

# Predictors of Periodontal Status and Caries: The Role of Patient Education and Oral Health Literacy on Disease Outcome and Treatment

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## ABSTRACT

An individual's health, health behaviour, and health outcomes have all been proven to be strongly predicted by their level of health literacy. Low literacy has been attributed to concerns with preventative care, delayed medical diagnoses, inadequate compliance to medical instructions, poor self-management abilities, increased mortality risks, poor health outcomes, and increased health-care expenses which are contraindicating towards sustainable developmental goal-3. The purpose of this study is to investigate the association between oral health literacy (OHL) and oral health status among the dental patients.

**Methods** – A convenience sample of participants was obtained from dental patients who volunteered at the Government Dental College and Hospital. A data collecting form was used to gather information on participants demographics, Socioeconomic status, and smoking history. Data on patients' periodontal and caries risk assessment, caries experience, and periodontal condition was obtained from their dental records. The Comprehensive Measure of Oral Health Knowledge (CMOHK) was used to assess oral health literacy. The median CMOHK score of 15 was used to divide the sample into two groups, limited OHL ( $\leq 16$ ) and adequate OHL ( $> 16$ ).

**Results:** Data from 300 respondents had been analyzed. More than half of the participants were women (57.33%). The average age of the participants was 42.3 years [SD 14.2]. Subjects with limited OHL showed substantially higher mean values for missing teeth ( $p < 0.05$ ) and lower mean values for filled teeth ( $p < 0.05$ ) compared to those with adequate OHL. Subjects with low OHL exhibited a significantly higher percentage of severe periodontitis than those with adequate OHL ( $p = 0.04$ ).

**Conclusion:** Subjects with lower OHL levels exhibited poorer periodontal health. Improving patients' OHL could contribute to increase medicinal adherence, self-management abilities, and overall treatment outcomes.

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## INTRODUCTION

Oral health is a key determinant of overall health, well-being, and quality of life. [1] Health literacy is "Individuals' ability to receive, process, and comprehend fundamental health information and services required to make appropriate health decisions". Health literacy has been found to be a strong predictor of an individuals health behavior, holistic healthcare and health outcomes. [2,3]

Evidence from molecular and immunology exhibits a link between oral disorders and other noncommunicable diseases (NCDs) due to common risk factors. [4] Tooth brushing frequency and oral hygiene in adolescents are influenced by socio-economic condition and health literacy. The Global Oral Health Action Plan 2023-2030 aims to encourage early prevention, provide vital information on reducing health disparities, and create innovative methods to improve oral health outcomes. [5]

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According to Macek et.al, oral health literacy is influenced by various sociodemographic factors like income, education and sociocultural characteristics. [6] Furthermore, individuals' oral health literacy includes characteristics such as reading comprehension, word identification, communication competence, and conceptual understanding. [7] Apart from this, getting access to online information has become easier in recent years, which can play a significant part in oral health literacy, as patients are more likely to web-search their symptoms and diseases, which can lead to both better or poorer decision making. Poor self-rated health has been associated to noncompliance with health guidelines, a lack of self-management skills, an increased risk of mortality, and a major health-care expense burden. [8]

Individuals' reading skills might fall short of the expectations of oral health services, creating a spurious barrier to preventative care and treatment. [9] Access to health care and lowering the burden of health inequalities necessitates patient perception, perceived needs, and cultural perspectives, all of which play an important influence in determining dental service utilization. [10] Adults with a higher education are more likely to comprehend oral hygiene habits that encompass regular brushing, flossing, and dental check-ups, and they usually have convenient access to professional dental care. [11]

The study aimed to investigate the relationship between oral health literacy and oral health status in patients receiving government-provided health care. This focus directly supports Sustainable Development Goal 3 (SDG-3): Ensure healthy lives and promote well-being for all at all ages, by recognizing oral health literacy as a vital pathway to achieving universal health coverage, reducing inequalities, and improving population-level health outcomes.

#### **METHODOLOGY –**

A convenience sample of participants was obtained from dental patients who volunteered at the Government Dental College and Hospital. A written consent was obtained from all the participants, the research was conducted following all the necessary protocols. The study included both men and women patients and those who required emergency treatment were excluded from the study. A single trained investigator was assigned for collecting demographic information such as age, gender, education, and socioeconomic status (SES) was assessed by the Modified BG Prasad Scale (2020) was used to estimate SES in Indian homes.

Indicators for dental caries were calculated based on the number of decayed, missing, and filled teeth (DMFT) was obtained from their dental records. Proximal caries was confirmed using radio graphs, which are routinely taken for all the patients.

