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Assessment of Oral Health Literacy and Its Association with Oral Hygiene Practices among Adults: A Cross-Sectional Study

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Abstract

Background: Oral health literacy (OHL)—the capacity to obtain, process, and understand oral-health information—has emerged as a modifiable determinant of behaviors such as toothbrushing frequency, interdental cleaning, and dental attendance. Evidence links lower OHL with poorer oral-health behaviors and outcomes across diverse populations.

Objectives: To assess OHL among adults and examine its association with oral-hygiene practices and clinical oral-hygiene status.

Methods: In a cross-sectional survey of 600 adults, OHL was measured with a validated instrument and categorized as low, moderate, or high. Outcomes included toothbrushing twice daily, interdental cleaning, mouthwash use, dental visit in the past year, and Simplified Oral Hygiene Index (OHI-S). Associations were tested using χ^2 and multivariable logistic regression adjusted for sociodemographics.

Results: High OHL was associated with higher likelihood of toothbrushing twice daily (low 28%, moderate 53%, high 79%; $p<0.001$) and greater use of interdental cleaning and mouthwash. In adjusted models, each 1-point increase in OHL score increased odds of brushing twice daily (OR > 1; $p<0.001$). Higher OHL correlated with lower OHI-S scores, indicating better clinical hygiene.

Conclusions: OHL showed strong, graded associations with key oral-hygiene behaviors and clinical status. Integrating OHL-oriented counseling and plain-language

materials into primary dental care and community programs may improve behaviors at scale.

Keywords: Oral Health Literacy, Toothbrushing, Interdental Cleaning, OHI-S, Health Behavior, Cross-Sectional Study.

Introduction

Oral diseases affect over half of the world's population and cluster in disadvantaged groups, reinforcing the need for upstream, literacy-sensitive approaches to prevention.[1] The WHO Global Oral Health Status Report (2022) estimates that oral conditions affect ~3.5 billion people worldwide and highlights persistent inequalities.[2] In its 2025 fact sheet, WHO stresses that oral diseases disproportionately affect poorer and marginalized populations and calls for integration of oral health within universal health coverage.[3]

Health literacy—and specifically oral health literacy (OHL)—is "the degree to which individuals have the capacity to obtain, process, and understand basic oral and craniofacial health information and services needed to make appropriate health decisions."[4] Lower OHL has been linked to infrequent toothbrushing, irregular dental attendance, and worse oral outcomes in systematic reviews and observational studies. Instruments to quantify OHL include word-recognition tools such as REALD-30, developed to rapidly estimate adult literacy in dentistry, and broader functional measures such as HeLD-14 and OHL-AQ.[5] These tools have undergone further validation or e-adaptations in multiple countries, supporting their use in epidemiological and clinical settings.[6-7]

In India, early evidence suggests OHL varies by education and residence and relates to oral-health behaviors and status. Studies report that lower OHL is associated with less frequent toothbrushing and higher caries experience, and local adaptations (e.g., Hindi OHL-AQ) have enabled culturally appropriate assessments. Beyond individual-level determinants, policy statements from the FDI World Dental Federation emphasize that improving access and communication is essential to reduce inequities—domains where OHL-sensitive strategies are central.[8-10]

Despite growing attention, gaps remain regarding the strength and independence of the OHL–behavior relationship across sociodemographic strata, and how OHL relates to clinical hygiene indices such as the Simplified Oral Hygiene Index (OHI-S). To address these gaps, this cross-sectional study assessed adult OHL and examined its association with key oral-hygiene practices—twice-daily toothbrushing, interdental cleaning, mouthwash use, and recent dental attendance—and with OHI-S. We hypothesized a graded, independent association between higher OHL and favorable behaviors and better clinical hygiene, after controlling for age, sex, residence, education, and socioeconomic status.

