

Health Belief Model Construct Associated with Oral Health Behaviors: A Meta-Analysis

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ABSTRACT

Background: Daily toothbrushing and regular dental check-ups are essential components in the prevention of oral diseases. However, the low level of adherence to these behaviors highlights the need for a more comprehensive review of the evidence to understand the influencing factors. This study aimed to estimate the strength of association between constructs of the Health Belief Model (HBM) and oral health behaviors.

Subjects and Method: This systematic review and meta-analysis searched PubMed and Google Scholar for full-text cross-sectional studies published between 2015 and 2025. Eligibility criteria were defined using the PICO framework: P= children; I= high perceived susceptibility, high perceived benefit, and high self-efficacy; C= low perceived susceptibility, low perceived benefit, and low self-efficacy; and O= daily toothbrushing and dental check-ups. A total of 14 eligible studies were included and analyzed using Review Manager 5.3.

Results: A total of 14 articles were included in this meta-analysis, originating from Norway, Spain, Australia, Taiwan, Iran, the United Kingdom, France, Ethiopia, Japan, the United States, and China. High perceived susceptibility increased the likelihood of daily toothbrushing (aOR= 1.31; 95% CI= 1.10 to 1.56; p= 0.003; I²= 55%) and dental check-ups (aOR= 1.39; 95% CI= 1.19 to 1.62; p<0.001; I²= 64%). High perceived benefit increased the likelihood of daily toothbrushing (aOR= 1.64; 95% CI= 1.39 to 1.94; p < 0.001; I²= 0%) and dental check-ups (aOR= 1.48; 95% CI= 1.31 to 1.66; p= 0.001; I²= 52%). High self-efficacy markedly increased the likelihood of daily toothbrushing (aOR= 6.43; 95% CI= 1.62 to 25.48; p< 0.001; I²= 97%) and dental check-ups (aOR= 2.38; 95% CI= 1.67 to 3.39; p< 0.001; I²= 98%).

Conclusion: High perceived susceptibility, high perceived benefit, and high self-efficacy significantly improve oral health behaviors in children..

Keywords: health belief model, oral health, toothbrushing, children.

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BACKGROUND

Oral health behaviors, such as brushing teeth at least twice a day and attending

regular dental check-ups, are among the key pillars of oral disease prevention. Dental caries and periodontal disease

remain major public health problems, affecting quality of life, causing pain, and increasing the economic burden of treatment (Legget et al., 2025).

Despite various health promotion efforts, adherence to recommended toothbrushing practices and routine dental visits remains relatively low. Several studies have shown that psychosocial factors—such as perceived susceptibility to disease, belief in the benefits of prevention, and confidence in one's ability to perform healthy behaviors—affect individual compliance. However, findings reported across studies are often inconsistent (Sumita et al., 2022).

The Health Belief Model (HBM) is a widely used theoretical framework to explain why individuals are willing or unwilling to engage in health behaviors. Constructs such as perceived susceptibility, perceived benefit, and self-efficacy are believed to play a crucial role in shaping individuals' decisions to maintain oral health. Nevertheless, research findings still show considerable variability regarding the strength of the association between these constructs and oral health behaviors (Liu et al., 2024).

This situation highlights the need for a deeper understanding of the psychological factors influencing toothbrushing and dental check-up behaviors. Without clear evidence, interventions designed to promote preventive behaviors risk being less effective and poorly targeted (Tadakamadla et al., 2021).

Despite the growing number of primary studies, the available evidence remains fragmented. Previous studies have examined different HBM constructs and oral health outcomes, with varying effect estimates across populations and settings. Some studies assessed only one HBM construct or one oral health behavior, while others reported weak or statistically non-significant associations. Consequently, the

overall magnitude and consistency of the associations between perceived susceptibility, perceived benefit, self-efficacy, and oral health behaviors remain unclear (Sumita et al., 2022; Liu et al., 2024).

To address this research gap, the present study quantitatively synthesizes adjusted effect estimates for three HBM constructs and examines their associations with two specific preventive oral health behaviors: daily toothbrushing and dental check-ups. The novelty of this study lies in the separate subgroup analysis of each HBM construct across both oral health outcomes. This approach allows the strength and consistency of the associations to be compared and provides more focused evidence for determining which psychological constructs should receive greater emphasis in theory-based oral health promotion programs.

This study are expected to enrich the literature on the association between perceived susceptibility, perceived benefit, and self-efficacy with oral health behaviors. Such evidence can serve as a reference for healthcare professionals and policymakers in designing more targeted, theory-based interventions that deliver meaningful outcomes in the community.

This study aimed to estimate the magnitude of the association between Health Belief Model (HBM) constructs and oral health behaviors.

SUBJECTS AND METHOD

1. Study Design

This meta-analysis study review and these articles were obtained from databases namely PubMed and Google Scholar. The keywords used in searching for articles in the database are “Health Belief Model” OR “HBM” OR “HBM construct” AND “oral health” AND “toothbrushing” AND “dental

care“ AND “dental examination” AND “Multivariate analysis”.

2. Step of Meta Analysis

This study employed the following steps of meta-analysis:

- 1) Formulate research questions in the PICO, including: P= Children; I= high perceived susceptibility, high perceived benefit, high self-efficacy; C= low perceived susceptibility, low perceived benefit, low self-efficacy; O= daily tooth-brushing and dental check-ups.
- 2) Search for primary study articles from various electronic and non-electronic databases.
- 3) Conduct screening and critical assessment of primary research articles.
- 4) Perform data extraction and synthesize effect estimates into RevMan 5.3.
- 5) Interpret and conclude the results.

