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Review Article

Behavioral Theories and Health Literacy Influencing Oral Health Behaviors: A Systematic Review

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Abstract

Background/ problem: The impact of periodontal diseases on oral health is globally recognized. Preventing their onset and progression depends on appropriate oral health behaviors (OHBs). Understanding the factors enhancing OHBs is essential for developing effective oral hygiene interventions to improve oral health outcomes.

Objective/ purpose: This review aims to investigate the comprehensive factors influencing OHBs specifically in working-age adults who exhibit distinct characteristics compared to other generations. To date, no prior systematic review has been conducted for this age group.

Design and Methodology: This systematic review utilized various databases to collect articles published from January 2013 to August 2023, concentrating on adults aged 18 to 65 years. The study assessed OHB outcomes and clinical examination of dental plaque. Articles were selected based on the PICO framework, and their quality was evaluated using the JBI critical appraisal tool.

Results: Out of the 22 studies meeting the inclusion criteria, experimental studies predominantly focused on theory–based interventions, including self–efficacy and theory of planned behavior (TPB). Among the cross–sectional studies, a significant association was found between oral health literacy (OHL) and OHBs. Additionally, socioeconomic factors such as education, age, income, and residency were identified as influencing OHBs.

Conclusion and Implications: This review identifies various factors associated with OHBs. It underscores the importance of integrating psychological and sociological perspectives into oral health promotion strategies. Effective interventions may target self–efficacy, leverage the TPB framework, enhance OHL, or incorporate a combination of these approaches while acknowledging the influence of socioeconomic status on OHBs.

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Periodontal diseases, including gingivitis and periodontitis, are prevalent oral health concerns globally, with their prevalence increases as individuals age. Among adolescents, the prevalence rates range from 15.30% to 59.30%, while in adults, these range from 11.60% to 99.90% (Carvajal et al., 2024). These statistics underscore the broad impact of periodontal diseases on oral health and overall well–being. Maintaining oral hygiene is crucial for preventing and managing periodontal diseases. Oral health behaviors (OHBs), such as oral hygiene habits and dietary choices, play a pivotal role in this context (Kirch, 2008). Understanding the factors that influence OHBs is essential for developing effective interventions and targeted oral health promotion strategies and empowering individuals to maintain good oral hygiene practices

Previous research has explored factors influencing OHBs, including individual level such as sociodemographic, psychosocial, and environmental factors. Studies highlight the impact of knowledge, attitudes, beliefs, and self–efficacy on brushing habits, sugar intake, and dental visits (Tadin et al., 2022). Sociodemographic disparities in OHBs are evident among older adults and those from lower socioeconomic backgrounds (Kim et al., 2014). Psychosocial factors like social support and OHL are associated with favorable behaviors (Parker & Jamieson, 2010). Environmental challenges, such as limited access to dental care, also affect optimal oral hygiene (Hannan et al., 2021). This review of prior studies underscores the multidisciplinary nature of behavior change, where knowledge from psychology and sociology converge to provide a deeper understanding of factors influencing OHBs.

The working-age group, consisting of millennials born between the early 1980s and mid-1990s, is known for their digital fluency, emphasis on work-life balance, and diverse cultural influences (Ramos, 2023). This generation plays a crucial role in national development but also faces periodontal problems due to their focus on occupational responsibilities, which leads to limited time for oral care and various stressors impacting OHBs (Irie et al., 2022). Understanding the factors that impact OHBs in this age group is essential for improving their oral health. Existing review often focus on specific populations like adolescents or health action process approach (HAPA) interventions and missing a broad view of OHB factors (van Nes et al., 2023). To the best of our knowledge, there is currently no systematic review specifically investigating the factors influencing OHBs in the working–age group. This systematic review aims to investigate the comprehensive factors that influence OHBs specifically in working–aged adults.

Literature Review

The literature review addresses the primary outcome which is oral health behavior, and principal theories including oral health literacy, self-efficacy, and the theory of planned behavior.

Oral Health Behaviors

Oral health behaviors (OHBs) comprise individual actions influencing oral health and can be categorized into oral hygiene habits, dietary choices, and dental service utilization (Kirch, 2008). Oral hygiene habits, like brushing twice daily with fluoride toothpaste and daily flossing, prevent plaque accumulation, a precursor to periodontal diseases. Maintaining a balanced diet, such as limiting the intake of sugary snacks and beverages, helps support healthy teeth and gums, whereas poor dietary choices contribute to plaque formation. Finally, regular dental checkups, cleanings, and timely treatment for existing problems are crucial in preventing severe complications (Tadin et al., 2022).

