30.50
Public School	465 (47.70)	31.15	5.31	31.50	31.75

Chi-square analysis was performed to examine the difference in the mean scores between the socio-demographic variables. The results (see Table 4) showed that categorical oral health literacy (Poor, Moderate and Good) has a significant association with all socio-demographic variables except for age group. A significant Chi-square value for their father's education

($X^2=80.003$; $p<0.001$); their mother's education level ($X^2=67.492$; $p<0.001$); and their community/caste ($X^2=63.766$; $p<0.001$) indicated that the level of oral health literacy is strongly associated with these socio-demographic variables. The percentage of participants categorised as having poor oral health literacy is higher for those attending a public school (38.9) compared to

those attending a private school (31.6). The result was statistically significant ($X^2 = 31.664$; $p < 0.001$). The percentage of participants categorised as having good

oral health literacy was higher for those attending an urban school and the results were statistically significant ($X^2 = 10.599$; $p < 0.001$).

Table 4: Cross-Tabulation of Oral Health Literacy Scores with Sociodemographic Variables

Category	Total	Oral Health Literacy			Chi-Square X^2 (significance)
	n	Poor	Moderate	Good	
Gender					
Male	542	205 (37.8)	301 (55.5)	36 (6.6)	6.906 (0.032)*
Female	432	137 (31.7)	250 (57.9)	45 (10.4)	
Adolescent age					
12 years	23	9 (39.1)	14 (60.9)	0	3.44 (0.751)
13 years	224	83(37.1)	121(54.0)	20 (8.9)	
14 years	529	178(33.6)	305(57.7)	46(8.7)	
15 years	198	72(36.4)	111(56.1)	15(7.6)	
Father's highest level of Education					
8 th standard	258	119 (46.1)	135 (52.3)	4 (1.6)	80.00 (0.00)**
10 th standard	228	80(35.1)	137 (60.1)	11 (4.8)	
12th standard	108	41(38.0)	58 (53.7)	9 (8.3)	
University	274	62(22.6)	160 (58.4)	52 (19.0)	
No Father/Guardian	32	12(37.5)	19 (59.4)	1 (3.1)	
Don't Know	72	28(37.8)	42 (56.8)	4(5.4)	
Mother's highest level of Education					
8 th standard	336	142 (42.3)	182 (54.2)	12 (14.8)	67.49 (0.00)**
10 th standard	181	71 (39.2)	99 (54.7)	11 (13.6)	
12th standard	129	40 (31.00)	78 (60.5)	11(13.6)	
University	210	44 (21.0)	124 (59.0)	42 (51.9)	
No Mother/Guardian	15	5 (33.3)	10 (66.7)	0	
Don't Know	103	40 (38.8)	58 (56.3)	5 (6.2)	
Caste subdivision					
Forward Caste	60	14 (23.3)	32 (53.3)	14 (23.3)	63.76 (0.00)**
Backward Caste	443	128 (28.9)	272 (61.4)	43 (9.7)	
Most Backward	198	60 (30.3)	127 (64.1)	11(5.6)	
Scheduled Caste & tribes	273	140 (51.3)	120 (44.0)	13(4.8)	
Geography and type of school					
Rural School	516	195 (37.8)	291 (56.4)	30 (5.8)	10.6 (0.005)**
Urban School	458	147 (32.1)	260 (56.8)	51 (11.1)	
Private School	509	161 (31.6)	282 (55.4)	66 (13.0)	31.66 (0.000)**
Public School	465	181 (38.9)	269 (57.8)	15 (3.2)	

Key: * = $p < .05$, ** = $p < .001$

Multiple variable linear regression analyses (Table 5) were performed to determine the independent variables which contributed significantly to explaining the variability in the dependent variable.

The oral health literacy score is a dependent variable which is a continuous and ratio variable. Hence, multiple linear regression analysis was performed. All independent variables were coded as categorical-nominal variables. Each category within different socio-demographic variables was dichotomised into a separate dummy variable.

Preliminary analyses were carried out using linear regression with each variable in turn. These all showed a significant relationship for all predictor variables except for participant's age. Hence, all predictor variables except age were included in the model at the same time by the forced entry method rather than stepwise regression method [16].

The results (Table 5) indicated that the oral health literacy scores were significantly associated with adolescents who were male ($\beta = -0.766$; $p < 0.05$), did not

know their father’s highest level of education ($\beta=-1.844$; $p<0.05$), whose mother had finished university education ($\beta=1.420$; $p<0.05$), and who belonged to the community Scheduled Caste/Tribes ($\beta=-2.418$; $p<0.005$). Being a male participant, not knowing the father’s level of education and being a member of Scheduled Caste/Tribes all have a negative influence on the oral health literacy scores, while the mother’s level of education is positively associated with the overall OHL score.

The developed model is highly significant ($F=8.919$; $p<0.001$) with the strength of the relationship 12.6%. Even though the R square value is low ($R^2=0.112$), accounting for 11% of the variance in the data, the highly significant F statistic (see Table 5) indicates the actual relationship between the significant predictors and dependent variable is real.