3. Inclusion Criteria

The inclusion criteria used in this study were full-text articles with a cross-sectional study design. Articles were published in English and Indonesian from 2015-2025. The final results of the study were reported using multivariate analysis with adjusted Odds Ratio (aOR) and 95% confidence intervals (CI).

4. Exclusion Criteria

Exclusion criteria in this study were different operational definitions, anonymous research, articles that did not use univariate and bivariate analysis, and articles that used quasi experiment, protocol study, pilot study, cohort, case control, and randomized controlled trial study.

5. Operational Definition of Variables

Perceived susceptibility refers to an individual's perception of their vulnerability or likelihood of experiencing oral

diseases (e.g., dental caries or periodontal disease), measured using a questionnaire.

Perceived benefit is the individual's belief in the advantages of daily tooth-brushing and regular dental check-ups in preventing oral health problems.

Self-Efficacy represents an individual's level of confidence in their ability to consistently brush their teeth daily and attend regular dental check-ups, as measured through a questionnaire.

Daily Toothbrushing is defined as the behavior of brushing teeth at least twice a day (morning and night), as self-reported by respondents.

Dental Check-Ups are defined as the behavior of visiting a dental health professional at least once within the past six months, based on respondents' self-reports.

6. Instruments

The instrument in this study was the PRISMA Flow Diagram using primary study quality assessment for a cross-sectional meta-analysis research design.

7. Data analysis

Articles were collected and data processing was carried out using the Review Manager application (RevMan 5.3) to determine the influence between knowledge, self-efficacy and social support and the use of HIV testing among homosexuals. Data processing was presented in the form of forest plots and funnel plots.

RESULTS

The article search process from online primary study publications yielded 14 selected articles, representing several continents, namely Asia, Europe, America, Oceania, and Africa.

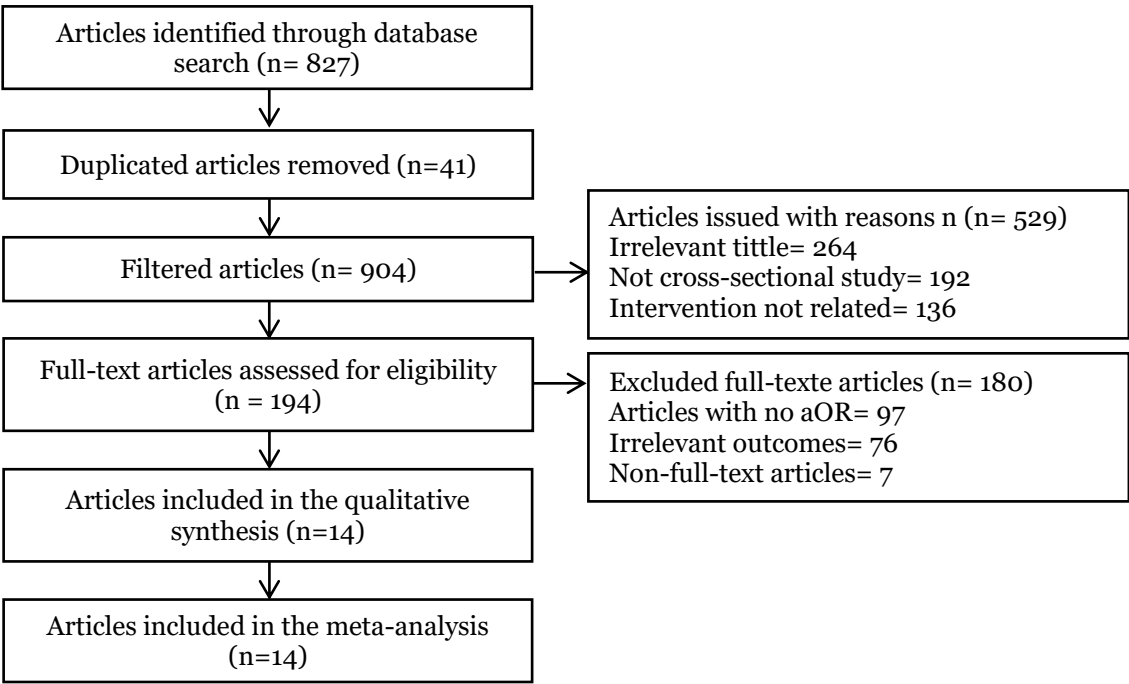


Figure 1. Results of PRISMA Flow diagrams the relationship between Health Belief Model constructs and oral health behaviors