The Comprehensive Measure of Oral Health Knowledge (CMOHK) was used to assess oral health literacy. The median CMOHK score of 15 was used to divide the

sample into two groups, limited OHL ( $\leq 16$ ) and adequate OHL ( $>16$ ).

Descriptive and inferential statistics were used. P-values  $< 0.05$  were considered statistically significant.

#### **SAMPLE AND SETTING**

Based on the previous study results from Baskaradoss et.al [12] the prevalence of Periodontal diseases obtained was 58%. The sample size was calculated with a 95% confidence interval, 58% prevalence and 5% allowable error. The sample size obtained was 279, rounding of to 300.

#### **RESULTS –**

A total of 300 participants were included in the study. The overall mean age was  $42.3 \pm 14.2$  years. Participants with low oral health literacy (OHL) had a mean age of  $45.7 \pm 9.1$  years, whereas those with high OHL had a mean age of  $40.2 \pm 8.3$  years; however, this difference was not statistically significant ( $p = 0.86$ ). Females constituted 57.33% of the study population. The distribution of OHL levels did not significantly differ by gender ( $p = 0.65$ ).

Educational attainment demonstrated a statistically significant association with OHL levels ( $p = 0.034$ ). Individuals with higher educational qualifications, particularly professional degrees, were more likely to have higher OHL compared to those with only high school education. Although socio-economic status showed variation across OHL categories, the association was not statistically significant ( $p = 0.083$ ). Similarly, marital status was not significantly associated with OHL levels ( $p = 0.62$ ). With respect to oral health characteristics, cigarette smoking status was not significantly associated with OHL ( $p = 0.274$ ). The distribution of caries risk categories (low, moderate, and high) was comparable between the two OHL groups, with no statistically significant difference observed ( $p = 0.812$ ).

A statistically significant association was found between periodontitis status and OHL levels ( $p = 0.047$ ). Participants with low OHL exhibited a higher proportion of severe periodontitis compared to those with high OHL, whereas healthy or mild periodontal status was more prevalent among individuals with higher OHL.

In terms of caries experience, there was no statistically significant difference in the mean number of decayed teeth (DT) between low and high OHL groups ( $p = 0.492$ ). However, the mean number of missing teeth (MT) and filled teeth (FT) differed significantly between the groups ( $p = 0.008$  and  $p = 0.015$ , respectively). Participants with higher OHL demonstrated greater restorative treatment experience as reflected by higher FT scores. Despite these differences in individual components, the overall DMFT index did not significantly differ between OHL groups ( $p = 0.532$ ).

Overall, the findings indicate that while socio-demographic variables such as age, gender, socio-economic status, and marital status were not significantly

associated with OHL, educational level showed a significant relationship. Furthermore, periodontal status and certain components of caries experience were significantly associated with oral health literacy.

Tables –

**Table 1-** Socio-demographic characteristic distribution by OHL levels

Variable		All N (%)	Low OHL (< 16)N (%)	High OHL (≥16) N(%)	P value*
<b>Meanage±SD</b>		42.3 ± 14.2	45.7±9.1	40.2±8.3	0.86 †
<b>Gender</b>	<b>Male</b>	128 (42.66)	62 (48.43)	66 (51.56)	0.65
	<b>Female</b>	172 (57.33)	92 (53.48)	80 (46.51)	
<b>Education</b>	<b>High school graduate</b>	90 (30.00)	62 (20.66)	28 (9.33)	0.034
	<b>College degree</b>	88 (29.33)	46 (15.33)	42 (14.0)	
	<b>Professional degree</b>	32 (10.66)	14 (4.66)	18 (6.0)	
<b>Socio-economic Status</b>	<b>Below BPL</b>	116 (38.66)	44 (37.93)	72 (62.03)	0.083
	<b>Above BPL</b>	184 (61.33)	97 (52.71)	87 (47.28)	
<b>Marital status</b>	<b>unmarried</b>	94 (31.33)	62 (20.66)	32 (10.66)	0.62
	<b>Married</b>	176 (58.66)	105 (35)	71 (23.66)	
	<b>Divorced / Widow</b>	30 (10)	14 (4.66)	16 (5.33)	

BPL Below poverty level, APL Above poverty level, OHL Oral health literacy; \*Chi-squared test; † Independent samples T-Test