Oral health behaviors can be measured through two primary methods: self–reported questionnaires and clinical examinations. Self–reported questionnaires offer a simple and cost–effective way to assess OHBs on a large scale, however, they are susceptible to reporting bias, as individuals may over– or under–report their actual behaviors. On the other hand, clinical examinations provide a more objective measure of OHBs through direct assessment of the oral cavity. These examinations often involve measuring plaque and gingival indices, which offer quantifiable data on the presence and severity of oral health issues. This method offers greater accuracy and reduces reporting bias compared to self–reported questionnaires. However, clinical examinations require more time and resources to administer, limiting their large–scale application. In contemporary research, OHB is commonly measured using one of these two methods, or a combination of both.

Oral Health Literacy

Oral health literacy (OHL) refers to individuals' ability to obtain, understand, and use basic oral health information and services to make informed decisions and adopt appropriate health behaviors (National Institute of Dental and Craniofacial Research, 2005). It can be categorized into three levels: 1) functional literacy, the ability to read and write to manage daily life; 2) interactive literacy, which involves social skills to communicate and interact with healthcare providers; and 3) critical literacy, the advanced ability

to analyze, evaluate, and apply information for making appropriate decisions regarding one's life. Research has shown that individuals with high levels of OHL tend to exhibit better OHBs, such as proper oral hygiene, healthy eating habits, and regular dental visits (Thirasupa et al., 2023; Ueno et al., 2013).

Self-efficacy

Self-efficacy is a psychological construct that refers to an individual's belief in their ability to successfully perform a specific task or behavior. It plays a crucial role in behavior change and motivation. When individuals have high self-efficacy, they feel confident in their skills and believe they can overcome challenges and achieve desired outcomes (Bandura, 1986). Self-efficacy can be cultivated through four primary sources: mastery experiences, vicarious experiences, verbal persuasion, and emotional and physiological states. Mastery experiences, which involve successfully completing a task, provide the most robust enhancement of self-efficacy, as they directly demonstrate capability. Vicarious experiences, such as observing others succeed, particularly those perceived as similar to oneself, can also bolster self-efficacy. Verbal persuasion, or positive feedback and encouragement from others, can convince individuals of their abilities, increasing their effort and persistence. Lastly, emotional and physiological states, such as stress levels and mood, can impact self-efficacy; positive states enhance it, while negative states can diminish it (Bandura, 1986). Self-efficacy plays a crucial role in influencing OHBs. In a study by López–Jornet et al. (2014), participants in the intervention group showed increased period, frequency, and use of interproximal brushing. Additionally, higher scores in oral hygiene–related self–efficacy were significantly correlated with the utilization of professional tooth cleaning and reduced gingival bleeding in non–smoking patients (Woelber et al., 2015).

Theory of Planned Behavior

The theory of planned behavior (TPB) is a well-established psychological framework used to understand and predict human behavior. It posits that an individual's behavioral intentions are influenced by three key factors: attitudes, subjective norms, and perceived behavioral control. Firstly, attitudes refer to the individual's evaluation of a particular behavior, including beliefs about its outcomes and consequences. Positive attitudes towards a behavior are more likely to result in the intention to perform that behavior. Secondly, subjective norms involve social influences and perceptions of what others expect or approve of regarding the behavior. If an individual perceives that significant others approve of a behavior, they are more likely to intend to engage in that behavior. Lastly, perceived behavioral control refers to the individual's belief in their ability to successfully perform the behavior. Higher levels of perceived control led to stronger behavioral intentions. Positive attitudes towards regular brushing and flossing, along with perceived social approval and confidence in one's ability to maintain oral hygiene, can lead to intentions to engage in these behaviors consistently (Rajeh., 2022).

Review Method

Aim of the Review

This study applies a systematic review approach to address the research objective to investigate the comprehensive factors that influence OHBs specifically in working–age adults. The research question is: ‘What are the factors, including behavioral theory, interventions and sociodemographic factors, affecting OHBs, such as toothbrush frequency, use of fluoridated toothpaste, and frequency of dental visits, in working-age adults aged 18 to 65 years?’

Design

This systematic review was designed and conducted following the preferred reporting items for systematic reviews and meta–analyses (PRISMA) guidelines (Page et al., 2021) and was recorded in the international prospective register of systematic reviews (PROSPERO database) under the protocol CRD42023447214. The search covered a 10-year period from January 2013 to August 2023.