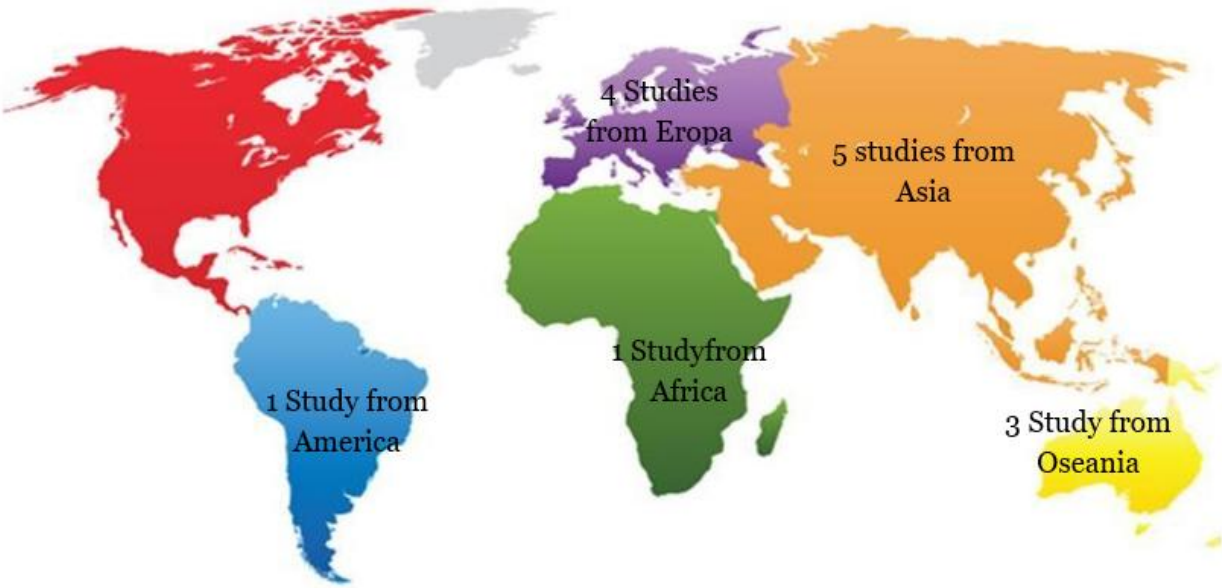


Figure 2. Research distribution map the relationship between Health Belief Model constructs and oral health behaviors

Figure 2 illustrates the geographic distribution of studies included in the meta-analysis the relationship between Health Belief Model constructs and oral health

behaviors. The studies were conducted across four continents: Asia, Europe, the Americas, Oceania, and Africa.

Table 1. The quality assessment result on the relationship between Health Belief Model constructs and oral health behaviors

Primary Study	Criteria													Total
	1				2		3		4	5	6		7	
	a	b	c	d	a	b	a	b			a	b		
Arora et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Berzinski et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Blaizo et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Carrillo-Diaz et al. (2015)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Chou et al. (2025)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Godarzi et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Hiratsuka et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Kebede et al. (2022)	2	0	1	2	2	2	2	2	2	2	2	2	2	24
Legget et al. (2025)	2	0	1	2	2	2	2	2	2	2	2	2	2	24
Liu et al. (2024)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Mortazavi et al. (2025)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Nasir & Vu 2022	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Sumita et al. (2022)	2	0	1	2	2	2	2	2	2	2	2	2	2	24
Tadakamdla et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	2	26

Description of the question criteria:

1. Formulation of research questions in PICO acronym:
 - a. What is the population in the study primary is the same as the population in PICO meta-analysis?
 - b. What is the operational definition of intervention (intervention), namely the status of exposure (exposed) in primary studies is the same as that definition intended in meta-analysis?
 - c. What is the comparison (comparison), namely status not exposed (unexposed) is used Primary studies are the same as that definition intended in meta-analysis?
 - d. What is the outcome variable being studied? in primary studies is the same as that definition intended in meta-analysis?
2. method for selecting research subjects:
 - a. Descriptive cross-sectional study (prevalence): Is the sample randomly selected?
 - b. Analytical cross-sectional study: Are samples randomly or purposively selected??
3. Methods for measuring comparisons (intervention) and outcome variables:
 - a. Are both exposure or intervention and outcome variables measured with the same instruments in all primary studies?
 - b. If variables are measured on a categorical scale, are the cut-offs used the same across primary studies?
4. Bias of the design:
 - a. How much is the response rate?
 - b. Is non-response related to outcomes?
5. Methods to control confounding:
 - a. Is there any confusion in the results or conclusions of the primary study?
 - b. Have primary study researchers used appropriate methods to control the effects of confusion?
6. Method of statistical analysis:
 - a. Is there any confusion in the results or conclusions of the primary study?

- b. Have primary study researchers used appropriate methods to control the effects of confusion?
7. Is there any confusion in the results or

8. conclusions of the primary study?

Description of scoring:

0= No; 1= Hesitate; 2= Yes

Table 2. Description of the primary study the association between health belief model (HBM) constructs and oral health behavior

Author (Year)	Country	Sample	Population	Intervention	Comparison	Outcome
Arora et al. (2020)	Australia	703	Elementary school students aged 5–14 years	High perceived benefit	Low perceived benefit	Daily tooth-brushing
Berzinski et al. (2020)	Australia	239	Children aged 0–4 years	High self-efficacy	Low self-efficacy	Dental check-ups
Blaizo et al. (2020)	France	2413	Children aged <18 years	High perceived susceptibility	Low perceived susceptibility	Daily tooth-brushing and dental check-ups
Carrillo-Diaz et al. (2015)	Spain	250	School-aged children aged 12–14 years	High perceived susceptibility	Low perceived susceptibility	Dental check-ups
Chou et al. (2025)	Taiwan	250	Pre-school children aged 3–5 years	High self-efficacy	Low self-efficacy	Dental check-ups
Godarzi et al. (2019)	Iran	416	Fifth-grade elementary school girls aged 10–12 years	High perceived susceptibility, high perceived benefit, high self-efficacy	Low perceived susceptibility, low perceived benefit, low self-efficacy	Daily tooth-brushing
Hiratsuka et al. (2019)	United States	100	Children aged 0–6 years	High self-efficacy	Low self-efficacy	Daily tooth-brushing
Kebede et al. (2022)	Ethiopia	610	Elementary school students, aged ≥7 years	High self-efficacy	Low self-efficacy	Dental check-ups
Legget et al. (2025)	United Kingdom	3,372	Children aged <18 years	High self-efficacy	Low self-efficacy	Dental check-ups
Liu et al. (2024)	China	1,562	Pre-school children aged 3–6 years	High perceived susceptibility, high perceived benefit, high self-efficacy	Low perceived susceptibility, low perceived benefit, low self-efficacy	Daily tooth-brushing and dental check-ups
Mortazavi et al. (2025)	Iran	449	Children aged 6–12 years	High perceived susceptibility, high perceived benefit, high self-efficacy	Low perceived susceptibility, low perceived benefit, low self-efficacy	Dental check-ups
Nasir & Vu 2022	Norway	416	Childrens in Norway	High perceived susceptibility, perceived benefit, & self-efficacy	Low perceived susceptibility, low perceived benefit, low self-efficacy	Daily tooth-brushing