Table 5: Regression analysis for Oral Health Literacy Score and Sociodemographic Variables

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	33.285	.771		43.154	.000**
Gender (Male-1, Female-0)	-.766	.359	-.067	-2.136	.033*
Father’s Education					
8 th	-1.195	.684	-.092	-1.747	.081
10 th	-.085	.667	-.006	-.127	.899
12 th	Reference category				
University	1.272	.724	.101	1.757	.079
No Father	-1.327	1.188	-.041	-1.117	.264
Don’t Know	-1.844	.910	-.086	-2.028	.043*
Mother’s Education					
8 th	Reference category				
10 th	.176	.535	.012	.328	.743
12 th	.413	.633	.024	.652	.515
University	1.420	.693	.103	2.049	.041*
No Mother	.656	1.644	.013	.399	.690
Don’t Know	-.090	.685	-.005	-.131	.896
Caste					
Forward Caste	.153	.778	.007	.197	.844
Backward Caste	Reference category				
Most Backward Caste	-.320	.482	-.022	-.665	.506
Scheduled Caste/Tribes	-2.418	.437	-.188	-5.537	.000**
School					
Location (Rural-1;Urban-0)	-.241	.371	-.021	-.649	.517
Type (Private-1 Public-0)	-.241	.447	-.021	-.539	.590
R= 0.355; R square = .126 ANOVA: F= 8.918; p=0.000 a. Dependent Variable: DMFT b. Predictors: (Constant), Mother’s Education, Father’s education, Location of School, Type of School, Gender and Caste **p < 0.05. ***p<0.001					

DISCUSSION

In this study, thirty five percent of participants had poor oral health literacy which indicated their current level of OHL skills was likely to be insufficient to prevent and manage dental caries. Only eight percent of participants were considered to possess sufficient oral health literacy skills to assist in prevention of dental caries, self-manage dental caries, and participate effectively in the oral health care decision making process with basic oral health knowledge and

comprehension skills. An intervention to improve oral health literacy is needed for both rural and urban school students whether they attend either private or public schools.

Female participants scored slightly higher than males on OHL. This result was in keeping with adults’ oral health literacy studies in the international literature [3, 17]. Further analysis of individual components of oral health literacy indicated that the females scored

higher for the oral health behaviour score and this is also reported in another study [3]. Even though the concept of measuring oral health literacy was different in Ueno *et al.*'s study, which is based on visual drawing to measure OHL, the study results indicated that females had higher oral health literacy than males. An Indian oral health literacy study conducted among adult patients seeking dental care reported females scoring higher than males in oral health literacy skills [18]. Females scoring higher than the males in both adolescent and adult age groups is a common trend in both international and Indian based literature.

The adolescents whose parents attended university scored higher than other participants. This result is similar to other studies among adult populations which demonstrated that the oral health literacy score increased with an increase in the level of education attained, and university graduates scored highest in those studies [10, 19-21]. Oral health literacy studies conducted among parents also indicated that a parent's oral health literacy, relating to a child's oral health increased with an increase in parental educational attainment [15, 22]. Although the studies mentioned above were conducted among adult participants, the relationship between level of education in adults and oral health literacy is consistent with the current study result. This indicates that education has a strong influence on the level of oral health literacy. For the state of Tamil Nadu, decreasing the secondary and the higher secondary dropout rates of students, especially for females, would have a strong influence on improving the oral health literacy of the population and in turn the oral health outcomes of the community. Any oral health literacy intervention for children/adolescents should consider involving parents rather than just doing an intervention through school or oral health professionals.

The rural and public school participants scored lower than urban and private school participants, respectively. This is an expected result for the current study because compared to rural school participants the Chennai school participants have more exposure to oral health-related knowledge because of increased access to oral health services compared to rural school students. The public school participants scored less than private school participants in the oral health literacy measure. The education level and socio-economic status of the parents of participants who attended urban schools and private schools were comparatively higher than the education level of parents of rural and public schools respectively.

Oral health literacy was strongly associated with different caste categories in the bivariate analysis, a result that has not been previously reported. The descriptive mean scores indicated that Forward Caste people scored highest and Scheduled Caste and Tribes scored very low among all caste categories. This is an

expected result. Only 1.6% of participants from the total Forward Caste reported that their parents attained an education level less than 8th standard but in other caste categories between 22% and 44% of participants reported their parents had an education level at or below 8th standard. This explains the reason for the highest score among the Forward Caste. This result further demonstrates the strong correlation between the parents' level of education and adolescents' oral health literacy scores. Participants from Scheduled Caste and Tribes community had poor oral health literacy when compared to other participants in the total sample and for rural schools the Most Backward Community participants had poor oral health literacy skills.

In Tamil Nadu, oral health services are in a development stage of implementation and the current Tamil Nadu school curriculum does not have an oral health education component which explains, in part, why a minimal number (8.3%) of participants had good oral health literacy skills. The availability of oral health information for Tamil Nadu adolescents could be described, at present, as minimal. There is very limited oral health information on Tamil Nadu television, even though, this medium is popular among children and adolescents. Because of this, an oral health literacy intervention through the schools and all other alternative means, such as television, radio, newspaper, posters, the Internet, and hospital pamphlets could be enhanced to improve oral health literacy skills. The current "*Samacheer Kalvi*" (uniform system of education) curriculum could be updated to include oral health literacy education at both primary and secondary levels. The oral health literacy skills of adolescents in countries who have oral health education implemented already in the school curriculum could be researched to understand the effect of school oral health literacy education on adolescents' oral health. Future research could investigate a better approach to improve oral health literacy in the adolescent population who did not have the opportunity to achieve oral health literacy in childhood due to the nature of the oral health services and compromised general literacy and oral health literacy in their parents.

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