

Impact of oral health literacy on oral conditions among different population groups (A systematic review and meta-analysis)

ABSTRACT

Background and Objectives: Literacy in oral health is essential for promoting and preventing oral health issues. Evaluating oral health literacy enables the identification of opportunities to implement interventions at both policy and practice levels, aiming to improve oral health outcomes for individuals and populations. This review aims to conduct a systematic review focused on the association between oral health literacy and oral conditions.

Materials and Methods: The search strategy aimed to retrieve both published and unpublished literature. The databases searched include PubMed, Scopus, Google Scholar, Web of Science, CINAHL, ProQuest, EBSCO- APA PsycInfo, and Shodhganga. After the search, all retrieved citations were examined to determine whether they meet the inclusion requirements. When possible, quantitative data was combined and analysed through a meta-analysis. The methodological validity of the included studies was critically evaluated using the JBI critical evaluation tool. The effect size was provided as a risk ratio or odds ratio for dichotomous data, while standard mean differences was used to depict it for continuous data. Statistics were used to evaluate study heterogeneity. In cases where statistical pooling is not possible, the findings were reported descriptively.

Results: This review incorporated data from 9,044 participants across 22 cross-sectional studies. The results indicated an association between inadequate oral health literacy and individuals experiencing dental caries [OR: 0.36(95% CI 0.15, 0.89) Thirteen studies, 4857 participants], Periodontal pocket [OR: 0.38 (95% CI 0.24, 0.62) five studies, 2651 participants], and tooth loss [OR: 0.57(95% CI 0.45, 0.72) 2 studies, 1281 participants]. However, it's important to note that the studies included in this review were identified as having a high risk of methodological bias.

Conclusion: Oral health Literacy is associated with poor oral health conditions; however, the quality of evidence is low.

Paper Type: Research Article

Keywords: Dental Caries; Gingivitis; Oral Diseases; Oral Health Literacy; Periodontal Disease.

Vattiprolu Sujay Vivek

Department of Public Health Dentistry,
Amrita Vishwa Vidyapeetham, Amrita
School of Dentistry, Kerala, India.

Anju James

Department of Public Health Dentistry,
Amrita Vishwa Vidyapeetham, Amrita
School of Dentistry, Kerala, India.

Chandrashekar Janakiram

* Department of Public Health Dentistry,
Amrita Vishwa Vidyapeetham, Amrita
School of Dentistry, Kerala, India.

(Corresponding author):
sekarcandra@gmail.com

Vijay S Kumar

Department of Public Health Dentistry,
Amrita Vishwa Vidyapeetham, Amrita
School of Dentistry, Kerala, India.

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Introduction

Health Literacy (HL) was recognised as one of five health strategies at the Seventh Global Conference on Health Promotion of the World Health Organization (1), and low health literacy was considered "The Silent Health Epidemic". The degree of education, culture, language, and health system settings of an individual are all related to their level of health literacy (2) and is strongly associated with the individual's health behaviour and utilization of preventive strategies to improve health outcomes (3). Poor self-rated health is linked to non-compliance with health recommendations, a lack of self-management skills, a high mortality risk, and a significant cost burden on health (4). The organizational definition acknowledges that HL and health equality are related, which is achieving the highest degree of health for all individuals (5).

Oral Health Literacy (OHL) is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic oral health information and services needed to make appropriate health decisions" (6). Literacy in oral health is essential for promoting and preventing oral health issues. Over the past ten years, OHL has gained recognition in the dental literature and has been essential in reducing inequities in oral health and advancing oral health (7). Globally, the focus on oral health literacy stems from concerns about inequalities in oral health, especially among marginalized populations. Dental conditions like dental decay and periodontal problems significantly contribute to the overall disease burden worldwide, further emphasizing the importance of addressing this issue (8,9). Extensive evidence

exists regarding the economic burden associated with poor oral health, and it is widely recognized that poor oral health significantly affects one's quality of life (10). Individuals with limited OHL exhibit a lack of dental health knowledge, tend to visit the dentist less frequently and experience more severe oral health issues (11–14). Increased incidences of dental decay (15) and unfavourable gum health (16) have been linked to failure to follow dental advice. The National Institute of Dental and Craniofacial Research (NIDCR), United States strongly advocated for prioritizing OHL, claiming that there are large gaps in oral health status between people with high OHL and those who don't, and low levels of OHL are pervasive and contribute significantly to these differences (9).

Different OHL tools have been developed to improve oral health outcomes, which can be effectively used for planning oral health programs. Tools like Rapid Estimate of Adult Literacy in Dentistry REALD- 99 (17), Rapid Estimate of Adult Literacy in Dentistry REALD-30 (18), Oral Health Literacy Instrument (OHLI) (11), Test of Functional Health Literacy in Dentistry (TOFHLiD) (19), 84-item Rapid Estimate of Adult Literacy in Medicine and Dentistry (REALM-D) (20) Comprehensive Measure of Oral Health Knowledge (CMOHK) (21), Oral Health Literacy Assessment (OHL-AQ) (22), Health Literacy in Dentistry scale (HELD-14) (12) were some of the most frequently used OHL tools.

Evaluating oral health literacy enables the identification of opportunities to implement interventions at both policy and practice levels, aiming to improve oral health outcomes for individuals and populations.

