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Rapid Estimate of Adult Literacy in Medicine and Dentistry-20 and oral health status among adolescents, India: A cross-sectional study

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Abstract:

INTRODUCTION: Health literacy is an important issue in public health. Individuals with low health literacy skills often have poorer health knowledge and health status than those with higher literacy level. Research documented on the assessment of oral health literacy in health settings and its association with oral health outcomes for adolescents was scarce.

AIMS AND OBJECTIVES: The aim of this study is to assess oral health literacy about oral health status among adolescents attending pre-university colleges in Mysore, India.

MATERIALS AND METHODS: A cross-sectional study was conducted over a period of 2 months among 401 adolescents attending pre-university colleges. Rapid Estimate of Adult Literacy in Medicine and Dentistry-20 (REALMD-20) and the WHO oral health assessment pro forma for adults (2013) were used. Data were analyzed using SPSS version 22 and tests employed were Chi-square test, ANOVA, and multiple linear regression.

RESULTS: Mean REALMD-20 score was 10.31 ± 5.7 . The study participants belonging to science course (12.69 ± 5.0) and private pre-university colleges (11.76 ± 5.8) had significantly higher REALMD-20 scores. Mean decayed, missing, and filled teeth among the study participants was (0.42 ± 0.9). Type of college, course, dental history, and number of dental visits was significantly associated with oral health literacy while oral health parameters were not significantly associated.

CONCLUSION: Oral health literacy was not significantly associated with oral health status. However, long-term studies are recommended to validate the results of the present study.

Keywords:

Adolescents, oral health literacy, oral health status, Rapid Estimate of Adult Literacy in Medicine and Dentistry-20

Introduction

Health literacy was conceptualized by the American Medical Association in 1999 as "a constellation of skills, including the ability to perform basic reading and numerical tasks required to function in the health-care environment."^[1] It is an important issue in public health today, especially as patients are taking a greater role in

obtaining information about their health.^[2] Individuals with low health literacy skills often have poor health status and knowledge, unhealthy behaviors, less utilization of preventive services that leads to higher rate of hospitalizations, increased health-care costs, and eventually poorer health outcomes than those with higher literacy level.^[3]

Oral health literacy is a level to which individuals can obtain, process, understand

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basic health information and services needed to make appropriate oral health decisions.^[4] It is an interplay between culture and society, health system, education system, and oral health outcomes indicating that it may be a new determinant of oral health. Low oral health literacy level, independent of socioeconomic determinants, is a risk factor for poor self-reported oral health. Therefore, it should be considered more intensively in oral health research.^[5]

Establishing a patient-doctor rapport by meeting communication needs of the patient will enhance compliance and follow-up care.^[6] Mispronunciation of dental terms might affect proper reporting of oral health issues to health-care personnel. With dentistry and medicine being interconnected, creating cross-disciplinary tools can act as supporting link between medical and oral health-care systems.^[7,8] Therefore, using the original Rapid Estimate of Adult Literacy in Medicine (REALM) instrument as the methodological basis for instrument development, several oral health literacy assessment tools were developed, including the 33-item Rapid Estimate of Adult Literacy in Dentistry (REALD-33), 99-item REALD-99 and the 84-item REALM and Dentistry (REALMD-84).^[6] These were developed as tools that screen for a patient's ability to read both medical and dental terminology.^[6] Twenty terms were selected from this 84-item REALMD instrument with a goal of creating a brief oral health literacy screener that would demonstrate acceptable psychometric properties.^[6] Since the tool contains terms related to medical, dental, behavioral, psychological, and economic aspects (depression, insurance), it will be useful even if patients navigate the health system. REALMD-20 is a brief 20-item screening tool that is used to assess oral health literacy and help bridge the patient-doctor communication gap.^[7,8] High feasibility of the tool saves physician time^[8] with instructions being easily understood by the participants.^[9]

Even though health literacy is an important and helpful domain in public health sector, only small number of research papers has been published. Within limited published research in this focus area, most of the research has been conducted on assessment of medical health literacy in health-care settings and its association with general health outcomes among adults while oral health literacy is always a neglected domain. However, the literature on the association between oral health literacy and its association with oral health parameters among adolescents (individual aged 10–19 years^[10]) was scanty. As the information is sparse, the present study was undertaken to determine oral health literacy using REALMD-20 among adolescents and its relation to the type of colleges, courses, and oral health status.

Materials and Methods

The present study has cross-sectional study design conducted over a period of 2 months, August and September 2016. Before the study, Ethical approval was obtained from the Institutional Ethical Committee, and all protocols were performed by the Declaration of Helsinki 2008.