Author (Year)	Country	Sample	Population	Intervention	Comparison	Outcome
Sumita et al. (2022)	Japan	748	Children aged <18 years	High perceived susceptibility, high perceived benefit	Low perceived susceptibility, low perceived benefit	Daily tooth-brushing and dental check-ups
Tadakamdla et al. (2021)	Australia	606	Children aged 2-8 years	High perceived susceptibility	Low perceived susceptibility	Daily tooth-brushing

Table 3. aOR and 95% CI data the association between perceived susceptibility and oral health behaviors (daily toothbrushing and dental check-ups)

(Author, Year)	aOR	95% CI	
		Lower Limit	Upper Limit
Daily toothbrushing			
Blaizot et al. (2020)	1.47	1.06	2.05
Goodarzi et al. (2019)	1.78	1.14	2.77
Liu et al. (2024)	1.08	0.85	1.37
Nasir & Vu (2022)	1.64	0.97	2.77
Tadakamadla et al. (2021)	1.44	1.21	1.72
Dental check-ups			
Blaizot et al. (2020)	1.63	1.30	2.03
Carrillo-Diaz et al. (2015)	1.47	1.11	1.95
Liu et al. (2024)	1.38	1.18	1.62
Mortazavi et al. (2025)	1.56	1.26	1.96
Sumita et al. (2022)	1.06	0.88	1.28

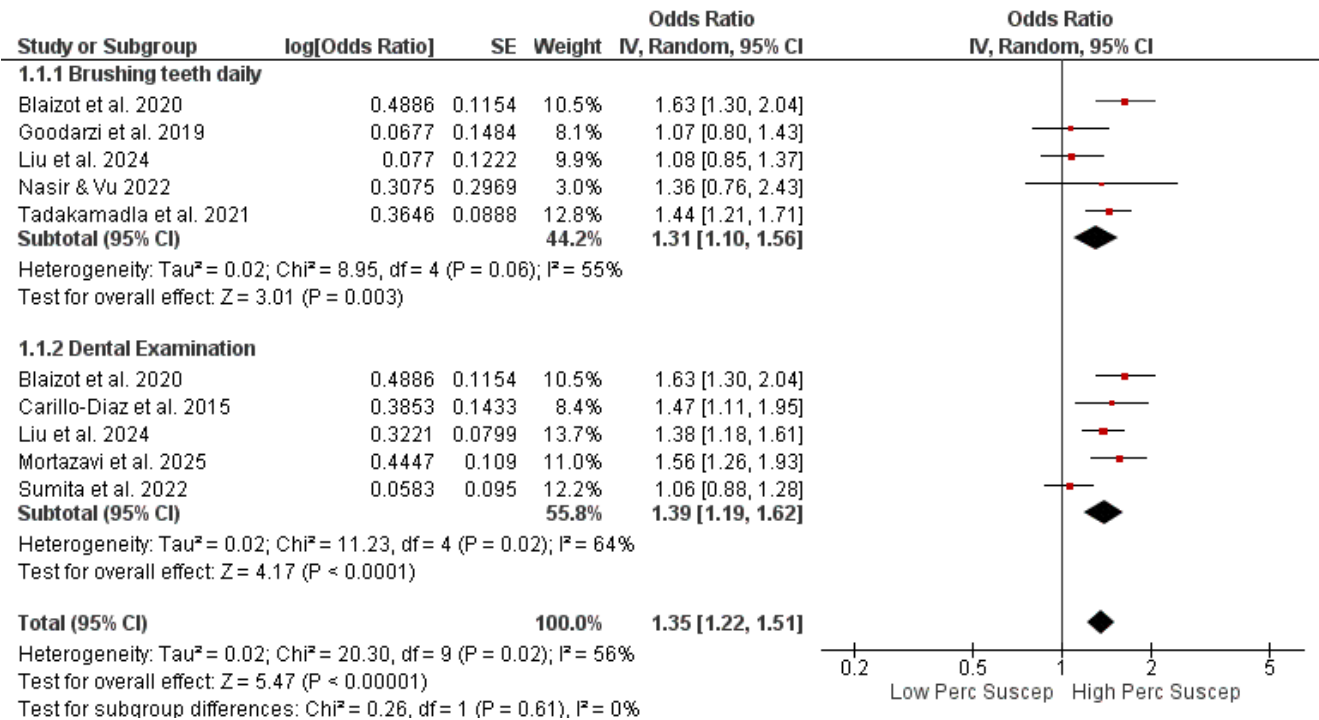


Figure 3. Forest plot of subgroup analysis on the association between perceived susceptibility and oral health behaviors

The forest plot in Figure 3 demonstrates an association between perceived susceptibility and oral health behaviors (daily toothbrushing and dental check-ups).

Five studies showed that children whose parents had high perceived susceptibility were 1.31 times more likely to brush their teeth daily than children whose parents had low perceived susceptibility (aOR= 1.31; 95% CI= 1.10 to 1.56; $p= 0.003$; $I^2= 55\%$). The I^2 value indicated moderate heterogeneity among the included studies. Another five studies showed that children

whose parents had high perceived susceptibility were 1.39 times more likely to undergo dental check-ups than children whose parents had low perceived susceptibility (aOR= 1.39; 95% CI= 1.19 to 1.62; $p< 0.001$; $I^2= 64\%$). This I^2 value indicated substantial heterogeneity among the studies. Both pooled associations were statistically significant, although the heterogeneity results showed moderate to substantial variation in effect estimates across the included studies.

