Original Article

The relationship between oral health literacy and oral health among nursing students in Chengalpattu district, India: A correlational study

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Abstract

Context: Better health literacy develops the competencies of the individual to assimilate, comprehend and adapt to healthy practices and reduce risk behaviors. Oral health literacy has also proved to be critical in reducing oral health disparities and in promoting oral health.

Aim: The study aimed to assess the oral health literacy level and its impact on oral health status among dental nurses.

Setting and Design: A cross-sectional study was conducted among 170 nursing students at private nursing college between September 2019 and December 2019.

Materials and Methods: Oral health literacy (OHL) was assessed using the Rapid Estimate of Adult Literacy in Dentistry (REALD-30) and dental caries were assessed by decayed, missing, and filled teeth (DMFT) index

Statistical Analysis Used: The data were analyzed using descriptive statistics, Kruskal–Wallis test, and multiple linear regression analysis.

Results: Among the participants, the IV-year students showed a higher rate of rinsing after meals (77.3%), brushing frequency twice a day (36.4%). A steady increase in the mean OHL scores was observed with an increase in the level of education. Significant association was found between REALD-30 (OHL) and dental caries (β = -0.151, *P*-value = .049).

Conclusion: The current study result demonstrates the correlation between oral health literacy and dental caries. To achieve better outcomes, there is a need to involve inter-professional primary health care providers, such as nurses to raise awareness and promote oral health by incorporating additional cross-cutting actions in training programs aimed at health care, disease prevention, and health promotion.

Keywords: Dental caries, Nursing students, Oral health, Health literacy

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INTRODUCTION

Health literacy has been recognized as one of the determinants of staying healthy, recovering from illness, and enhancing the health-related quality of life in individuals.[1] Health literacy is defined as "the cognitive and social skills which determine the motivation ability of an individual to gain access to understand and use information in ways which promote and maintain good health."[2] Health literacy has found to be a strong predictor of individuals' health, health behavior, and health outcomes.[3]

World Health Organization's (WHO's) 7th Global Conference on Health Promotion also lists health literacy as one of the five key tracks for promoting health. Low literacy has been noticed with less utilization of preventive services, delayed diagnoses of medical conditions, misunderstanding health instructions, poor self-management skills, and oral health outcomes.[4]

Similar to health literacy, oral health literacy (OHL) has also proved to be critical in reducing oral health disparities and in promoting oral health. OHL is defined as the "degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions."[5] Studies have demonstrated that OHL exerts an influence on seeking dental services, resulting in better oral health status. OHL is a medium to extend a hand of extensive primary care to any individual which is considered to be the "foundation of an effective health care system" and to achieve better oral health outcomes and improved equity in access and control expenditures.[6]

The *Global Burden of Disease Study 2016* estimated that in most low-income and middle-income countries, with an increase in urbanization and changes in living conditions, the prevalence of oral diseases continues to increase notably due to inadequate exposure to primary oral health-care services and poor access to basic oral health knowledge. Despite tremendous considerable efforts by health professionals to promote oral health among the masses, the gap between oral health knowledge and practices undoubtedly remains.[7]

Various scales to measure OHL are the Rapid Estimate of Adult Literacy in Dentistry (REALD)-99 items, the REALD-30 items, the Rapid Estimate of Adult Literacy in Medicine (REALM) and REALD, Test of Functional Health Literacy in Dentistry, the OHL Instrument, and the Comprehensive Measure of Oral Health Knowledge,[6] out of which REALD-30 is brief and easy to administer and it only measures recognition and pronunciation. It has better predictive validity and significantly correlates with REALM score related to perceived dental health status.[8]

Most of the patients acquire information from various sources, but the information provided to them by their dentist and dental nurses serves to guide and inform their ability for optimum oral health self-care and decision-making related to health overall. The encounter with a dental nurse is a chance for patients to receive guidance and learn skills for their self-care and additional health services. The communication skills of the dental nurses contribute to a patient's OHL that in turn results in improved oral health outcomes.[9]

The influence of OHL on dental conditions has currently piqued the interest of researchers. Although recently gaining more attention, there has been little work in the field of OHL and, more specifically, no studies have investigated the influence of OHL on oral health among dental nurses. Hence, this study aimed to assess the OHL level and its impact on oral health status among dental nurses.