Search Strategy and Data Sources

The process began by conducting a preliminary literature review to establish definitions and gain an overview of the research procedures employed. Subsequently, a systematic literature review was conducted using databases from PubMed, Scopus, ScienceDirect, ProQuest, Sage Journals, and Google Scholar to identify papers containing adequate information for research synthesis. A selection of search terms, Medical Subject Heading terms (MeSH), and keywords were established and adapted for each database. The examples of keywords used during the search are ("factor"[All Fields] OR "factors"[All Fields] OR "determination"[All Fields] OR "determinant"[All Fields] OR "determinants"[All Fields]), (TITLE–ABS–KEY (oral AND health AND [behavior OR behaviour]) OR toothbrushing OR floss OR (dental AND visit) OR (Plaque AND index) OR (Gingival AND index) AND TITLE–ABS–KEY (intervention) OR TITLE–ABS–KEY (factor OR determinant) OR TITLE–ABS–KEY (program) AND TITLE–ABS–KEY (adult) OR (oral AND health AND behaviour) OR (oral AND hygiene) OR toothbrushing OR floss OR (dental AND visit) OR (Plaque AND index) OR (Gingival index) AND (intervention OR factor OR determinant OR program) AND (adult OR working age adult)). The search covered the period from January 2013 to August 2023. The obtained search results were exported to the reference management software EndNote 9, where duplicates were identified and removed. The initial screening of titles and abstracts was conducted to identify potentially relevant studies.

The titles and abstracts of identified articles were independently screened by reviewers based on predetermined criteria. Relevant full texts were retrieved and independently screened by the same reviewers. Discrepancies were resolved through discussion and consensus, with a third reviewer, KK, consulted if needed.

Search Outcomes

The search and selection process are detailed in Figure 1. Initially, 10,187 database records and 17 citation records were identified. After deduplication, 9,578 titles and abstracts were screened, leading to the exclusion of 9,424 references. One full–text report was unavailable, leaving 153 full–text references. Of these, 137 were excluded due to misalignment with the outcome of interest, target population, or language (non–English). Consequently, 16 studies from the database search were included. For records from citation searching, 11 out of 17 reports were excluded for not meeting the criteria, leaving 6 reports. Ultimately, this systematic review included a total of 22 studies from both database and citation searching.

Eligibility Criteria and Study Selection

The inclusion and exclusion criteria were detailed as below.

Inclusion criteria

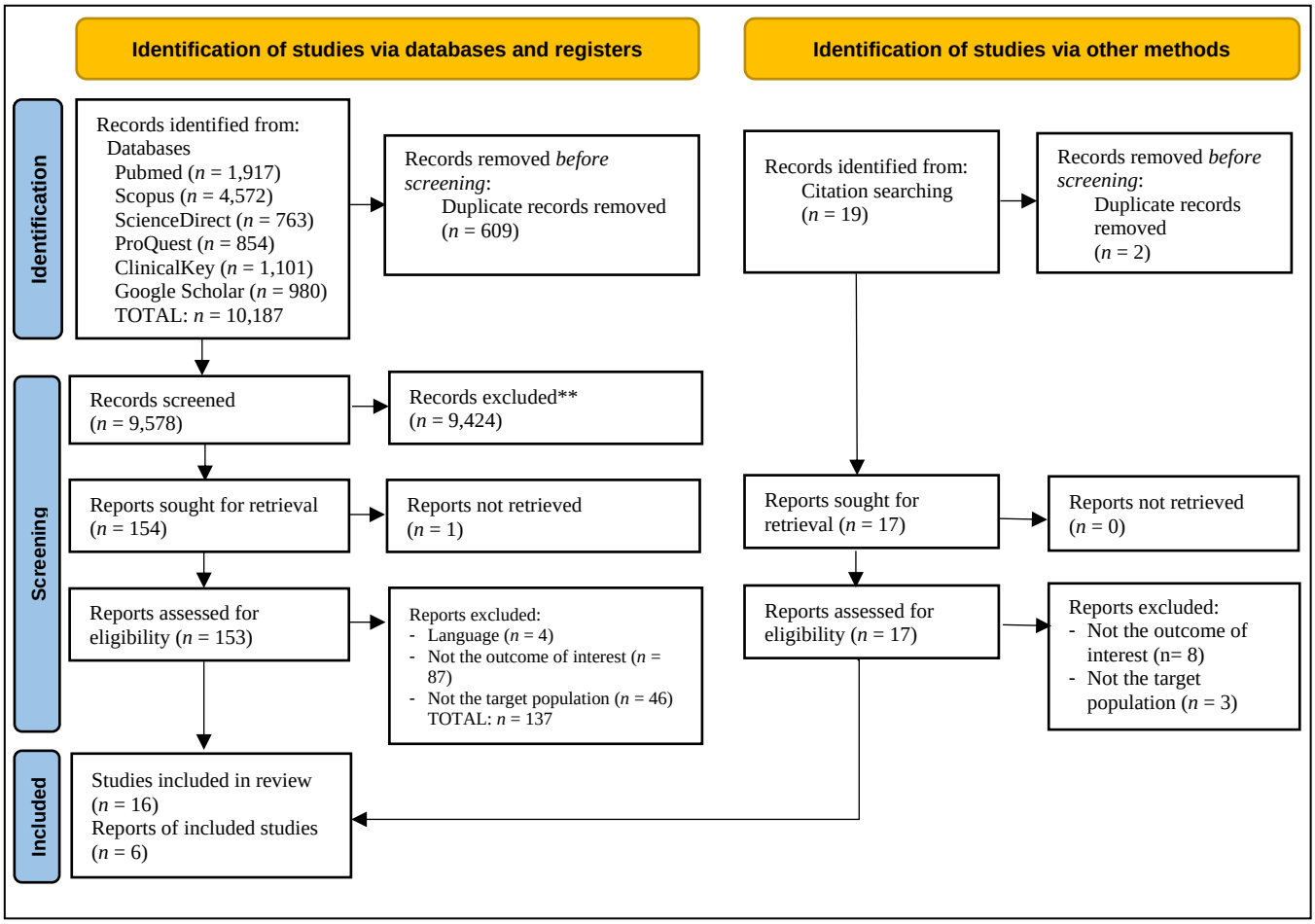
The eligibility criteria for this study were defined using the PICO format as follows: 1) Patient or Population (P): Working–age adults aged 18 to 65. 2) Intervention or Phenomenon of Interest (I): Factors influencing OHB, including interventions aimed at improving OHB in any study setting. 3) Comparison or Control (C): Both comparison and non–comparison groups. 4) Outcome (O): OHB outcomes such as toothbrush frequency, fluoridated toothpaste use, dental visit frequency, and dental plaque examination. This study included a variety of research methods, covering quantitative approaches such as experimental and observational studies, mixed methods research, and qualitative research.