This aligns with the underlying rationale for measuring broader health literacy, as it enables informed decision-making to promote overall well-being (9). Policy makers could benefit from significant information and evidence from a comprehensive literature review that identifies and summarises the scientific literature on the relationship between OHL and oral disease. In February 2023, four systematic reviews on closely related topics were found after a search of PubMed, JBI. Database of Systematic Reviews and Implementation Reports and PROSPERO.

A systematic review was conducted in 2009 by Dewalt and Hink, assessing the relationship between parent/child literacy and child health outcomes. (23). This review included articles published between 1980 and 2008. Health outcomes included measurements of morbidity, health behaviours, health knowledge, utilization of healthcare resources, and oral health outcomes were not assessed.

Among the four identified systematic reviews, three were conducted by Firmino et al.

a. In 2018, a systematic review was conducted solely to examine the association between parental/caregiver OHL and children's oral health outcomes. (24) The limitation of this review was that it considered only dental caries as oral health outcomes.

b. In 2017, another study was conducted to assess the relationship between oral health literacy and oral health conditions; the results of this study were confined only to narrative synthesis of association without performing

quantitative meta-analysis due to heterogeneity in the studies.(25)

c. Another systematic review assessed the association of oral health literacy with oral health behaviours, perception of knowledge, and dental treatment-related outcomes, and found that no association exists between OHL and any of the outcomes investigated. Oral diseases were not considered for the outcome assessment. (26)

Post-2018, numerous primary studies have assessed the influence of OHL on oral diseases. So, updating the evidence on OHL and oral disease is essential. Hence this study was planned to develop comprehensive evidence on the association between Oral Health Literacy and oral health outcomes.

Review question

What is the impact of Oral Health literacy on oral diseases among different population groups?

Materials and Methods

This review was conducted in a systematic manner in accordance with JBI methodology for reviews of aetiology and risk (27). PROSPERO registration number: CRD42023397294.

Experimental and observational studies evaluating association between OHL and oral diseases were included in this review. Baseline data was considered for the experimental studies. Publications lacking primary data or quantitative results and case series/case reports, abstracts, and conference presentations/abstracts were excluded.

Search strategy

The search technique intends to retrieve both peer- and non-peer-reviewed research. A preliminary PubMed search was conducted,

and then each article's title and abstract was analysed for text and index terms. The identified keywords and index terms were used to create a search strategy that is customised for each bibliographic database. Identified research was assessed for any additional pertinent references. All articles, irrespective of the language in which they are published, are considered for this systematic review. Studies published in other language was translated to English using DeepL translate. To promote more sensitivity, search range based on year of publication was not considered. The databases searched for published studies include PubMed, Scopus, Google Scholar, Web of Science, CINAHL, ProQuest, EBSCO- APA PsycInfo, Shodhganga. Index terms and keywords used for search strategy was ("Mouth Disease") OR ("Mouth Diseases "[MeSH Terms])) OR ("Oral health")) OR ("Dental caries")) OR ("Dental caries"[MeSH Terms])) OR ("Periodontal diseases"[MeSH Terms])) OR ("Periodontal diseases")) OR (Gingivitis[MeSH Terms])) OR (Gingiv*)) OR (Malocclusion)) OR (Malocclusion[MeSH Terms])) OR ("Fluorosis, Dental"[MeSH Terms])) OR ("Fluorosis, Dental")) OR ("Oral manifestations"[MeSH Terms])) OR ("Oral manifestation")) OR ("Mouth Neoplasm")) OR ("Mouth Neoplasms"[MeSH Terms])) OR ("Oral mucosal lesion*")) OR ("Tooth loss")) OR ("Tooth loss"[MeSH Terms]).

Study selection

All identified citations were uploaded into Covidence after the search (<https://app.covidence.org/reviews/active>) and removed duplicate citations. Two independent reviewers (V.S.K and V.S.V) screened titles and abstracts to remove

irrelevant citations. The complete text of the remaining citations was analysed against the eligibility criteria by two independent reviewers (V.S.K and V.S.V). Any disagreement between the reviewers during the study selection process was resolved by the third reviewer (C.J). Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram was used to report the search and selection process results (27).

Assessment of methodological quality

Two independent reviewers (A.J and V.S.K) critically evaluated the methodological quality of the included studies using standardized JBI critical appraisal instruments (28) for observational and experimental studies. Like the selection process, any disagreement between the reviewers was settled with the aid of third reviewer (C.J). Selected studies were described narratively in a table along with the outcomes for each critical appraisal criterion (yes, no, or unclear). Each study received an overall score based on several "Yes" responses ranging from 0 to 8. Finally, studies were classified based on their score: 0–3, low quality; 4–6, medium quality; and 7–8, high quality. (29) No quantitative studies were excluded based on critical evaluation.

Data extraction

Data was extracted from included studies by two independent reviewers (A.J and V.S.V) utilising the tailored data extraction tool. The extracted data contains information regarding author of the study, year of publication, location, study design, sample size, age group and tool to measure both oral health Literacy and oral conditions. Authors

were not contacted as there is no missing data.

Data synthesis

Where feasible, studies were combined for quantitative meta-analysis utilising JBI SUMARI. Effect sizes were provided as relative risk ratios or odds ratios for dichotomous data, and standardised mean differences with their 95 percent confidence intervals for continuous data. The χ^2 test and the I² index were used to evaluate the statistical heterogeneity's magnitude. Random effect models were used for statistical analysis. The results were presented narratively where statistical pooling is not feasible. A funnel plot was also generated to assess the publication bias.