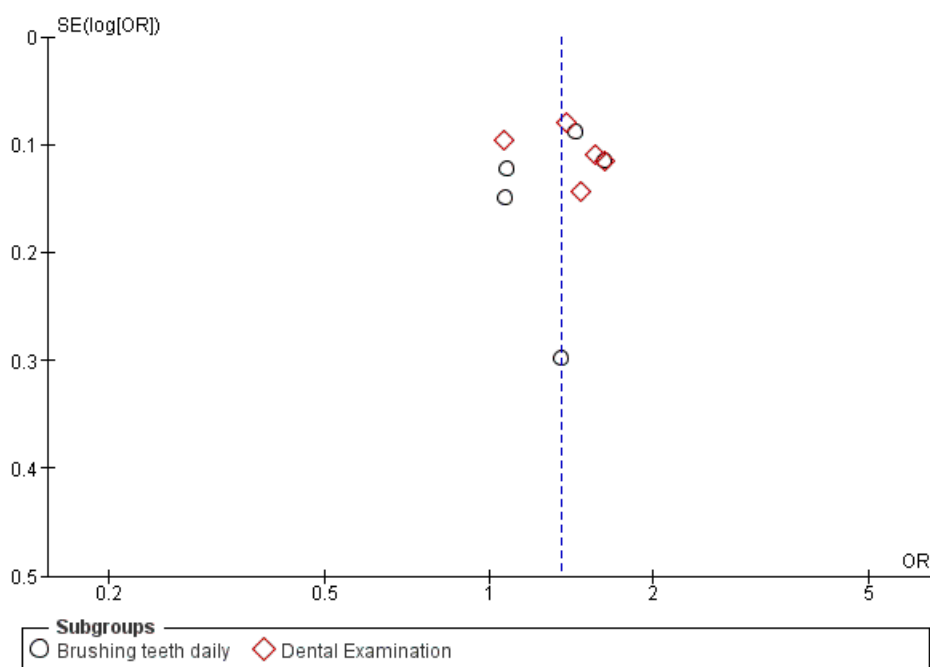


Figure 4. Funnel plot of subgroup analysis on the association between perceived susceptibility and oral health behaviors

Figure 4 presents the funnel plot for the association between perceived susceptibility and oral health behaviors. The plot shows that the distribution of effect estimates across studies is symmetrical on both sides of the vertical line representing

the overall effect estimate, indicating no evidence of publication bias in the studies examining the association between perceived susceptibility and oral health behaviors.

Table 4. aOR and 95% CI data the association between perceived benefits and oral health behaviors (daily toothbrushing and dental check-ups)

(Author, Year)	aOR	95% CI	
		Lower Limit	Upper Limit
Daily toothbrushing			
Arora et al. (2020)	1.74	1.17	2.60
Goodarzi et al. (2019)	1.78	1.14	2.77
Liu et al. (2024)	1.47	1.06	2.05
Nasir & Vu (2022)	1.64	0.97	2.77
Sumita et al. (2022)	1.68	1.25	2.26
Dental check-ups			
Liu et al. (2024)	1.22	0.97	1.54
Mortazavi et al. (2025)	1.02	0.64	1.10
Sumita et al. (2022)	1.68	1.25	2.26

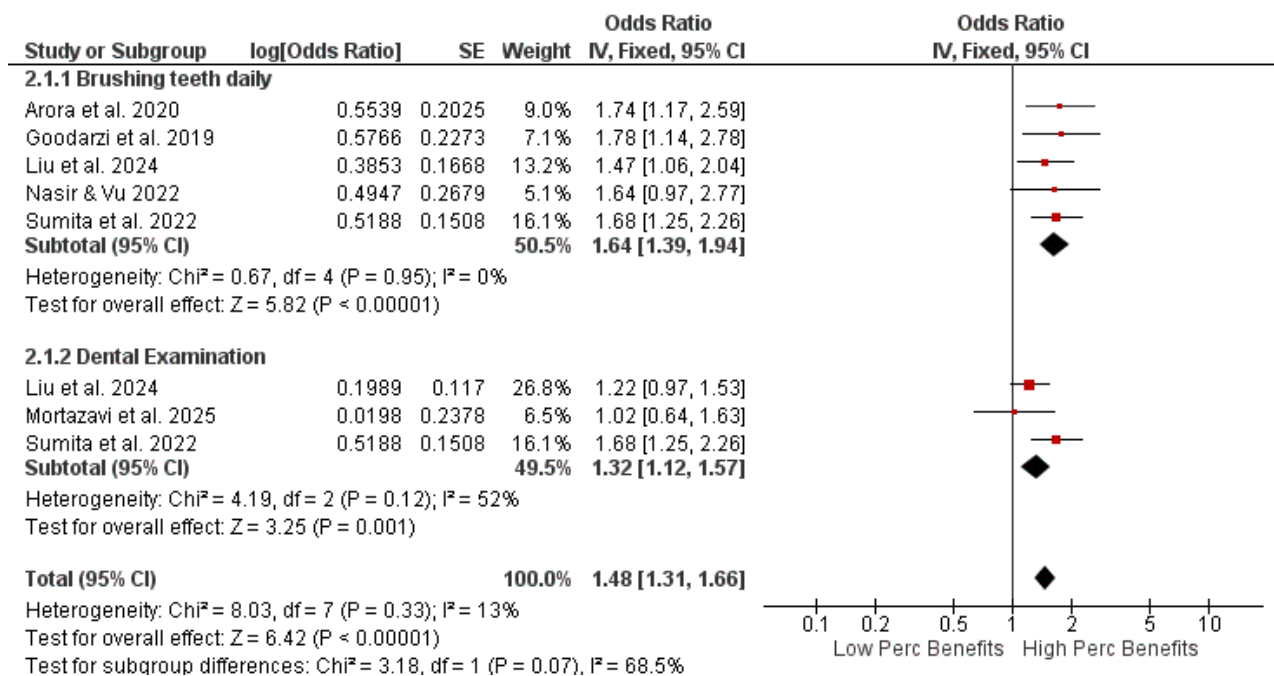


Figure 5. Forest plot of subgroup analysis on the association between perceived benefits and oral health behaviors

The forest plot in Figure 5 illustrates the association between perceived benefit and oral health behaviors (daily toothbrushing and dental check-ups).