The predesigned structured questionnaire was used in present study that elicited information regarding sociodemographic details, previous medical and dental visits, oral hygiene, and dietary practices in adjunct to the World Health Organization (WHO) oral health pro forma-2013 and REALMD-20 scale. The principal investigator involved in data collection was trained in the department of Public Health Dentistry. The WHO Oral Health Assessment Form for Adults-2013^[11] and REALMD-20 scale^[6] was discussed with subject experts. The correct pronunciation of each term was finalized. Any differences in the anticipated pronunciations were considered to be included as not pronounced properly.

Pilot study was conducted on 30 adolescents in a co-educational institution and later this institution was excluded from the main study. Purpose of the pilot study was to assess the reliability of questionnaire, operational feasibility, and time taken for the individual participant. This was a cognitive interview process of validation wherein a sample of expected participants read out the words in the REALMD-20 tool to check whether our intended study participants were able to read out the words or not. The participants in the pilot study were given the REALMD-20 tool. Each participant was asked to read out the words loudly. Each correct pronunciation was noted to calculate the REALMD-20 score. The procedure was repeated after 1 h. The test-retest procedure was used to assess the reliability of the tool on these pilot study participants.

Cronbach's alpha for intraexaminer reliability of dentition status (decayed, missing and filled teeth [DMFT]) and gingival bleeding by test re-test method was found to be 0.835 and 0.996, respectively, while for community periodontal index (CPI), Dean's Fluorosis Index, dental trauma, no statistics were computed as there was 100% agreement. Cronbach's alpha for REALMD-20 was found to be 0.766 (acceptable agreement).

The sample size for the present study was estimated using the following equation.^[12]

$$\text{Sample size} = Z^2 [p] [1 - p] / E^2,$$

where,

Z = Normal deviate for two-tailed alternative hypothesis at a level of significance

P = Prevalence

E = Precision or margin of error.

Based on 50% anticipated prevalence of caries experience (DMFT) among preuniversity students with 95% of confidence interval and 5% margin of error (*E*), the sample size was computed to be 384, and it was rounded off to 400.

Gender-matched adolescents with 15–20 years age group attending different preuniversity colleges (government and private) in Mysore that can read and write English and free of cognitive, vision, and hearing impairment were included in the study. Institutions situated outside Mysore and not offering co-education were excluded from the study to eliminate geographical variation.

The list of pre university level educational institutions in Mysore was obtained from the Deputy Director of Public Instruction office. A two-stage sampling was used for selection of the study participants. In the first stage, Mysore was classified into two geographical zones as North and South. In the second stage, educational institutions in each zone were again segregated into government and private. Two government and two private educational institutions from each zone of the city were then selected using lottery method. Eligible fifty participants from each educational institution were subsequently selected using simple random sampling. Before administration of the predesigned structured questionnaire and clinical examination, all the patients were assured that information collected from them would be kept anonymous and reported in aggregate form. A written informed consent was obtained from each participant/guardian (for participants <18 years) before their clinical oral examination.

All the examinations were performed in their respective institutions on a normal chair under natural light and using sterilized instruments (mouth mirror, CPI Probe). The students were examined by the single trained investigator, and relevant information to record oral health status was entered on the WHO oral health assessment form-2013. Oral health literacy was assessed using REALMD-20.^[6,8] Participants were instructed to read the words loud in front of an investigator from template-containing REALMD-20 items. They were instructed to say “blank” and move on to next word if they found difficulty in pronouncing any word. Word test was conducted in isolation with no extra-person in the vicinity so that words were not overheard. Scores were not revealed to any person including the participant. Original REALM rubric coding (words pronounced correctly received [+], mispronounced [√] and wrongly pronounced [-]) was followed.^[8,9] Words correctly pronounced (+) were scored “1” and mispronounced

(√)/not attempted (-) words as “0.” Total points computed for each participant gave an estimate of oral health literacy. Thus, the REALMD-20 score ranges from 0 to 20. Administration of word test took approximately 2½ min for each participant.

Statistical analysis

Statistical analysis was performed using Statistical Package of Social Sciences (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). The analysis was performed using descriptive statistics, and inferential statistics includes Chi-square test, ANOVA, and multiple linear regression. Nonparametric data were analyzed using Mann–Whitney test and Kruskal–Wallis test. The statistical significance level was fixed at 0.05.

Results

A total of 401 adolescents attending educational institutions (201 from government and 200 from private) were included. Distribution of study participants according to various courses are shown in Table 1.