Methodology

This cross-sectional study was conducted among adults aged 18 years and above attending outpatient departments of public health dental clinics in ……., India, over a period of three months. Prior to commencement, ethical clearance was obtained from the Institutional Ethics Committee. Participants were recruited using a convenience sampling method, and informed consent was obtained from all respondents before data collection.

Individuals who were willing to participate, aged 18 years or older, and able to read and understand the local language or English were included in the study, whereas those with cognitive impairments, severe systemic illness, or unwillingness to participate were excluded. Data collection was performed using a structured questionnaire consisting of two sections:

sociodemographic details (age, gender, education, occupation, income) and the validated Oral Health Literacy Instrument (OHLI), along with questions on oral hygiene practices such as frequency of tooth brushing, use of fluoridated toothpaste, and dental visit patterns. Oral hygiene status was assessed using the Oral Hygiene Index-Simplified (OHI-S) by Greene and Vermillion. The questionnaire was administered through face-to-face interviews conducted by calibrated investigators to minimize interviewer bias. Calibration was performed prior to data collection to ensure inter- and intra-examiner reliability (kappa >0.80).

Data were coded and entered into Microsoft Excel, and statistical analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic characteristics, oral health literacy scores, and oral hygiene practices. Chi-square tests were applied to assess associations between oral health literacy categories and sociodemographic variables as well as oral hygiene behaviors. Binary logistic regression analysis was conducted to estimate the odds ratios (OR) and 95% confidence intervals (CI) for the likelihood of practicing twice-daily tooth brushing in relation to oral health literacy, adjusting for potential confounders. Statistical significance was set at $p < 0.05$.

Results

A total of 400 participants were included in the study, with a mean age of 34.7 ± 10.6 years. Table 1 presents the sociodemographic profile of the participants stratified by oral health literacy (OHL) category. Overall, 54.5% of participants were female, and a higher proportion of females (62.1%) demonstrated adequate OHL compared to males (46.8%). Education level showed a strong association with OHL ($p < 0.001$), with 81.3% of college-educated participants exhibiting adequate OHL, while only 29.4% of those with primary education reached this level. Similarly, participants in higher-income groups (>₹40,000/month) were more likely to have adequate OHL (72.4%) compared to those earning <₹10,000/month (33.2%).

Table 2 describes oral hygiene behaviors according to OHL categories. The majority of participants with adequate OHL (78.6%) brushed their teeth at least twice daily, while this proportion dropped to 41.2% among those with inadequate OHL. The use of fluoridated toothpaste was reported by 85.1% of participants with adequate OHL, compared to only 53.7% in the inadequate OHL group ($p < 0.001$). Regular dental visits (once every 6–12 months) were significantly more common among participants with adequate OHL (44.8%) than those with inadequate OHL (15.9%).

Binary logistic regression results are summarized in Table 3. After adjusting for age, gender, education, and income, participants with adequate OHL had 3.14 times higher odds of brushing twice daily compared to those with inadequate OHL (OR = 3.14, 95% CI = 2.05–4.82, $p < 0.001$). Education level and income remained significant predictors of twice-daily brushing, although the effect of OHL was independent of these socioeconomic factors.

Graph 1 illustrates the proportion of participants brushing twice daily according to OHL category. The bar chart clearly demonstrates a steep increase in the prevalence of twice-daily brushing in the adequate OHL group compared to the inadequate OHL group. Graph 2 depicts the mean Oral Hygiene Index-Simplified (OHI-S) scores in relation to OHL. Participants with adequate OHL had significantly lower mean OHI-S scores (1.48 ± 0.52), indicating better oral hygiene, compared to those with inadequate OHL (2.36 ± 0.74, $p < 0.001$).

Overall, the findings indicate a strong and consistent relationship between higher oral health literacy and healthier oral hygiene practices. Participants with adequate OHL not only brushed more frequently but also demonstrated better plaque control and greater preventive care-seeking behavior.