Assessing certainty in the findings

Grading the certainty of the evidence in systematic reviews of prognostic factors was done using the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) technique (30). The outcomes presented in the SoF were the risk of oral diseases, including dental caries, oral hygiene status, gingivitis, periodontal disease and tooth loss.

Results

Study Inclusion: A comprehensive literature search yielded a total of 3,036 identified records. After removing 1,661 duplicate articles from the 3,036 records, 1,375 unique records remained for review based on their titles and abstracts. Following the review of titles and abstracts, 1,237 records were determined not to meet the eligibility criteria. Consequently, 137 articles were selected for full-text evaluation. Out of these, 115 were excluded because they did not meet the eligibility criteria, resulting in 22 studies

considered for the systematic review. The search and selection process for study inclusion are depicted in Fig. 1 using a PRISMA flowchart.

Methodological Quality: All 22 included studies underwent critical appraisal for methodological quality. None of the studies were excluded based solely on their methodological quality assessment. Among the included studies, nine studies (31–39) were rated as High quality, while the remaining thirteen studies (40–52) were rated as medium quality. No studies were rated as low quality. Most of the included studies used validated and reliable tools to measure exposure and outcome. However, most of them did not adequately address confounding issues (Q6). The methodological quality of all 22 publications is summarized in Supplementary file (Table 1).

Characteristics of the Included Studies

Table 1 provides a summary of the details of the included 22 articles for systematic review. All included studies utilized a cross-sectional study design. These studies were published between 2012 and 2022 and were conducted in English. Six studies (31,32,35,36,38,46) assessed OHL among children, while the rest focused on the general population (33,34,37,39–45,47–52).

The Oral Health Literacy instruments used in the different studies was as follows; BREALD-30 (31,36,38,44), REALD-30 (45,48,50), HELD-14 (47,52), OHL-AQ (34,46), OHL-M (35), OHLA-B (40), CMOHK (41), CMOHL-A (32), OHIP-4 (42), R-OHLI (43), ThREALD-30 (33), OHL-AQ-H (37), Questionnaire (39), OHL-Ishikava (49), HLS-4 (51). The most frequent being BREALD-30 (n=4) and REALD-30 (n=3).