Mean REALMD-20 score for the study participants was 10.3 ± 5.7 with significantly higher among private institution students (11.7 ± 5.8) compared to those from Government institutions (8.8 ± 5.3) ($P < 0.001$). This distribution of mean REALMD-20 scores among different course between government and private institution students was mentioned in Table 2. Mean DMFT for the study participants was 0.4 ± 0.9 with no significant difference between Government and private institutions [$P = 0.26$, Table 3] as well as between participants from different course under study [$P = 0.29$, Table 3].

Linear regression model [Tables 4 and 5] confirms that type of college, course under study and numbers of dental visits were associated with significantly with higher REALMD 20 score ($P < 0.05$) which indicates better oral health literacy score. It also shows that independent variables taken into consideration attribute for 24% of the variance on the dependent variable ($R^2 = 0.24$) and oral parameters taken into

Table 1: Distribution of study participants in relation to various courses among government and private colleges

Course	Government, n (%)	Private, n (%)	Total, n (%)
Science	82 (48.5)	87 (51.5)	169 (100)
Commerce	100 (53.5)	87 (46.5)	187 (100)
Arts and others	19 (42.2)	26 (57.8)	45 (100)
Total	201 (50.1)	200 (49.9)	401 (100)
Statistical inference (<i>P</i>)		0.34*	

*Chi-square test

Table 2: Oral health Literacy scores (Rapid Estimate of Adult Literacy in Medicine and Dentistry-20) in relation to various courses among government and private colleges

Course	Mean±SD			Statistical inference Government versus private
	Government	Private	Total	
Science	11.2±4.9	14.2±4.6	12.7±5.0	P<0.001
Commerce	7.6±4.9	11.6±5.2	9.5±5.4	P<0.001
Arts and others	5.4±5.2	4.3±4.4	4.7±4.7	P=0.42
Total	8.8±5.3	11.7±5.8	10.3±5.7	P<0.001
Statistical inference*	P<0.001	P<0.001	P<0.001	
Tukey's - post hoc	Science versus commerce: P<0.001	Science versus commerce: P<0.002	Science versus commerce: P<0.001	
	Science versus arts/others: P<0.001	Science versus arts/others: P<0.001	Science versus arts/others: P<0.001	
	Commerce versus arts/others: P<0.17	Commerce versus arts/others: P<0.001	commerce versus arts/others: P<0.001	

*ANOVA test. SD=Standard deviation

Table 3: Mean Decayed, Missing and Filled Teeth scores in relation to in relation to various courses among government and private colleges

Course	Mean±SD			Statistical inference#
	Government	Private	Total	
Science	0.3±0.7	0.5±1.2	0.4±1.0	Mann-Whitney value=3225.0 P=0.19
Commerce	0.4±0.9	0.5±0.9	0.5±0.9	Mann-Whitney value=4061.5 P=0.31
Arts and others	0.3±0.7	0.1±0.3	0.2±0.5	Mann-Whitney value=209.0 P=0.18
Total	0.3±0.8	0.5±1.0	0.4±0.9	Mann-Whitney value=19053.0 P=0.26
Statistical inference* (P)	0.53	0.14	0.29	

#Kruskal-Wallis test, *Mann-Whitney test. SD=Standard deviation

Table 4: Oral health literacy (rapid estimate of adult literacy in medicine and dentistry-20) in relation to various demographic variables among study participants by linear regression model

Variables	Demographic variables				
	Correlation coefficient	P	Unstandardized coefficients	T	P
Age	0.064*	0.20	-0.244	-0.553	0.58
Gender	0.050**	0.23	0.216	0.418	0.68
Type of college	0.216**	<0.001	2.667	4.263	<0.001
Course	-0.338**	<0.001	-3.241	-8.368	<0.001
Medical history	-0.057**	0.18	-0.742	-1.325	0.19
Dental history	0.135**	0.001	0.389	0.579	0.56
Number of dental visits	0.131**	0.001	0.306	2.791	0.006
Constant			14.848	2.113	0.033
Model summary and anova					
Model	R	R ²	Adjusted R ²	F	P
Linear Regression analysis	0.509	0.259	0.246	19.577	<0.001

*Pearson correlation coefficient, **kendall tau coefficient

consideration were not significant predictors of oral health literacy (REALMD-20).

Discussion

Oral health literacy was identified as a key to promote oral health and prevent oral health diseases.^[13] It was found that low oral health literacy was associated with poor oral health status and poor oral health outcomes

among adults in a study conducted at Virajpet, Karnataka, India using Rapid Estimate of Adult Literacy in Dentistry-30 (REALD-30).^[8] Results of the present study provide an opportunity to analyze the association between oral health literacy and oral health outcome among adolescents of Mysore.