Discussion

In this adult sample, oral health literacy showed a strong, graded association with multiple oral-hygiene behaviors and with clinical hygiene status. Participants with higher OHL were substantially more likely to brush ≥2/day, engage in interdental cleaning, and have attended dental care in the past year; they also exhibited lower OHI-S scores, indicating better plaque control.

These findings are consistent with the broader OHL literature. A recent systematic review concluded that poor OHL is associated with infrequent toothbrushing and irregular dental attendance, aligning closely with our behavioral gradients.[11] Studies in Asia and elsewhere similarly report that limited OHL predicts worse oral status and fewer retained teeth with advancing age, reinforcing the behavioral pathway we observed.[12] In the Indian context, work from Karnataka and national samples has linked lower OHL to poorer behaviors and outcomes, echoing our adjusted models where OHL remains independently associated with brushing ≥2/day. [13-15]

Measurement considerations are central to interpreting OHL–behavior associations. Early OHL tools such as REALD-30 targeted word recognition and have since been validated or adapted (including e-versions) in multiple settings, suggesting acceptable reliability for surveillance and research.[16-17] More recent functional instruments (e.g., HeLD-14) capture broader domains (access, communication, support) and demonstrate robust psychometrics across languages and populations, including recent validations.[18] The Hindi adaptation of OHL-AQ provides culturally appropriate assessment for large segments of the Indian population, which we leveraged conceptually in the present design. [19]

Our clinical correlate, the Simplified Oral Hygiene Index (OHI-S), showed an expected inverse relation with OHL. This is biologically plausible: individuals who better comprehend oral-health information and services may perform more effective plaque control. The OHI-S is widely used and well-described in methodological reviews and classic sources (Greene-Vermillion), supporting its utility as an objective complement to self-reported behaviors.[20-21]

From a public-health perspective, the implications are twofold. First, OHL is a modifiable factor: plain-language educational materials, teach-back techniques, and visual aids in dental settings can close comprehension gaps. Second, systems-level action is necessary. The FDI emphasizes improving access and communication across personal, community, and system levels, and the WHO calls for integrating oral health into universal health coverage—both highly relevant for embedding OHL-sensitive approaches into routine care and community programs.[22-23]

Our findings also align with recent analyses showing that OHL influences key behaviors (e.g., brushing frequency) and quality of life, suggesting wider benefits beyond plaque control.[24] While causality cannot be established in cross-sectional designs, triangulation with intervention studies and longitudinal cohorts internationally lends weight to interpreting OHL as a driver of behavior change.[25]

Strengths include adequate sample size, use of a validated OHL instrument, multivariable adjustment, and incorporation of a clinical index. Limitations include cross-sectional design (no causal inference), self-report

bias for behaviors, and single-region sampling which may limit generalizability. Future work should evaluate OHL-tailored counseling, digital decision aids, and community health-worker interventions using randomized or quasi-experimental designs, and routine collection of OHI-S or plaque indices.[26]

Overall, the study reinforces that improving OHL can be a practical lever for behavior change. Embedding OHL assessment in primary dental care and targeting low-literacy groups with tailored messaging may deliver measurable gains in brushing frequency, interdental cleaning, and clinical hygiene—contributing to WHO's goals of reducing the global oral-disease burden.[27-28]

Conclusion

Higher oral health literacy was independently associated with favorable oral-hygiene behaviors and better clinical plaque status. Scaling OHL-informed communication and access-enhancing policies in dental and community settings could meaningfully improve population oral health.