Exclusion Criteria

The following exclusion criteria were applied in this review: 1) Studies that did not specifically focus on OHBs or dental plaque examination as outcomes. 2) Publications that were not research–based, including editorial messages, letters to the editor, article reviews, and systematic reviews. 3) Studies involving participants below 18 or above 65 years old only. 4) Studies published in languages other than English. These criteria were used to ensure the relevance and quality of the selected studies for this review.

Figure 1

PRISMA Flow Diagram of the Study Selection Process



Data Extraction

Data extraction was conducted by two reviewers with discrepancies resolved through discussion or consultation with a third reviewer. Exclusion reasons for full–text studies were documented. The PRISMA flow chart was used to illustrate the review stages. An extraction form was created and pilot–tested before implementation. This form was structured to extract specific data in the PICO format, along with additional details such as author, publication year, country, and study type.

Quality Appraisal

The studies were evaluated by two independent reviewers using the Joanna Briggs Institute (JBI) Critical Appraisal tools. These tools provided specific assessments for various study types and were chosen based on international standards. Reviewers used a scoring system they designed, evaluating each checklist item with ‘Yes,’ ‘No,’ ‘Unclear,’ or ‘Not applicable’ answers. Studies with scores above 60% on the JBI checklist were selected. The intraclass correlation coefficient (ICC) was calculated to assess agreement between reviewers, resulting in an ICC of 0.914, indicating excellent reliability (Koo & Li, 2016).

Results

Characteristics of Included Studies

The characteristics of the 22 articles are summarized in Table 1. All studies aimed to assess factors affecting OHBs in adults. The majority of the studies (n = 12) were cross–sectional. Eight studies were experimental, comprising 5 randomized controlled trials and 3 quasi–experimental studies. One study utilized a mixed–method design, while another was a prospective cohort study with a 6–month follow–up

period. Fifteen studies were conducted in Asia, with three each in Iran, Japan, Korea, China, and India, and one each in Taiwan, Turkey, Nepal, and Malaysia. The remaining studies were conducted in Europe (Spain, Sweden, Belarus, Germany), Africa (Burkina Faso, Nigeria), and South America (Brazil). Sample sizes ranged from 32 to 19,219 adults, aged 18 to 65 years, with OHBs measured using questionnaires and/or clinical examinations.