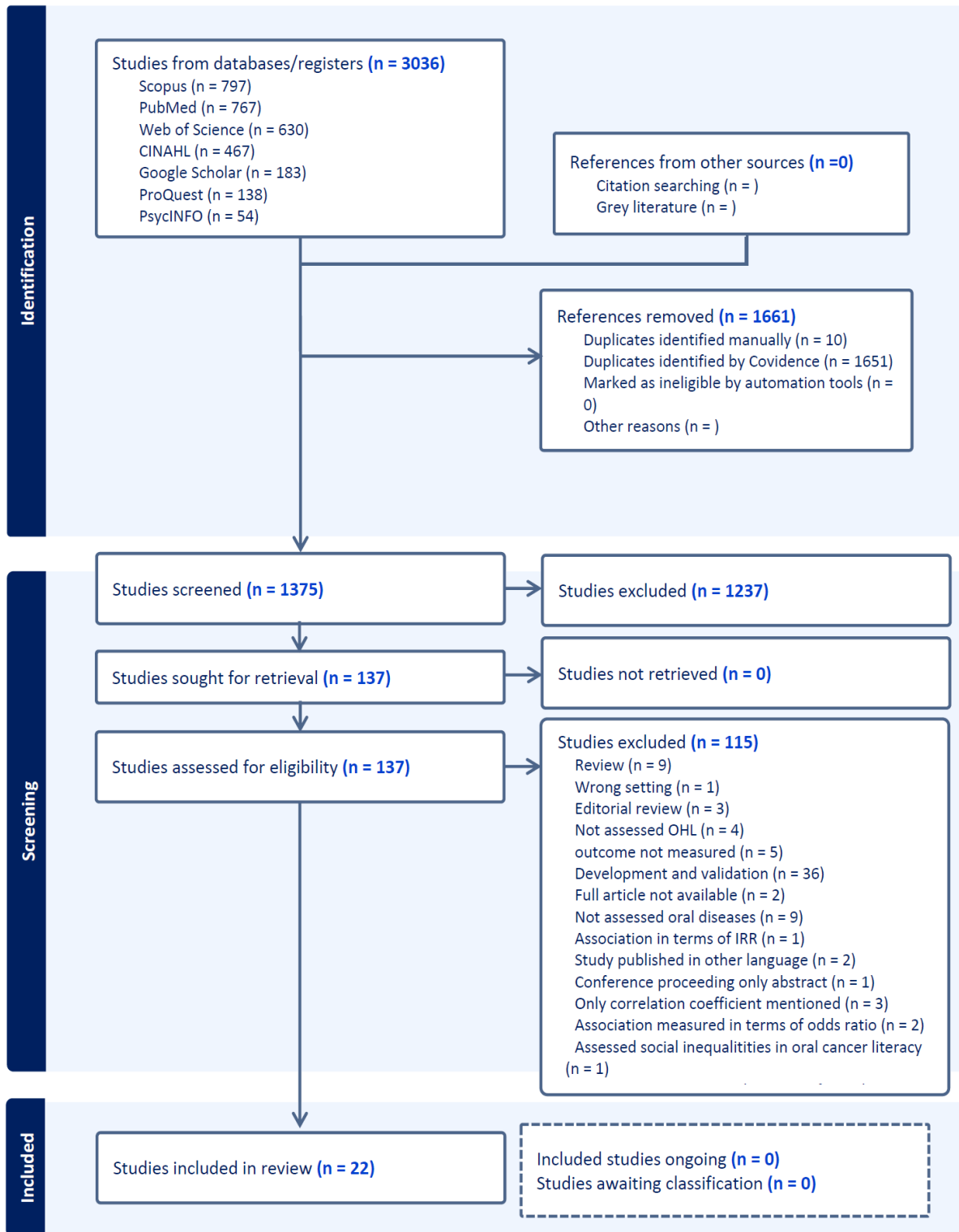


Figure 1. Impact of Oral Health Literacy on oral conditions among different population groups - A Systematic Review and Meta Analysis

Table 1. Characteristics of Included Studies

Author	Country	Study design	Sample size	Study population	Age group [in years]	Measurement of oral health literacy	Oral Conditions	Measurement of outcome
Adil 2020	Malasia	Cross-sectional study	230	parent/pre-school children	3-6; 22-51	OHL-M	Dental Caries	dmft Index
Bado 2022	Brazil	Cross-sectional study	250	Adult population	≥18	OHLA-B	Periodontal disease	CPI INDEX
Barasuol 2019	Brazil	Cross-sectional study	206	children & parents	6-12; 35.8	BREALD-30	Dental Caries	DMFT/dmft Index
Baskaradoss 2018	USA	Cross-sectional study	150	Adult population	53.3	CMOHK	periodontitis	CPI INDEX
Baskaradoss 2019	Saudi Arabia	Cross-sectional study	300	adult/child	37.9, 8.3	CMOHK-A	Dental Caries	DMFT/deft
Batista 2018	Brazil	Cross-sectional study	248	Adults	≥18	OHIP-14	Dental Caries	DMFT Index
Blizniuk 2015	Belarus	Cross-sectional study	281	Adults	18-60	R-OHLI	Tooth loss	Sillness-loe plaque index(PI)
Chaichit 2020	Thailand	Cross-sectional study	1110	Adults	20-59	THREALD-30	Periodontal disease	CAL &PPD
Das 2020	India	Cross-sectional study	600	Adults	18-64	OHL-AQ	Oral health status	WHO oral health assessment form 2013
Dutra 2019	Brazil	Cross-sectional study	746	Adult	15-19	BREALD-30	Dental caries	NVAD INDEX
Kesavan 2019	India	Cross-sectional study	457	Adults	17-25	REALD-30	Oral hygiene status	OHI-S Index
Khodadadi 2016	Iran	Cross-sectional study	384	Children	21-84 months	OHL-AQ	Oral health status	dmft Index
Mialhe 2022	Brazil	Cross-sectional study	920	Adults	>18	HELD-14	Tooth loss	Questionnaire

Author	Country	Study design	Sample size	Study population	Age group [in years]	Measurement of oral health literacy	Oral Conditions	Measurement of outcome
Montes 2019	Brazil	Cross-sectional study	415	Pre-school children	4-5	BREALD-30	Dental Caries And Plaque	PUFA INDEX, dmft, Plaque index.
Wehmeyer 2014	USA	Cross-sectional study	121	Adults	>18	REALD-30	Periodontal health status	CAL & PPD
Vyas 2016	India	Cross-sectional study	170	Adults	>18	OHL-AQ-H	Dental caries	DMFT INDEX
Ueno 2013	Japan	Cross-sectional study	589	Adults	>20	Questionnaire	Tooth loss and Dental caries	OHI Index
Sukhabogi 2020	India	Cross-sectional study	605	Adults	31.5	OHL-Ishikawa, 2008	Tooth loss, Gingivitis, Dental caries	DMFT Index
Singh 2020	India	Cross-sectional study	137	Adults	>18	REALD-30	Periodontal disease	CAL & PPD
Silva-Junior 2020	Brazil	Cross-sectional study	137	Adults	23-69	HLS-14	Periodontal disease	CPI INDEX
Neves 2020	Brazil	Cross-sectional study	740	Children	12	BREALD-30	Dental caries	Self-assessment intraoral examination (Th-OHS criteria)
Sermsuti-anuwat 2020	Thailand	Cross-sectional study	361	Adults	>60	HELD-14	Tooth loss	

OHL-M*-Bahasa Malaysia version of the Oral Health Literacy Instrument, OHLA-B*-Oral Health Literacy Instrument-Brazilian (OHLA-B), BREALD-30*-Brazilian version of the Rapid Estimate of Adult Literacy in Dentistry, CMOHK*-Comprehensive Measure of Oral Health Knowledge, CMOHK-A*- Comprehensive Measure of Oral Health Knowledge-Arabic, OHIP-14*- Oral Health Impact Profile ,R-OHLI*- Russian language version of the Oral Health Literacy Instrument, ThREALD-30*- Thai version of the Rapid Estimate of Adult Literacy in Dentistry-30 items, (OHL-AQ)*- linguistically adapted prevalidated 17 item Oral Health Literacy Adult Questionnaire, REALD-30*- Rapid Estimate of Adult Literacy in Dentistry, HELD-14*-Health Literacy in Dentistry Scale, OHL-AQ-H*- oral health literacy – adult questionnaire, HLS-14*- 14-item Health Literacy.