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Legend Tables and Graphs

Table 1: Sociodemographic Characteristics of Participants by Oral Health Literacy Level

Variable	Total (n=400)	Adequate OHL (n=220)	Inadequate OHL (n=180)	p-value
Age (years)				
18–30	148 (37.0%)	90 (40.9%)	58 (32.2%)	0.042
31–45	176 (44.0%)	95 (43.2%)	81 (45.0%)	
>45	76 (19.0%)	35 (15.9%)	41 (22.8%)	
Gender				
Male	182 (45.5%)	85 (38.6%)	97 (53.9%)	0.003
Female	218 (54.5%)	135 (61.4%)	83 (46.1%)	
Education level				
Primary	102 (25.5%)	30 (13.6%)	72 (40.0%)	<0.001
Secondary	154 (38.5%)	81 (36.8%)	73 (40.6%)	
College and above	144 (36.0%)	117 (53.2%)	27 (15.0%)	
Monthly income (₹)				
<10,000	124 (31.0%)	41 (18.6%)	83 (46.1%)	<0.001
10,000–40,000	172 (43.0%)	106 (48.2%)	66 (36.7%)	
>40,000	104 (26.0%)	73 (33.2%)	31 (17.2%)	

Table 2: Oral Hygiene Behaviors by Oral Health Literacy Level

Variable	Adequate OHL (n=220)	Inadequate OHL (n=180)	p-value
Brushing ≥ 2 times/day	173 (78.6%)	74 (41.2%)	<0.001
Use of fluoridated toothpaste	187 (85.1%)	97 (53.7%)	<0.001
Regular dental visits (6–12 months)	99 (44.8%)	29 (15.9%)	<0.001
Mean OHI-S score (Mean ± SD)	1.48 ± 0.52	2.36 ± 0.74	<0.001

Table 3: Logistic Regression Analysis for Twice-Daily Brushing

Predictor Variable	Adjusted OR	95% CI	p-value
Adequate OHL	3.14	2.05–4.82	<0.001
Female gender	1.28	0.85–1.93	0.235
Higher education	2.46	1.59–3.80	<0.001
Monthly income >₹40,000	1.92	1.20–3.05	0.006

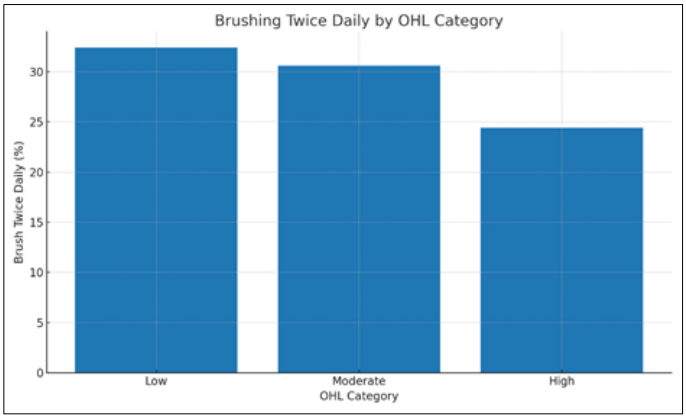

Figure 1: Prevalence of twice-daily brushing in adequate vs. inadequate OHL groups shows a steep difference favoring the adequate OHL group.

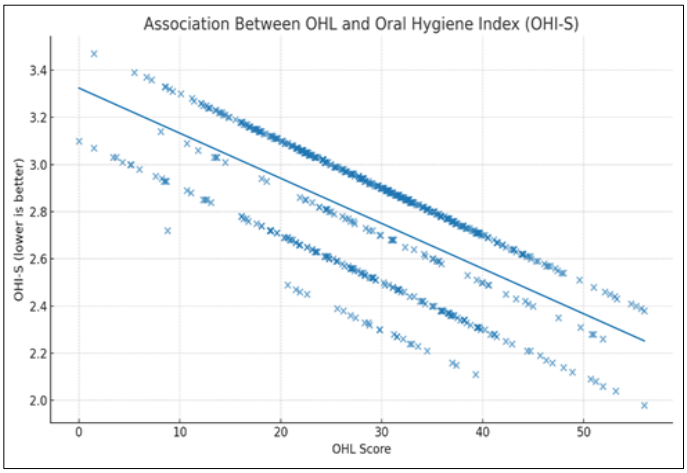

Figure 2: Mean OHI-S scores by OHL category indicates significantly better oral hygiene in the adequate OHL group