MATERIALS AND METHODS

Research design and settings

A correlational study was conducted over a period of 4 months from September to December 2019 among nursing students in a private nursing college at Chengalpattu, India. The planning of this study was based on the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology Initiative.[10]

Individuals who can understand and communicate in English without any impairment were included in the study. Undergraduates from nursing college were encompassed as a recruited subject. Participants not knowing the English language were excluded from the study. Students other than paraprofessionals like allied sciences and engineering students were excluded from the study. Individuals with a known history of cognitive impairment were exempted from the study. Participants who were not willing to participate in the study were kept out from the involvement.

Sample size and sampling procedure

A pilot study was conducted among 30 participants to validate the assessment form (REALD-30 items) and to get the required sample size. The estimated sample size was 170 with the following inputs of 80% power and margin of error at 5% with 95% confidence level and was selected using convenience sampling.

Data collection tool and procedure

A REALD-30 item questionnaire was assessed for content validity using intra-class correlation coefficient (ICC). Inter-examiner agreement ICC = 0.987 (95% confidence interval [CI]: 0.970–0.995) and 0.874 (95% CI: 0.860–0.895); and intra-examiner agreement ICC = 0.973 (95% CI: 0.921–0.991) and 0.994 (95% CI: 0.982–0.998) and internal consistency of questionnaire was found to be good. The pilot survey was carried out and questionnaire assessed for content validity and internal consistency of questionnaire was found to be good (Cronbach's alpha = 0.84). A single trained investigator collected the data. The subjects were informed that their participation was voluntary and was assigned a separately scheduled cubicle for completing the questionnaires.

Data collection was done in three parts. First, the data related to the demographic details consisting of age, gender, and year of study were collected. Second, OHL was assessed using the REALD-30 items which is a pioneering questionnaire based on the recognition of words related to dentistry that has been prevalidated. It includes 30 dentally related words arranged in order of increasing difficulty. The participants were asked to read the words loudly. They were asked to read only the words which are familiar and which they can pronounce correctly. To score REALD-30, one point is given to each word pronounced correctly and then summed to get an overall score. The score has a possible range of 0 (lowest literacy) to 30 (highest literacy). Thus, a higher number of correctly pronounced words resulted in a higher score, denoting a higher level of OHL.[11] The third part included questions for the assessment of oral health behaviors which include diet, rinsing after meals, brushing frequency, and snacking in between meals.

All the participants underwent dental clinical examination for the assessment of dental caries.

Dental examination was conducted after air-drying the teeth, under natural light, and with the aid of a dental mirror and explorer. Indicators for dental caries were calculated based on the number of decayed, missing, and filled teeth using the decayed, missing, and filling teeth (DMFT) index as proposed by Klein *et al*.[12] All teeth were evaluated according to the criteria recommended by the WHO using the "DMFT" index. The DMFT index is applied to permanent dentition and is expressed as the total number of teeth or surfaces that are Decayed (D), Missing (M), and Filled (F) for an individuals.[12]

Data analyses

The data were initially compiled in a Microsoft Excel spreadsheet; the data analysis was done with the Statistical Package for the Social Sciences (SPSS) for Windows version 20.0 software (IBM, Chicago Inc., IL, USA). Descriptive statistics were performed for demographic variables. Inferential statistics were done with Kruskal–Wallis test. Multiple linear regression analysis was applied using the stepwise method for the determination of the best predictors among oral health behaviors which include diet, rinsing after meals, brushing frequency, and snacking in between meals and REALD-30 (OHL) for caries status (presented as a continuous variable). For all analyses, $P < 0.05$ was considered to be statistically significant.

Ethical consideration

Ethical clearance was obtained from the institutional ethical committee, before starting the study (KIDS/IEC/003/2019/IV). The purpose of the study was explained to the participants, and informed consent was obtained from the participants after obtaining the necessary permission from college authorities.

RESULTS

Of the one seventy participants who expressed interest to participate in the study, 88.3% were females and 11.7% were males. The age of the participants ranged between 17 and 25 years with a mean age of 19.4 ± 1.5. Among the total participants, 26% were I-year students ($n = 44$), 23% were II-year students ($n = 39$), 25% were III-year students ($n = 43$), and 26% of them ($n = 44$) were IV-year students. The response rate to the questionnaire was 100% since it was informed priorly.

The majority of the participants in all 4 years were in a mixed diet (I-year –93.2%, II-year –87.2%, III-year –93.0%, and IV-year –93.2%, respectively). Among the participants, the IV-year students showed a higher rate of rinsing after meals (77.3%) which is followed by III-year (53.5%), then II-year (61.5%), and finally the I-year students (61.4%). The brushing frequency was more, i.e., twice a day among IV-year students (36.4%), followed by II-year, III-year, and I-year students (30.8%, 27.9%, and 27.3%, respectively). The II-year students showed higher consumption of snacks in between meals (41.0%), followed by III-year (30.2%), I-year (29.5%), and IV-year (25.0%) students [Table 1].