Five studies indicated that children whose parents had high perceived benefit were 1.64 times more likely to brush their teeth daily compared with children whose parents had low perceived benefit (aOR= 1.64; 95% CI= 1.39 to 1.94; p< 0.001).

Three additional studies showed that children whose parents had high perceived benefit were 1.48 times more likely to undergo dental check-ups compared with children whose parents had low perceived benefit (aOR= 1.48; 95% CI= 1.31 to 1.66; p= 0.001). Both associations were statistically significant. The analysis of daily toothbrushing showed no observed heterogeneity among the included studies (I²=

0%), indicating that the effect estimates were consistent across studies. Meanwhile, the analysis of dental check-ups showed

moderate heterogeneity ($I^2 = 52\%$), indicating some variation in the effect estimates among the included studies.

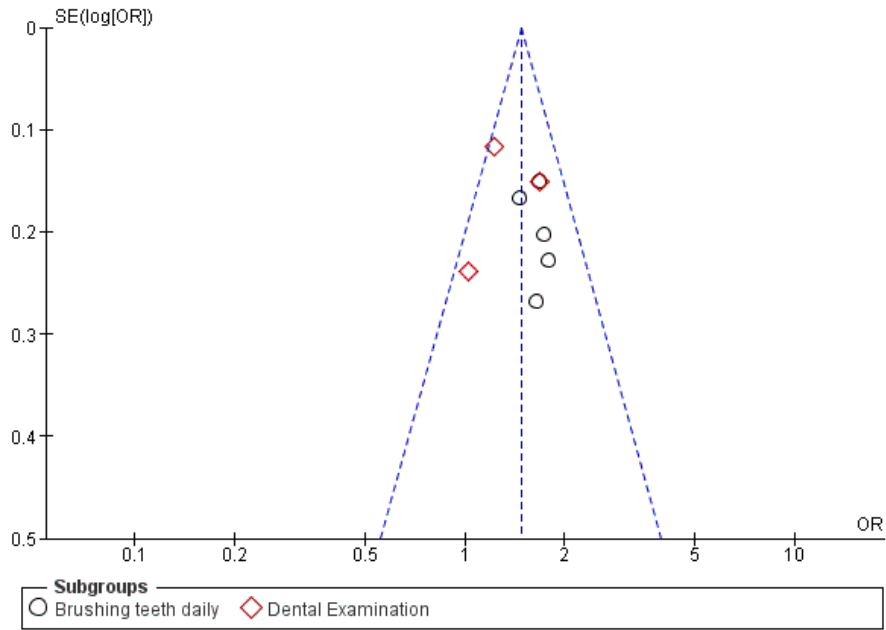


Figure 6. Funnel plot of subgroup analysis on the association between perceived benefits and oral health behaviors

Figure 6 presents the funnel plot for the association between perceived benefit and oral health behaviors. The plot demonstrates that the distribution of effect estimates across studies is symmetrical on

both sides of the vertical line representing the overall effect estimate, indicating no evidence of publication bias in the studies examining the association between perceived benefit and oral health behaviors.

Table 5. aOR and 95% CI data the association between self-efficacy and oral health behaviors (daily toothbrushing and dental check-ups)

(Author, Year)	aOR	95% CI	
		Lower Limit	Upper Limit
Daily toothbrushing			
Berzinski et al. (2020)	6.66	3.03	33.3
Goodarzi et al. (2019)	1.11	0.83	1.49
Hiratsuka et al. (2019)	49.10	11.46	188.14
Liu et al. (2024)	20.59	12.62	33.60
Nasir & Vu (2022)	2.14	1.24	3.68
Dental check-ups			
Chou et al. (2025)	1.06	1.02	1.12
Kebede et al. (2022)	1.05	0.99	1.12
Legget et al. (2025)	6.66	4.00	11.1
Liu et al. (2024)	11.73	8.45	16.28
Mortazavi et al. (2025)	1.50	1.21	1.91