OHL and Dental Caries

Thirteen studies (31, 32, 35–38, 42–46, 49, 51) with a total sample size of 4857 individuals assessed the relationship between dental caries and OHL. Among these, eight studies (31, 35–38, 42, 49, 51) examined dental caries as a binary outcome, and five (32, 43–46) studies considered continuous measures.

a) OHL and Dental caries (Binary outcome)

Individuals with adequate OHL were found to be 64% less likely to have dental caries

compared to those with inadequate OHL [OR: 0.36 (95% CI 0.15, 0.89), eight studies, 2689 participants]. However, substantial heterogeneity (94%) was observed across the studies (Fig. 2a).

b) OHL and Dental caries (Continuous outcome)

Dental caries favoured individuals without oral health literacy when assessed [SMD: -0.22 (95% CI -0.32, -0.11), five studies, 2168 participants]. Significant heterogeneity (16%) was found among these studies (Fig. 2b).

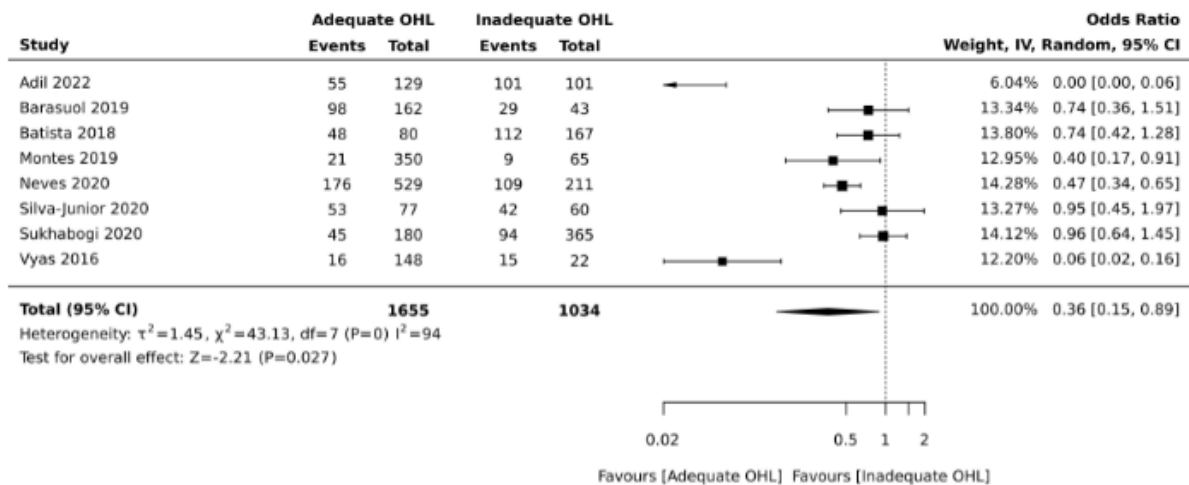


Figure 2a. Dental caries (Proportion) and OHL

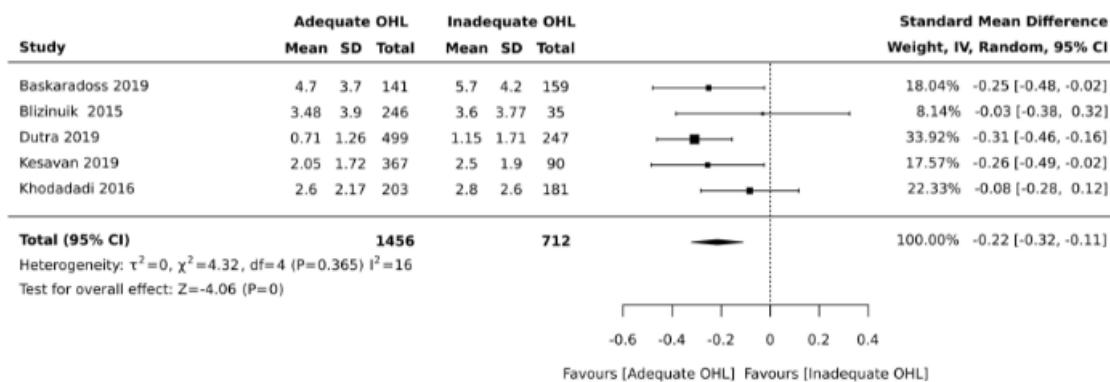


Figure 2b. Dental caries (Continuous) and OHL

Periodontal Disease and OHL:

Fourteen studies (33, 34, 36, 38–43, 45, 48–51) involving 9497 individuals assessed the impact of periodontitis and OHL.

1. OHL and Dental Plaque

Four studies (36, 42, 43, 51) with 1072 have assessed the impact of OHL with Dental Plaque.

a) OHL and Dental Plaque (Binary outcome)
No significant difference in presence of dental plaque in individuals with adequate and inadequate oral health literacy [OR: 0.71 (0.46, 1.08), three studies, 791 participants], $I^2=33\%$ (Supplementary file. Image 1).

b) OHL and Dental Plaque (Continuous outcome)

Only one study (43) have assessed OHL and Dental Plaque with Continuous measures where plaque was not significantly associated with oral health literacy level, ($P>0.05$).