**Table 2:** Oral health characteristics distributed by OHL levels

Variable		All N (%)	Low OHL (< 16)N (%)	High OHL (≥16) N(%)	P value*
<b>Cigarette Smoking</b>	<b>Current Smoker</b>	20 (6.7)	08 (4.3)	12 (10.3)	0.274
	<b>Former / Never Smoker</b>	280 (93.3)	176 (95.7)	104 (89.7)	
<b>Caries Risk</b>	<b>Low</b>	40 (13.33)	24 (8.00)	16 (5.33)	0.812
	<b>Moderate</b>	112 (37.33)	68 (22.66)	44 (14.6)	
	<b>High</b>	148 (49.33)	83 (27.66)	65 (21.66)	
<b>Periodontitis</b>	<b>Healthy/Mild</b>	136 (45.3)	72 (39.1)	64 (55.2)	0.047
	<b>Moderate</b>	84 (28.0)	50 (27.2)	34 (29.3)	
	<b>Severe</b>	80 (26.7)	62 (33.7)	18 (15.5)	
<b>Caries Experience</b>	<b>DT</b>	1.84±0.85	1.95±0.83	1.77±1.01	0.492 ~
	<b>MT</b>	2.63±1.97	2.95±1.47	3.85±2.19	0.008 ~
	<b>FT</b>	3.71±2.11	2.39±1.38	3.42±2.27	0.015 ~
	<b>DMFT</b>	7.68±3.93	7.25±2.98	7.61±3.38	0.532 ~

OHL Oral health literacy, DMFT is number of decayed, missing, and filled permanent teeth, DT is number of decayed permanent teeth, MT is number of permanent teeth missing due to disease, and FT is number of filled permanent teeth,

\*Chi-squaredtest; ~ Mann-Whitney U Test

**DISCUSSION**

Dental health education can be taught in schools through teachers and peer role models, and it can be as effective as dental health education provided by professionals which will enhance the oral health literacy from early childhood. [12] Consistent with our results, studies have shown that lower OHL is associated with poorer oral health outcomes. In a foundational investigation by Baskaradoss, subjects with limited OHL demonstrated significantly higher numbers of missing teeth, lower numbers of filled teeth, and more severe periodontitis compared with those with

adequate OHL, highlighting the direct link between OHL and clinically measured oral disease status [13].

Similarly, evidence from Wehmeyer et al. [14] demonstrates a statistically significant association between lower OHL and worse periodontal health even after adjusting for confounders such as smoking and dental insurance status. These findings are congruent with our observation that severe periodontitis was more prevalent among participants with low OHL, suggesting that limited literacy may hinder the adoption of effective oral hygiene practices and delay timely utilization of preventive services. The pattern of greater treatment uptake associated with higher OHL has also been reported in studies of parental and child oral health, where higher parental OHL was linked to increased likelihood of children having restorative treatment and fewer missing teeth. [15] The broader literature supports the notion that OHL influences not only clinical outcomes but also oral

health behaviors that mediate disease risk. A recent cross-sectional investigation in school-aged children found that inadequate OHL was significantly associated with untreated caries and poorer oral hygiene after adjustment for socioeconomic and behavioral factors, underscoring the role of OHL in shaping preventive practices and disease progression. [16] With regard to tobacco use, the present study did not find a statistically significant association between cigarette smoking status and OHL levels. Although a slightly higher proportion of current smokers was observed in the high OHL group, this difference was not significant. Previous literature generally suggests that lower health literacy is associated with higher tobacco use and reduced cessation success, as individuals with limited literacy may have difficulty understanding risk information or accessing cessation resources. [18] The observed associations between OHL and oral health status in this study carry important public health implications.

Individuals with limited OHL may be less equipped to recognize early signs of disease, interpret professional advice, or navigate the dental care system, leading to delayed treatment and poorer outcomes. Interventions aimed at improving OHL through patient education, tailored communication, and community-level literacy programs, could therefore serve dual roles in enhancing both knowledge and clinical outcomes. An understanding of participants' OHL levels is crucial in designing effective health educational materials as well as designing intervention programs to successfully achieve oral health promotion at a community level.

## CONCLUSION

In conclusion, our findings reinforce existing evidence that higher oral health literacy is associated with more favorable oral health status, including better periodontal health and greater restorative care experience, and underscore the importance of targeting OHL in oral health promotion and disease prevention strategies. Future research should continue to explore causal pathways and assess the impact of literacy-focused interventions on long-term oral health outcomes. Importantly, strengthening oral health literacy contributes directly to Sustainable Development Goal 3 (SDG-3): Ensure healthy lives and promote well-being for all at all ages, by reducing health inequalities, fostering preventive care, and advancing universal access to essential oral health services.

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