Risk of Bias Assessment

Methodological quality assessment showed that the included studies met 62.5%–100% of the criteria on the JBI critical appraisal tool, indicating moderate to good quality assessment. Table 1 also presents the quality and risk of bias within the studies. Overall, most randomized controlled trials exhibited a low risk of bias, whereas observational studies were generally categorized as having a moderate to high risk.

Main Outcomes of the Review

Overall, the OHBs investigated in the studies were primarily related to interventions that were predominantly theory–based. The theories used included self–efficacy, theory of planned behavior (TPB), HAPA, acceptance and commitment therapy (ACT), self–management cues, and knowledge, attitude, and practice (KAP). Among the cross–sectional studies included in this review, there was an association found between OHL and OHBs. It is worth noting that this relationship was mentioned in up to 7 articles, which accounts for one-third of the included studies. Furthermore, the studies also revealed that OHBs is influenced by socioeconomic status. Factors such as higher education, younger age, higher income, and urban residency were found to be associated with OHBs. (Table 1)

Table 1

Study Characteristics Included in the Systematic Review on the PICO

Authors, Design	P	I	C	O	Significant finding	Quality assessment
Armoon et al., 2021; Iran, Randomizedcontrolled trial (RCT)	Iranian staff in hospital (n = 133) - Intervention: 66 (36.2 ± 8.3 years) - Control: 67 (37.0 ± 8.4 years)	Oral health intervention with TPB	Control group	- OHB (Toothbrushing, flossing, and dental visit frequency) - Clinical examination (DMFT, BOP)	Educational intervention can lead to significant difference between 2 groups in OHB and BOP at after and 2–month follow up period.	- Quality: Good - Risk of Bias (ROB): Low
Wu et al., 2022; China, RCT	Adults with fixed appliances (n = 44) - Intervention: 22 - Control: 22 (18–29 years)	Oral health intervention with HAPA	Control group	- Oral health behavior - Clinical examination (PI, Gingival bleeding)	Oral health education intervention had significant reduction compared between 2 groups on dental plaque and gingival bleeding in follow up 6 wks.	- Quality: Good - ROB: Low
Lopez et al., 2022; Spain, RCT	Patients with hyposalivation (n = 60) - Intervention: 30 - Control: 30 (56.7 ± 15.4 years)	Oral health intervention with Self–efficacy	Control group	- Clinical examination (Plaque extension index, Bleeding index, and CPITN)	Both groups showed significantly lower plaque and bleeding indices. Interproximal brushing was significantly more frequent among the intervention group	- Quality: Good - ROB: Low

Table 1 *(Continued)*

Authors, Design	P	I	C	O	Significant finding	Quality assessment
Wide et al., 2018; Sweden, RCT	Young adults with poor oral health (n = 124) - Control: 65 - Intervention : 59 (18–25 years)	Oral health intervention with ACT	Control group	OHB (Toothbrushing, flossing, toothpick, additional fluoride use)	Intervention group improved their OHB on all variables while control group improved 2 variables: flossing and additional use of fluoride	- Quality: Good - ROB: Moderate
Lhakhang et al., 2016; India, RCT	Periodontal disease patients (n = 112) - Control: 57 - Intervention: 55 (27.0 ± 12.7 years)	Oral health intervention with self–efficacy and self–regulatory	Control group	- OHB (Flossing frequency)	The intervention yielded effects on flossing frequency and flossing intentions at follow–up.	- Quality: Good - ROB: Low
Wu et al., 2020; Taiwan, Mixed method	Long–term care service staff (n = 80) (42.2 ± 13.0 years)	Oral health intervention with KAP and 3 teaching methods	–	- OHB (Oral cleaning frequency, product use, Oral cleaning sites)	There were significant differences in the pre– and post–scores of the daily frequency of oral hygiene skills	- Quality: Moderate - ROB: Low
Toyama et al., 2018; Japan, Quasi–experiment (Quasi-exp)	Japanese workers (n = 371) - Control: 183 (41.4 ± 11.9 years) - Intervention : 188 (40.7 ± 11.9 years)	Oral health intervention with Intention, goal setting, self–monitoring, behavioral	Control group	- OHB (Toothbrushing, snack, tobacco, fluoridated toothpaste, flossing, oral exam) - Clinical examination (CPI, debris)	- Intervention improved OHB in both groups. - At follow–up, the usage of fluoridate toothpastes and dental floss were significantly higher in the intervention group.	- Quality: Good - ROB: Moderate
Kim et al., 2017; Korea, Quasi–exp	Alcoholic patients (n = 32)	Oral health intervention with TPB	–	- OHB	OHB was influenced by oral health education by overall variables of TPB.	- Quality: Moderate - ROB: Moderate
Jerusha et al., 2019; India, Quasi–exp	Adults treated in Dental College (n = 501) (10–40 years)	Oral health education	–	- Clinical examination (PI)	Mean Plaque Index score has been significantly reduced after oral health education intervention	- Quality: Moderate - ROB: Moderate