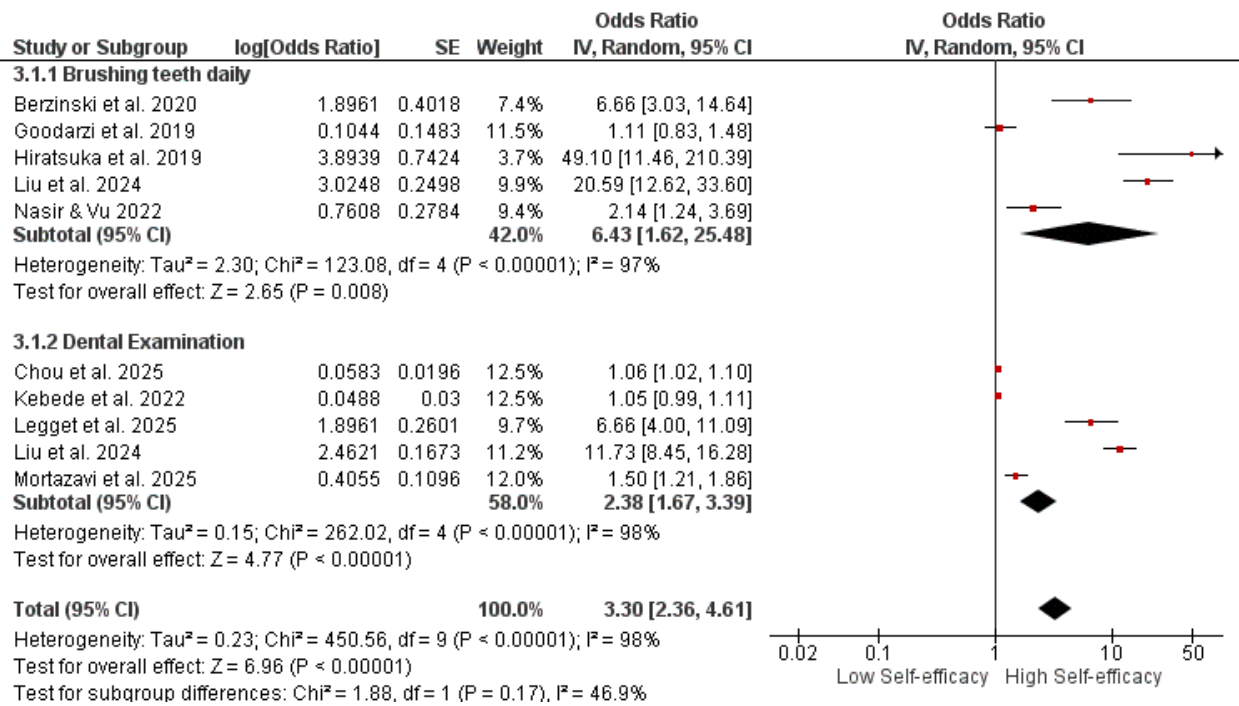


Figure 7. Forest plot of subgroup analysis on the association between self-efficacy and oral health behaviors

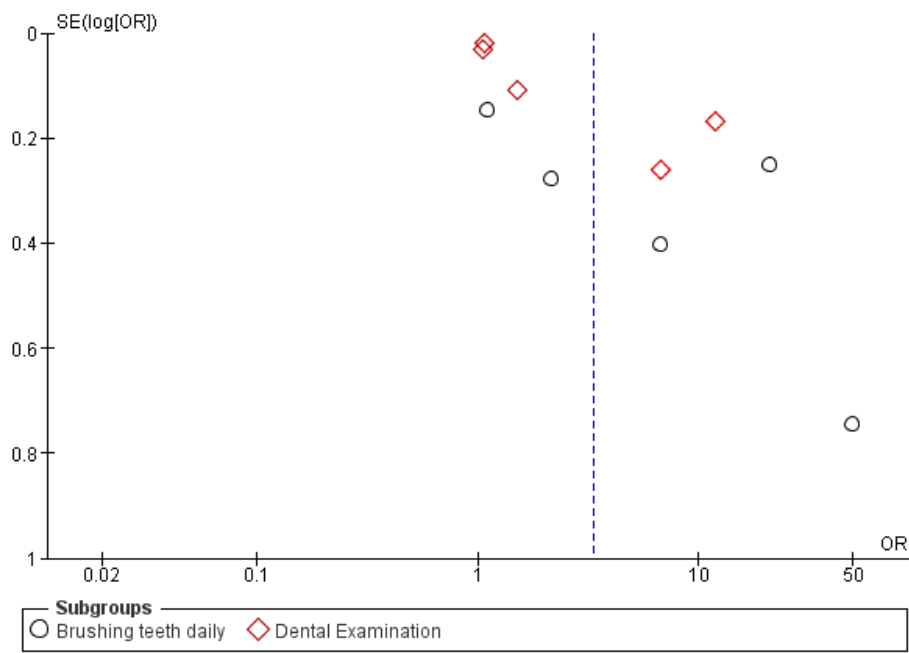


Figure 8. Funnel plot of subgroup analysis on the association between self-efficacy and oral health behaviors

The forest plot in Figure 7 illustrates the association between self-efficacy and oral health behaviors, including daily tooth-brushing and dental check-ups. Five studies

indicated that children whose parents had high self-efficacy were 6.43 times more likely to brush their teeth daily compared with children whose parents had low self-

efficacy (aOR= 6.43; 95% CI= 1.62 to 25.48; $p= 0.008$). Another five studies showed that children whose parents had high self-efficacy were 2.38 times more likely to undergo dental check-ups compared with children whose parents had low self-efficacy (aOR= 2.38; 95% CI= 1.67 to 3.39; $p< 0.001$). Both associations were statistically significant. The heterogeneity was considerable for both daily toothbrushing ($I^2= 97\%$) and dental check-ups ($I^2= 98\%$), indicating substantial variation in effect estimates among the included studies. Therefore, the pooled estimates should be interpreted with caution.

Figure 8 presents the funnel plot for the association between self-efficacy and oral health behaviors. The plot shows an asymmetrical distribution of effect estimates on either side of the vertical line representing the overall effect estimate. This indicates the presence of publication bias. Because the asymmetry is located on the right side of the vertical line, consistent with the position of the diamond in the forest plot, the publication bias suggests an overestimation of the true effect of self-efficacy on oral health behaviors.

DISCUSSION

Perceived susceptibility and oral health behaviors

This meta-analysis found that children whose parents had high perceived susceptibility were more likely to brush their teeth daily and attend regular dental check-ups. These findings align with the Health Belief Model (HBM), which emphasizes that individuals' beliefs about their susceptibility to disease are key drivers of preventive behavior. Liu et al. (2024) reported that parents who believe their children are at risk of developing dental problems are more likely to pay attention to their children's oral hygi-

ene habits and ensure regular access to dental care.