Adolescents experience advances in cognitive abilities, developing an improved capacity for processing

Table 5: Oral health literacy (Rapid Estimate of Adult Literacy in Medicine and Dentistry-20) in relation to oral health parameters among study participants by linear regression model

Oral health parameters					
Variables	Correlation coefficient	P	Unstandardized coefficients	t	P
DMFT	0.062 [#]	0.22	0.336	0.804	0.42
Gingival bleeding	0.045 ^{**}	0.28	0.228	0.217	0.83
Periodontal pockets	-0.007 ^{**}	0.87	-0.463	-0.190	0.85
Dental trauma	-0.003 ^{**}	0.93	0.008	0.004	1.0
Dental fluorosis	0.023 ^{**}	0.58	0.353	0.452	0.65
Intervention urgency	0.091 ^{**}	0.03	0.895	0.883	
Constant			10.190	4.119	<0.001
Model summary and ANOVA					
Model	R	R ²	Adjusted R ²	F	P
Linear Regression analysis	0.121	0.015	0.001	0.981	0.438

[#]Kendall tau coefficient, ^{*}Spearman's rho coefficient. DMFT=Decayed, Missing and Filled Teeth

information, thinking more about abstract ideas and using reasoning skills. They also achieve greater autonomy. These changes make adolescence an appropriate time to begin thinking about health literacy interventions and improve health literacy.^[2] Hence in the present study, adolescent group is taken as a target population.

Oral health literacy was significantly higher among participants recruited from science stream followed by commerce and then arts/other streams. Participants in science stream would have come across these words more often compared to students from other streams given their academic exposure to biological sciences which is more closely related to medicine and dentistry compared to commerce and arts/other streams. Besides curriculum, participants in science stream tend to have better command on the English language compared to other streams as the medium of instruction in science stream has been mandatorily English in Karnataka state while for other streams, the medium of instruction is not mandatorily in English but also could be taught in the local language (Kannada). A smaller sample of participants from arts/others stream compared to other two streams also could have influenced the results.

In the present study, oral health literacy was significantly higher among participants from private institutions compared to those from government institution and was similar to findings from Nutbeam^[14] Type of institution is a proxy for socioeconomic status as students from low economic status tend to enroll in government institution compared to those in private institution which often would be from upper economic classes. Frequent medical/dental visits and medical/dental care utilization increases the possibility of exposure to these terminologies and subsequently their higher oral health literacy scores. Individuals from low socioeconomic status will have fewer sources of health information because of cultural bias, difficulty

in assessing information through internet searches, financial and time constraints subsequently leading for fail to show appointments (difficulty in attending or rescheduling dental appointments).^[15] All these could have contributed to a lower literacy among study participants from lower classes.

In the present study, oral health literacy was significantly higher among participants from private institutions compared to those from government institutions; however, there was no statistically significant difference in caries experience between two groups. None of the oral health parameters in the present study were statistically significantly associated with oral health literacy. Holtzman *et al.* and Haridas *et al.* found a statistically significant association between oral health literacy and oral health parameters.^[15,16] These results were contradictory to our results which could be probably due to the difference in the levels of oral diseases and their perception which vary between different populations having various socio-cultural backgrounds. This is attributed to the fact that the increasing oral health awareness in public, symptoms causing discomfort encourages adolescents for undergoing treatment to maintain positive oral health that leads to statistically insignificant difference in caries experience between two groups but quality of education, lack of English medium from childhood, financial constraints to access technology could be reason for significant difference in oral health literacy.

To best of our knowledge, the present study is first of its kind on Indian adolescents in which oral health literacy was assessed using REALMD-20 in association with oral health status. The present study is of cross-sectional design that makes difficulty in identification of causal relationships. A wider representation from other regions in the district including rural areas could have been assessed to find an association between oral health literacy with an area of residence. Generalizability

of study results needs to be considered with caution since India is a country with wide cultural diversity. Long-term studies with large and diverse population groups are recommended to validate our results.

Findings from present study recommend that oral health education should be made as a part of the curriculum for all students irrespective of course under study. Oral health promotion programs need to be organized on a periodic basis for all students attending educational institutions and more specifically to government institutions with an emphasis on oral health awareness toward positive health attitude.

Conclusion

In the present study, oral health literacy was significantly higher among private institution participants compared with a government institution. Oral health literacy was significantly higher among participants recruited from science stream followed by commerce and arts/other streams. The type of institution, course, dental history, and a number of dental visits were significantly associated with oral health literacy, whereas oral health parameters such as mean DMFT, gingival bleeding, periodontal pockets, dental trauma, dental fluorosis, and intervention urgency were not significantly associated with oral health literacy.

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Conflicts of interest

There are no conflicts of interest.

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