The mean DMFT score for I, II, III, and IV years was 1.64 ± 2.013, 1.35 ± 2.076, 1.23 ± 2.529, and 1.11 ± 2.354, respectively. No statistically significant differences were found in DMFT scores among the nursing students. The mean

REALD-30 score for the participants was 9.91 ± 3.790 (I year), 17.31 ± 4.156 (II years), 19.35 ± 6.532 (III years), and 21.25 ± 9.279 (IV years) which was found to be statistically highly significant ($P = 0.000$) [Table 2].

Table 3 shows the results of the multiple linear regression stepwise models for dental caries as the outcome. A model with 5 steps was carried out and explained more than 27% ($R^2 = 0.276$) of the variance on the dependent variable "dental caries." There was a significant negative association in the relationship between dental caries and OHL ($\beta = -0.151$, $P = 0.049$). Oral health behaviors which include diet, rinsing after meals, brushing frequency, and snacking in between meals were not significant predictors of caries status. DMFT scores were correlated with REALD-30 score ($r = 0.314$) and were statistically significant ($P < 0.012$).

DISCUSSION

OHL has gained prominence in the dental literature in the last decade. Similar to health literacy, OHL has also

Table 1: Distribution of participants based on their oral health behavior

Year of the study	Diet (%)		Rinsing after meals (%)		Brushing frequency (%)		Snacking in between meals (%)	
	Veg	Mixed	Yes	No	Once	Twice	Yes	No
I	6.8	93.2	61.4	38.6	72.7	27.3	29.5	70.5
II	12.8	87.2	61.5	38.5	69.2	30.8	41.0	59.0
III	7	93.0	53.5	46.5	72.1	27.9	30.2	69.8
IV	6.8	93.2	77.3	22.7	63.6	36.4	25.0	75.0

Table 2: Mean distribution of DMFT score and Rapid Estimate of Adult Literacy in Dentistry-30 (oral health literacy) scores based on year of study

Year of the study	DMFT score		REALD-30 (OHL) score	
	Mean±SD	P	Mean±SD	P
I	1.64±2.013	0.951	9.91±3.790	0.000*
II	1.35±2.076		17.31±4.156	
III	1.23±2.529		19.35±6.532	
IV	1.11±2.354		21.25±9.279	

*Statistically significant. Kruskal-Wallis test. SD: Standard deviation, REALD-30: Rapid Estimate of Adult Literacy in Dentistry-30, OHL: Oral health literacy

Table 3: Multiple linear regression model for independent variables' effect on caries status (DMFT)

Predictor variable	DMFT		
	β (standardized coefficients)	CI	P
Diet	−0.040	−0.761-1.025	0.771
Rinsing after meals	−0.182	−1.54-0.287	0.187
Brushing frequency	0.097	−0.389-1.067	0.360
Snacking in between meals	0.126	−0.244-1.721	0.140
OHL	−0.151	−0.073-0.000	0.049*

*$P < 0.001$, statistically significant. β: Beta-coefficient, CI: Confidence interval, OHL: Oral health literacy

proved to be critical in reducing oral health disparities and in promoting oral health.[3] The REALD-30 was used in the present study to measure OHL which is a pioneering questionnaire based on the recognition of words related to dentistry that has been validated in several different languages. Nonetheless, this instrument is strongly associated with functional literacy and has adequate psychometric properties, making it valid and reliable for measuring this construct.[13] Dental nurses are in a unique position to help patients with low oral or general health literacy, thus empowering them to an active role in their oral health care. Individuals with limited health literacy are likely to encounter difficulties navigating the dental health-care system and managing their oral health.[14]

With regard to oral health behavior, a majority of 69.4% reported that they brush their teeth at least twice daily and about 68.4% rinse their mouth after every meal. This finding is consistent with the findings of the study done by Ying *et al.*, which reported that the higher a participant's OHL, the more often they brushed their teeth, self-checked oral condition with a mirror, had regular dental checkups, and the better their oral hygiene status.[15] Our study findings affirm that oral health behavior is more detrimental to oral health and may be attributed to the fact that the respondents are more concerned with their oral health.