Increasing perceived susceptibility may foster a sense of responsibility and encourage parents to take preventive measures. In daily practice, this can be observed in parents' involvement in supervising their children's toothbrushing, scheduling dental visits, and regulating dietary intake that may contribute to caries. These findings are consistent with previous studies reporting a positive association between perceived susceptibility and toothbrushing practices as well as dental visits among children (Carriello-Diaz et al., 2015).

The implications of these findings are important for health promotion efforts. Educational strategies that highlight the risks of dental caries and their impact on children's health can raise parental awareness and motivate them to support proper oral health behaviors. Effective communication strategies should include prevalence data, case examples, and information about benefits to make the message more relevant and easily understood (Arora et al., 2020).

Nevertheless, excessively high-risk perception can lead to unnecessary anxiety or overcautious behaviors (Hiratsuka et al., 2019). Therefore, health promotion messages should balance information about risks with positive calls to action, encouraging parents to act without inducing excessive fear.

Further evidence indicates that perceived susceptibility can be strengthened through theory-based oral health education. Goodarzi et al. (2019) identified HBM constructs as important predictors of oral health behaviors among schoolchildren. In a randomized controlled trial, Sanaeinasab et al. (2022) reported that HBM-based education significantly improved oral health beliefs, attitudes, and behaviors, with perceived susceptibility showing the greatest

change among the HBM constructs. Mohammadkhah et al. (2022) also found significant improvements in perceived susceptibility, self-efficacy, behavioral intention, and oral health practices following an HBM-based educational intervention. Furthermore, Wilson et al. (2018) demonstrated that perceived susceptibility can be measured as a valid component of parental beliefs regarding their children's oral health. Collectively, these findings indicate that risk information should be specific, understandable, and accompanied by practical recommendations that parents and children can implement.

Perceived benefit and oral health behaviors

This meta-analysis showed that children whose parents had high perceived benefit were more likely to brush their teeth daily and attend routine dental check-ups. This finding is consistent with the Health Belief Model, which highlights that belief in the benefits of preventive actions plays an important role in the adoption of healthy behaviors (Mortazavi et al., 2025). Parents who recognize the benefits of toothbrushing and dental check-ups tend to be more consistent in guiding and supporting their children to practice these behaviors.

Parental understanding of the benefits of prevention not only increases their motivation to encourage toothbrushing but also influences family decisions to seek dental care regularly. Effective education about the benefits of oral health behaviors can strengthen this belief, thereby increasing parental involvement in ensuring correct toothbrushing habits and timely dental visits (Tadakamadla et al., 2021).

These findings underscore the importance of health promotion interventions that emphasize both the short- and long-term benefits of preventive behaviors. Messages should be designed in a realistic and

positive manner to strengthen perceived benefit, motivate action, and ultimately contribute to reducing the prevalence of dental problems in children.

Additional evidence reinforces the importance of perceived benefit in translating oral health knowledge into preventive action. Liu et al. (2024) found that higher parental perceived benefit was associated with brushing twice daily and parent-assisted toothbrushing among preschool children. Educational studies have also shown that HBM-based interventions can strengthen beliefs about the benefits of oral hygiene and improve preventive oral health practices among children and their parents (Sanaeinasab et al., 2022; Ashoori et al., 2022; Mohammadkhah et al., 2022).

These findings suggest that educational messages should clearly explain the direct benefits of daily toothbrushing and routine dental attendance, including preventing dental caries, maintaining gingival health, and identifying oral health problems at an earlier stage. Clear and practical information may help parents consider preventive care valuable and worth incorporating into family routines.

Self-efficacy and oral health behavior

This meta-analysis demonstrated that high parental self-efficacy was associated with a higher likelihood of children brushing their teeth daily and undergoing regular dental check-ups. This finding is in line with the Health Belief Model, which underscores the role of self-efficacy as a primary determinant of health behavior (Liu et al., 2024).

Parents with higher self-efficacy are generally better at overcoming barriers, establishing toothbrushing routines, and ensuring that children receive recommended dental examinations. These results are consistent with previous research reporting a positive association between parental self-

efficacy and children's oral health behaviors (Blaizot et al., 2020).

These findings highlight the importance of interventions designed to enhance self-efficacy, such as skill-building education and parental coaching, to ensure consistent maintenance of toothbrushing habits and regular dental check-ups among children.

Evidence from different populations further supports the central role of parental self-efficacy. Phanthavong et al. (2019) found that children whose guardians had higher self-efficacy were more likely to brush their teeth at least twice daily than children whose guardians had lower self-efficacy (OR= 2.14; 95% CI= 1.91 to 2.41). Liu et al. (2024) also reported strong associations between parental oral health self-efficacy and both twice-daily toothbrushing and parent-assisted toothbrushing. Longitudinal evidence from Chou et al. (2025) showed that greater caregiver self-efficacy was associated with a reduced risk of early childhood caries. In addition, parental psychosocial beliefs and competencies have been associated with improvements in oral health knowledge, preventive behaviors, and childhood caries outcomes (Albino et al., 2018). HBM-based education can therefore strengthen self-efficacy by combining information with demonstrations, supervised toothbrushing practice, goal setting, reminders, and strategies for overcoming practical barriers (Sanaeinasab et al., 2022).

AUTHOR CONTRIBUTION

JTA contributed to conceptualization, study design, and literature search. AFH and AW contributed to literature search, data analysis, and interpretation. SK and HA contributed to writing—original draft and writing—review and editing. All authors approved the final version of the manuscript and

agreed to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

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