2. OHL and Gingivitis

Six studies (34, 42, 43, 45, 49, 51) with 2268 participants have assessed the impact of OHL with Gingivitis.

a) OHL and Gingivitis (Binary outcome)

Four studies with 1,530 participants found no significant difference between individuals with adequate and inadequate OHL regarding the presence of gingivitis [OR: 0.83 (95% CI -

0.34, 2.04)] ($p=0.691$), with substantial heterogeneity (93%) among the studies (Supplementary file. Image 2a).

b) OHL and Gingivitis (Continuous outcome)
Two studies with 738 participants found no significant difference between individuals with adequate and inadequate OHL [SMD: -0.29 (95% CI -1.17, 0.60)] ($p=0.522$), with substantial heterogeneity (94%) across the studies (Supplementary file. Image 2b).

3. OHL and Periodontal pocket

Six studies (33, 34, 40, 41, 43, 49) assessed Periodontal pocket with OHL.

a) OHL and Periodontal Pocket (Binary outcome)

Individuals with adequate OHL were 62% less likely to have periodontal pockets compared to those with inadequate OHL [OR: 0.38 (95% CI 0.24, 0.62), five studies, 2615 participants], ($p=0.001$), with substantial heterogeneity (81%) among the studies (Fig. 3).

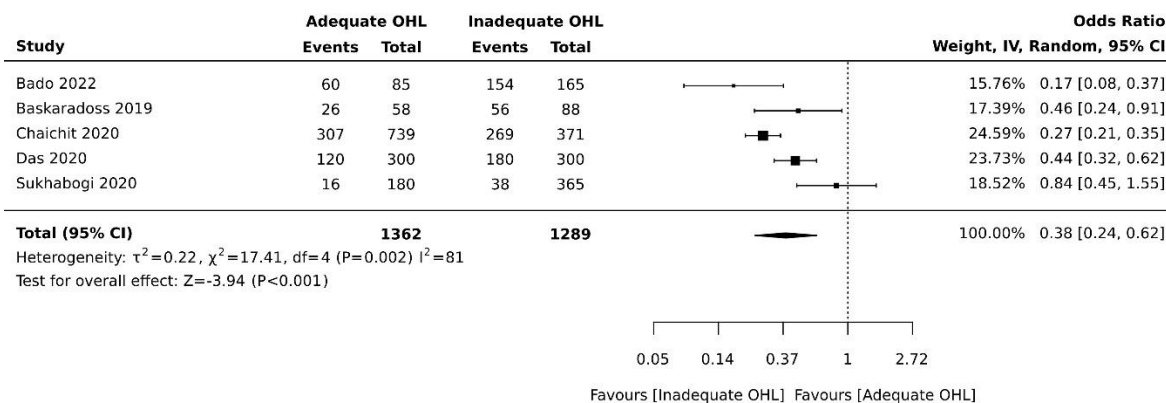


Figure 3. Periodontal pocket (Proportion) and Oral Health Literacy

b) OHL and Periodontal Pocket (Continuous outcome)

Only one study (43) assessed OHL and Periodontal pocket with continuous measures showed significant association ($p<0.001$) between OHL and Periodontal pocket

4. OHL and Clinical Attachment Loss

Seven (34, 38, 42, 48–51) studies assessed impact of Oral health literacy on Clinical Attachment Loss

a) OHL and Clinical Attachment Loss (Binary outcome)

Six studies (34, 42, 48–51) did not find a significant difference between individuals with adequate and inadequate OHL regarding the presence of clinical attachment loss [OR: 0.90 (95% CI -0.40, 2.04), six studies, 1967 participants], with substantial heterogeneity (91%) across the studies (Supplementary file. Image 3).

b) OHL and Clinical Attachment Loss (Continuous outcome)

Only one study (38) assessed OHL and Clinical Attachment Loss with continuous measures which showed there was no significant association, ($P > 0.05$).

Tooth Loss and OHL

Two studies (47, 52) reported a significant association between individuals with tooth loss and OHL. Individuals with adequate OHL were 43% less likely to have tooth loss compared to those with inadequate OHL [OR: 0.57 (95%CI-0.45, 0.72), two studies, 1,281 participants], ($p < 0.001$), with no observed heterogeneity (0%) among the studies (Fig. 4).

Summary of Findings presents relevant information of grading the certainty of the evidence (Fig. 5).