Table 1 *(Continued)*

Authors, Design	P	I	C	O	Significant finding	Quality assessment
Woelber et al., 2015; Germany, Prospecti ve cohort study	Adults treated in dental practices (n = 103) (43.6 years)	Self–efficacy	–	- Clinical examination (PI, Papilla Bleeding Index (PBI)) - Appearance at the second appointment	Higher scores in oral hygiene–related self–efficacy was significantly correlated with lower scores of gingival bleedings and reappearance to the follow–up appointment	- Quality: Moderate - ROB: Low
Alkan et al., 2015; Turkey, Cross–sectional study	Adults treated in Faculty of Dentistry (n = 364) -195 women -169 men (18–64 years)	Sociodemographic and psychological factors	–	- OHB (Toothbrushing, Dental visit) - Clinical examination (DMFT, Periodontal health status)	– Psychological factors associated with of dental visits frequency. –Education was directly correlated with the frequency of toothbrushing and dental visits	- Quality: Good - ROB: High
An et al., 2022; China, Cross–sectional study	Nurses in China (n = 317) (32.25 ± 7.1 years)	OHL	–	OHB (Toothbrushing, flossing, toothpicks, mouth rinse, dental visit)	The level of OHL has a statistically significant relationship with OHB	- Quality: Good - ROB: High
Diendéré et al., 2022; Burkina Faso, Cross–sectional study	Adults in Burkina Faso (n = 4,677) (Age range: 25–64 years)	Sociodemographic factors	–	OHB (Tooth cleaning frequency, use of fluoridated toothpaste, dental visits)	OHB relates to high education, urban area, younger adult, female	- Quality: Good - ROB: High
Olusile et al., 2014; Nigeria, Cross–sectional study	Adult Nigerians (n = 7,630) (37.9 ± 13.2 years)	Sociodemographic factors	–	OHB (Oral hygiene practice, dental visits)	OHB relates to high education, younger adults, Female, Southern living, Previous dental visit or oral health education	- Quality: Good - ROB: High
Park et al., 2016; Korea, Cross–sectional study	Adult Korean (n = 19,219) (Age ≥ 19 years)	Sociodemographic factors	–	OHB (Toothbrushing frequency, use of secondary oral products)	Higher income and educational levels related to frequent daily tooth brushing and daily use of secondary oral products	- Quality: Good - ROB: Low

Table 1 *(Continued)*

Authors, Design	P	I	C	O	Significant finding	Quality assessment
Thapa et al., 2016; Nepal, Cross–sectional study	Adult Nepalese (n = 4,143) (Age range: 19–65 years)	Sociodemographic factors	–	OHB (Tooth cleaning frequency, fluoridated toothpaste, dental visits)	Older age, woman, urban population, higher education were the main factors associated with OHB	- Quality: Good - ROB: Moderate
Fazli et al., 2021; Iran, Cross–sectional study	Couples participating in pre–marriage counseling programs (n = 828) (24.2 ± 5.4 years)	OHL	–	- OHB (Tooth brushing, dental visits, snacking, smoking status) - Clinical examination - (GI, PI, DMFT)	OHL had a significant correlation with the frequency of dental visits, and smoking status and inverse correlation with the number of DMFT, and PI, and GI	- Quality: Good - ROB: Moderate
Noor et al., 2019; Malaysia, Cross–sectional study	Malaysian adults (n = 165) (30.4 ± 9.7 years)	OHL	–	OHB (Toothbrushing, flossing, mouth rinsing, snack, smoking, vaping, dental visit)	Higher OHL scores significantly correlated to high toothbrush frequency, flossed, mouth rinsed, non–vapers or past–vapers and dental visit	- Quality: Moderate - ROB: High
Sistani et al., 2017; Iran, Cross–sectional study	Iranian adults (n = 1,031) (Age range: 18–65 years)	OHL	–	OHB (Toothbrushing, mouth rinsing, snacking or beverage, dental visit)	High OHL scores significantly correlated to daily toothbrushing, low sugary snacks or beverages intake, recent use of dental service	- Quality: Good - ROB: Moderate
Batista et al., 2017; Brazil, Cross–sectional study	Brazilian adults (n = 248) (Age range: 20–64 years)	OHL	–	- OHB (Tooth brushing, flossing, dental services) - Clinical examination (CPI, DMFT, biofilm)	Low OHL was associated with tooth brushing < 3 times a day, irregular tooth flossing, and untreated caries	- Quality: Good - ROB: Low