Findings regarding dietary habits indicate that 68.6% of the students did not consume snacks in between meals and the majority of the students (91.6%) have a mixed diet. This is fairly acceptable, but awareness and knowledge could be increased further so that more students change their dietary habits and stop snacking in between meals. Studies have shown that the frequency of sugary consumption is a more crucial factor in caries formation compared to its amount. The Vipeholm study established that sticky sweets consumed between meals (rather than within meals) significantly increased carious tooth surface formation.[16] It is worth highlighting that limited OHL is associated with fewer healthy lifestyle behaviors and further could cause poor oral health status.

The dental caries experience of the respondents was calculated from the DMFT index. In the present study on comparing among the study groups regarding DMFT score, the score was less among IV-year students. Our study shows that the mean DMFT score of the total participants lies around 1.33 ± 2.24. This is in contrast to the study conducted by Haridas *et al.* where the participants showed very higher DMFT scores of 4.40 ± 4.14 and stated that the educational level of the subjects may throw more light upon the associations between OHL and oral health

status.[17] The educational status also seems to affect the oral health status of the study subjects when the subjects were stratified by education.

On comparing the REALD-30 (OHL) scores among the study groups, the mean REALD-30 score was higher in IV-year students, and statistically, a significant difference was noted among the study group for mean OHL scores. A steady increase in the mean OHL scores was observed with an increase in the level of education. This indicates that education has a strong influence on the level of OHL. This is similar to the study done by Simon *et al*. (2018), which stated that a high level of OHL among participants was significantly associated with the education level.[18] Another study revealed that nursing students with higher grades were more likely to have higher scores on OHL which is similar to our study results.[19] This could be attributed to their exposure to the different clinical areas and community settings where they had been given opportunities to engage themselves in various health education and patient learning activities.

In the present study, subjects with low OHL had significantly higher mean values for DMFT scores as compared with subjects with high OHL. This is in accordance with the study done by Haridas *et al*., which concluded that higher REALD scores were associated with lower caries experience (DMFT score).[17] A possible explanation is that an individual with adequate OHL not only recognizes oral diseases at an earlier stage than someone with limited OHL but also is more prompt in seeking the required treatment.[3] Individuals with limited OHL are often more prone to delayed diagnoses of one's dental conditions which are explained by the higher DMFT scores in this group.

Results from the multi-linear regression model showed a statistically significant negative association between dental caries and REALD-30 (OHL) ($\beta = -0.151$, $P = 0.049$). Oral health behaviors which include diet, rinsing after meals, brushing frequency, and snacking in between meals were not statistically significant. These findings thus imply that those who had higher OHL scores were more likely to get lower caries experience (DMFT). This finding is similar to the study conducted by Haridas *et al*., which stated that higher REALD scores were associated with lower caries experience (DMFT score).[17] The current study result demonstrates the strong correlation between OHL and dental caries. However, after testing these variables, we could not detect significant associations between dental caries and any of the oral health behavior variables, and it could be due to social desirability bias.

Study limitation

The present results should be considered in light of the study's limitations. The data were collected from a nonprobability convenience sample; hence, the generalizability of this study results may be affected. This was a cross-sectional study, and thus, causal links cannot be derived from these findings. Further longitudinal studies may be required to extend the findings reported here. The present findings suggest the need to invest in oral health promotion strategies that increase the level of OHL. This study also draws attention to the need for dental nurses to improve their use of language when communicating with patients to assist them with decision-making in terms of health and the maintenance of healthy habits. The study results must be interpreted with caution, as the instrument is used to evaluate the identification of words without testing the comprehension of what is being read.

CONCLUSION

The present study was conducted to assess the OHL level and its impact on oral health status among dental nurses. To the best of our knowledge, this is the first study to perform this evaluation with nursing students in India. The results of this study provide insights into the dimension of OHL in relation to caries experience. This study confirms the association between OHL and dental caries. In conclusion, subjects with limited OHL levels had more caries experience. These findings may help to map and design an oral health education intervention to improve OHL among nursing students. This baseline survey data may potentially facilitate integrating oral health in nursing education and practice. To achieve better outcomes, there is a need to involve inter-professional primary health-care providers, such as nurses to raise awareness and promote oral health by incorporating additional cross-cutting actions in training programs aimed at health care, disease prevention, and health promotion.

Conflicts of interest
There are no conflicts of interest.

Authors' contribution
Concept- I.K
Design - I.K,V.S
Literature search - I.K,M.J
Data acquisition –I.K
Data analysis – I.K,M.J
Statistical analysis –I.K,M.J
Manuscript preparation- I.K

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