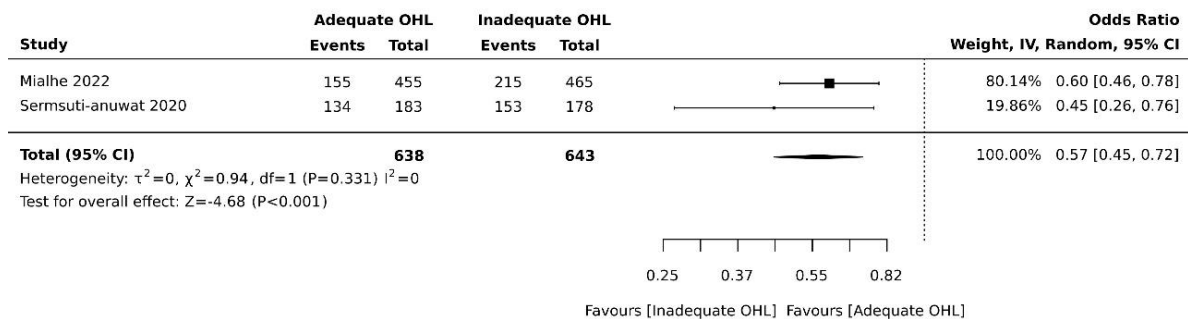


Figure 4. Tooth loss (Proportion) and Oral Health Literacy

Discussion

We conducted a systematic review with the objective of establishing evidence regarding the correlation between oral health literacy and the status of oral diseases, specifically contextualized within the domain of oral health (53). Universally, the available evidence consistently demonstrates that an individual's knowledge of health is significantly linked to their engagement in preventive health behaviors. This knowledge significantly influences the practice of maintaining oral health and can be effectively managed through simple daily techniques. Consequently, overall health literacy refers to the extent of an individual's knowledge and capacity to comprehend and implement

appropriate healthy behaviors. Numerous primary studies in the literature have explored the association between poor health literacy and the incidence of adverse health conditions.

OHL and dental caries

Our findings indicate a significant association between Oral Health Literacy (OHL) and dental caries. Individuals with adequate OHL exhibited a 64% lower likelihood of experiencing dental caries compared to those with inadequate OHL. However, it's important to note that this evidence stems from cross-sectional study designs, lacking the temporal causation perspective.

A funnel plot was generated which revealed no publication bias (Fig. 6 and Fig.7).

Impact of adequate Oral health literacy compared to inadequate oral health literacy for Dental Caries among Children and Adults

Patient or population: Dental Caries among Children and Adults

Setting:

Intervention: Impact of adequate Oral health literacy

Comparison: inadequate oral health literacy

Outcomes	N _e of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with inadequate oral health literacy	Risk difference with impact of adequate Oral health literacy
Dental Caries assessed with: Proportion of dental caries assessed be different indices	2689 (8 observational studies)	⊕○○○ Very low ^a	OR 0.36 (0.15 to 0.89)	494 per 1,000	234 fewer per 1,000 (366 fewer to 29 fewer)
Dental Caries (Dental Caries) assessed with: Mean DMF/dmft Scale from: 0 to 32	2168 (5 observational studies)	⊕○○○ Very low ^{a,b,c}	-	-	SMD 0.22 SD higher (0.32 higher to 0.11 higher)
ORAL HYGEINE assessed with: Measured by presence or absence of dental plaque	791 (3 observational studies)	⊕○○○ Very low ^{a,b}	OR 0.71 (0.46 to 1.08)	451 per 1,000	83 fewer per 1,000 (177 fewer to 19 more)
Gingivitis assessed with: measured by presence or absence of gingival inflammation by sillnes and loe plaque index	1530 (4 observational studies)	⊕○○○ Very low ^{a,b,c}	OR 0.83 (0.34 to 2.04)	451 per 1,000	46 fewer per 1,000 (233 fewer to 175 more)
Periodontal disease assessed with: presence or absence of clinical attachment loss by CPI index	1967 (6 observational studies)	⊕○○○ Very low ^{a,b,c}	OR 0.90 (0.40 to 2.04)	300 per 1,000	22 fewer per 1,000 (154 fewer to 166 more)
Tooth loss assessed with: presence or absence of periodontal pocket and clinical attachment loss by CPI Index	1281 (2 observational studies)	⊕⊕⊕ Moderate	OR 0.57 (0.45 to 0.72)	572 per 1,000	140 fewer per 1,000 (196 fewer to 82 fewer)

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).

CI: confidence interval; OR: odds ratio; SMD: standardised mean difference

GRADE Working Group grades of evidence

High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Explanations

a. Studies are cross sectional in nature and were high or unclear risks for methodological quality

b. Confidence intervals of included studies do overlap

c. Each individual study estimates varies

Figure 5. Summary of Findings presents relevant information of grading the certainty of the evidence

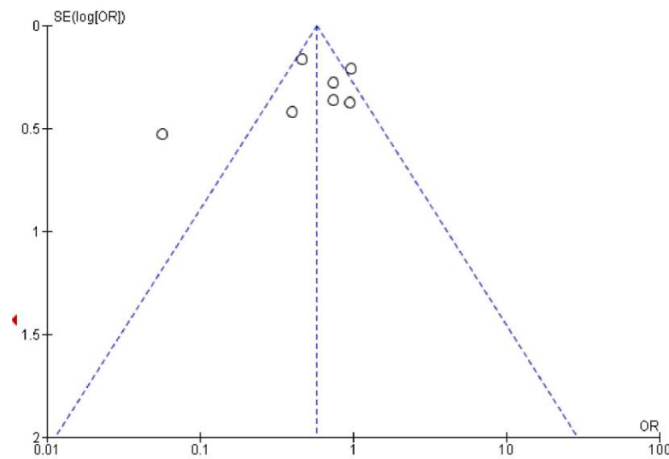


Figure 6. Funnel plot of included studies (Dental caries)