Table 1 *(Continued)*

Authors, Design	P	I	C	O	Significant finding	Quality assessment
Ueno et al., 2013; Japan, Cross–sectional study	Japanese Adults (n =518) (58.4 ± 15.4 years)	OHL	–	- OHB (Tooth brushing, self–check, dental visit, smoking) - Clinical examination (Plaque, CPI)	The higher the OHL, the more frequent the tooth brushing, self–checking, regular dental checkups, and better the oral hygiene status.	- Quality: Good - ROB: Moderate
Blizniuk et al., 2015; Belarus, Cross–sectional study	Adults in Belarus (n =281) (30.4 ± 9.7 years)	OHL	–	- OHB (Tooth brushing, dental visit, smoking) - Clinical examination (PI, bleeding, Pocket, DMFT)	OHL relate to oral health status but not relate to health behavior significantly	- Quality: Good - ROB: Moderate

Discussion and Conclusion

Discussion of Main Results

This study aimed to investigate the factors affecting OHBs in adults. The recruited experimental studies presented an association between OHBs and oral health education, which were predominantly theory–based. The most commonly repeated theory used in interventions in this systematic review was self–efficacy. Individuals with high self–efficacy are more likely to adopt and maintain good oral health practices, such as regular brushing, flossing, and dental visits, because they believe in their ability to perform these behaviors effectively (Anagnostopoulos et al., 2011). Conversely, low self–efficacy can lead to neglect in oral hygiene routines due to a lack of confidence in one's ability to adhere to these practices. Enhancing self–efficacy through targeted interventions, such as education, behavioral modeling, and supportive feedback, can lead to better oral health outcomes by encouraging more consistent and effective oral hygiene behaviors (López–Jornet et al., 2014; Woelber et al., 2015). This underscores the importance of self-efficacy in promoting and sustaining healthy oral practices.

The second theory replicated in this study was the theory of planned behavior (TPB). The TPB clarifies the interplay between individuals' attitudes, social influences, and perceived control over performing the OHBs. It helps improve attitudes by informing people about the benefits of good oral hygiene, shifts social norms by promoting these behaviors as socially desirable, and enhances perceived control by equipping individuals with the skills and tools needed to maintain good oral health. The study revealed that behavioral intention, which arises from the combination of these three factors, was a significant factor in promoting OHBs. Strong intentions indicate higher motivation and commitment to change behavior, making it more likely that individuals will follow through with their intentions. When individuals form intentions to improve their oral health, they are more likely to develop specific plans and strategies to achieve their goals (Ebrahimipour et al., 2016).

The research conducted by Lhakhang et al. (2016) incorporated both self–efficacy and intention in their oral health promotion intervention among periodontal disease outpatients. These factors were specified in a path model as mediators between intervention conditions and dental flossing behavior. The combination of self–efficacy and intention create a powerful synergy that promotes motivation, resilience, problem–solving, and sustained behavior change in oral health. Earlier studies have consistently shown that both components play vital roles in facilitating OHBs (Anagnostopoulos et al., 2011). By enhancing self–

efficacy beliefs and strengthening intentions, interventions and strategies can effectively support individuals in adopting and maintaining positive OHBs.

In the selected cross–sectional studies, OHL was the most frequently associated factor with OHBs. There is a significant relationship between higher OHL levels and better OHBs, including brushing frequency and time, use of fluoridated toothpaste, regular oral check–ups, and dental service frequency (Thirasupa et al., 2023). OHL was also linked to lower decayed and missing teeth, as well as plaque and gingivitis index scores (Parker & Jamieson, 2010). The causal pathway between OHL and OHBs suggests that low OHL leads to poor oral health knowledge and adherence to positive OHBs. Improved OHL also enhances patient–dentist communication, potentially reducing dental anxiety and increasing dental treatment–seeking behavior. However, some studies have reported conflicting findings, indicating no direct association between OHL and OHBs (Blizniuk et al., 2015).

Another important component related to OHBs is sociodemographic background. Significant factors include high education level, younger adults (25–30 or 30–44 years old), higher income, and urban residency. Numerous studies have found a correlation between higher education levels and OHBs, regardless of whether it is a developing or developed country (Diendéré et al., 2022; Olusile et al., 2014; Park et al., 2016). Those with higher educational levels tend to be more concerned about their physical appearance, including tooth whiteness, and engage in behaviors that align with this goal. They also tend to adopt a healthier lifestyle by seeking treatment for dental conditions at an earlier stage. Furthermore, individuals with higher educational levels often have a higher level of OHL, which is also associated with better oral health practices (Mohammadi et al., 2018).