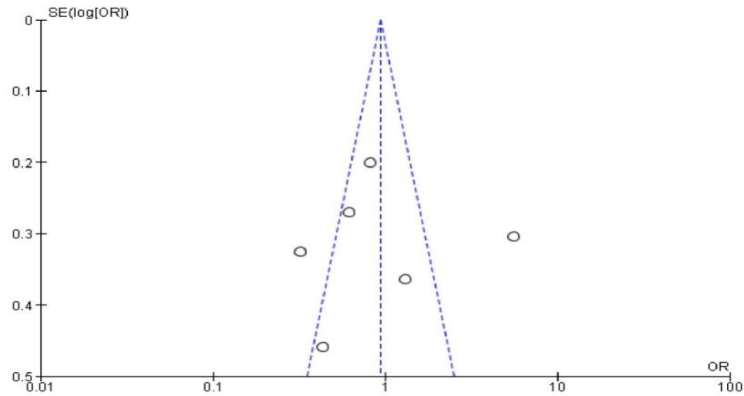


Figure 7. Funnel plot of included studies (Clinical Attachment Loss)

The quality of evidence is categorized as low due to a high heterogeneity of 94% and a lack of consistency among individual study estimates. This heterogeneity can be attributed to the utilization of different scales for assessing oral health literacy, the inclusion of different age groups, and varying contextual factors. Clinical heterogeneity and variance in outcome assessment tools may have contributed to this effect. Nonetheless, both the proportion and mean difference in the Decayed, Missing, and Filled Teeth (DMFT) index indicate a notable difference between oral conditions in the two groups. However, this difference is not very significant in terms of the mean change in dental caries between the two groups.

OHL and periodontal disease

Our assessment of the impact of OHL on periodontal disease revealed that individuals with adequate OHL had a 62% reduced likelihood of having periodontal pockets compared to individuals with inadequate OHL.

Similar to the dental caries analysis, the quality of evidence is considered low due to a high heterogeneity of 81% and a lack of consistency in individual study estimates.

Furthermore, no significant difference was observed between individuals with adequate and inadequate OHL regarding the presence of clinical attachment, with a high heterogeneity of 91% and a lack of consistency in individual study estimates.

Tooth loss and OHL

Regarding the impact of OHL on tooth loss, we found that individuals with adequate OHL were 43% less likely to experience tooth loss compared to those with inadequate OHL. The studies consistently reported a significant association between tooth loss and OHL. The absence of heterogeneity (0%), suggests consistency in the results. This implies that the association between OHL and tooth loss is not influenced by substantial variations across different study populations or methodologies. The results highlight the potential public health implications of improving oral health literacy. Developing targeted interventions to enhance OHL levels in the population could contribute to preventing tooth loss and promoting overall oral health.

The existing methodology for assessing oral health literacy and oral conditions in the literature exhibits substantial discrepancies.

These discrepancies may arise from differences in tools(54) used for measuring oral health literacy, categorization of individuals into adequate and inadequate literacy levels, as they are variation in the thresholds used to distinguish between health literacy level (55). Another potential source of variation is the adjustment for confounding factors (56), as various confounding risk factors can impact an individual's ability to comprehend oral health literacy and , not all included studies uniformly adjusted their estimates for these confounders.

Additionally, we were unable to identify covariates such as age, gender, education level, and access to information that affect overall literacy in our included studies. Subgroup analysis was not possible due to data unavailability. Adjusting for these confounders (57) may have led to more accurate estimates. Therefore, it is essential to recognize that an individual's oral health literacy is influenced by numerous barriers, facilitators, or mediators, which necessitate further exploration in primary studies. Inconsistent and high heterogeneity may also be attributable to insufficient statistical power in some included studies to detect differences.

Recent reviews (58) have explored the relationship between oral health literacy and oral health outcomes across various patient populations, but no specific patient group was singled out. Their findings align with our study, suggesting an association between oral health literacy and oral disease outcomes. However, these reviews did not delve into issues of utilization, availability, and accessibility of care. Other reviews focused

on specific populations, such as emergency room patients, children, adults, and ambulatory care patients, and similarly reported findings consistent with our present review. However, they did not provide conclusive insights into disease outcomes. The certainty of evidence in our review is affected by the cross-sectional design of our included studies, differences in measurement methods, varying cut-off points or thresholds, and the presence of inappropriate confounders.

Implications of practice and policy making

The association between oral health literacy and oral health outcomes necessitates empirical validation to inform healthcare policy and practice. Within the context of India, a comprehensive assessment of oral health literacy across demographics can empower patients, healthcare professionals, and policymakers in making informed decisions.

Findings of this study advocate for integrating chairside dental education into clinical practice, aimed at enhancing oral health literacy by imparting knowledge on proper oral hygiene practices such as effective toothbrushing techniques and flossing. Moreover, utilizing the findings from the study can help direct national initiatives aimed at enhancing the community's health-seeking behavior, so elevating the overall health standards.

This can be achieved through policy interventions such as mandating a standardized oral health curriculum starting from primary education, implementing supervised toothbrushing programs in schools, and organizing community-based

oral health education sessions as part of dental public health initiatives, particularly in regions with lower health literacy levels. Enhancing the oral health awareness in the community will bring down the overall disease burden in the population which is a primary preventive strategy which is deemed essential for low- and middle-income countries.

Conclusion

In conclusion, our review suggests that individuals with adequate oral health literacy have a reduced likelihood of experiencing oral health conditions. However, the quality of evidence supporting this association is very low. Future research should focus on developing universally applicable tools for assessing oral health literacy and its relationship with oral disease conditions. Additionally, the study designs in included studies should address the temporal aspect of the association between oral health literacy and oral conditions.

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