Studies have consistently found that younger adults are more likely to have a higher daily frequency of tooth cleaning and use fluoridated toothpaste (Diendéré et al., 2022; Olusile et al., 2014). This may be attributed to the influence of education and media on younger individuals, as they tend to have higher levels of education and are more likely to be engaged in skilled professions (Olusile et al., 2014). Additionally, motivations for tooth cleaning and toothpaste selection among young adults include concerns about tooth loss and the desire for teeth whitening. Younger adults often prioritize overall health and wellness, leading to a heightened awareness of oral health practices.

Higher income has been identified as a favorable factor associated with cleaning teeth at least twice a day, daily use of secondary oral products, and a reduced likelihood of requiring periodontal treatment (Park et al., 2016). This may be due to a greater ability to afford oral care products and services. However, income can also serve as a barrier to accessing dental services and having dental insurance coverage. Individuals with lower incomes may have limited awareness of the importance of proper dental care, as their primary focus may be on earning a living. Previous studies have shown that lower income is associated with an increased risk of oral diseases and a higher likelihood of requiring periodontal treatment (Kim et al., 2014).

Place of residence does indeed play a role in teeth cleaning habits. Studies have shown that urban residents have greater odds of using fluoridated toothpaste and making a dental visit within the last 6 months compared to rural residents (Diendéré et al., 2022; Thapa et al., 2016). This can be attributed to several factors. Urban areas generally have better access to dental care facilities, such as dental clinics and practices. There are typically more dentists and specialists available in urban settings, making it easier for individuals to schedule dental appointments and receive regular checkups. Moreover, urban areas often have higher population densities, which can lead to greater exposure to educational resources and campaigns about oral health. This increased awareness can result in a greater emphasis on oral hygiene practices, including the use of fluoridated toothpaste and regular dental visits.

Based on the findings of this systematic review, it is recommended to implement comprehensive oral health education programs starting from early childhood, such as in primary schools. By integrating oral health education into the curriculum, students can develop a strong foundation of oral health awareness, knowledge, and behaviors that can be sustained throughout their lives. Such programs should aim to

improve OHL, promote self–efficacy, and address socioeconomic disparities to ensure equitable access to oral health resources and services.

Limitations

While this systematic review aimed to comprehensively explore the factors influencing OHBs in working–age adults, limitations warrant consideration. The heterogeneity in methodologies of included studies presented challenges in data synthesis, potentially limiting the generalizability of findings. This underscores the need for future research to focus on more homogeneous designs, such as randomized controlled trials (RCTs), to enhance reliability and generalizability (Armoon et al., 2021; Wu et al., 2022). Additionally, future studies should consider relying more on clinical examinations to reduce potential bias from self–reported data.

Implications for Behavioral Science

This systematic review not only extends its implications beyond health science but also illuminates the key intersections with psychology and sociology. Understanding of the psychological factors influencing OHBs is crucial for designing effective interventions. Theories such as the theory of planned behavior (TPB), self-efficacy, and OHL play important roles in predicting and modifying health-related behaviors. Additionally, sociological perspectives are crucial for comprehending how social determinants impact OHBs.

By leveraging insights from psychology and sociology, interventions can be effectively tailored to improve oral health outcomes across diverse populations. Encouraging positive attitudes towards regular brushing and flossing, along with building confidence in one's ability to maintain oral hygiene, can lead to consistent engagement in these behaviors. Furthermore, increasing OHL enables individuals to access reliable information and make informed decisions for long-term oral health care. It is essential to recognize that enhancing oral health outcomes is not solely the responsibility of health professionals; governments also play a pivotal role. They should promote an environment that nurtures positive social norms and provides reliable information to the public. Employing these multi-level approaches will contribute significantly to the promotion of favorable OHBs and long-term oral health.

Conclusion

This systematic review has provided insightful knowledge into the associations between OHBs and various factors. Among these factors, oral health education emerged as the most prevalent and impactful factor. Implementing effective interventions and oral health promotion campaigns that enhance self–efficacy, apply the TPB, improve OHL, or utilize a combination of approaches, while considering the influence of socioeconomic status, can promote positive OHBs. These comprehensive strategies contribute to the improvement of oral health and overall well–being.

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Declarations

Conflicts of Interest: The authors declare no conflicts of interest.
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