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Rapid Review

The role and effectiveness of mobile health apps in oral health promotion programs: A rapid review

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ABSTRACT

Introduction: Oral diseases remain a major public health challenge worldwide despite ongoing preventive efforts, with dental caries and poor oral hygiene continuing to affect a large proportion of the population. Mobile health (mHealth) applications have emerged as a promising approach to oral health promotion by delivering accessible, interactive, and user-centered educational interventions that incorporate behavior change techniques to support sustained oral hygiene practices. This study aims to determine the role and effectiveness of mobile health apps in oral health promotion programs. **Methods:** This study employed a rapid review conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Articles were searched in PubMed, Scopus, ScienceDirect, and Google Scholar for studies published between 2020 and 2025 using Boolean operators. Articles were screened according to predefined inclusion and exclusion criteria, and study quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for randomized controlled trials (RCTs). **Results:** A total of nine RCTs met the eligibility criteria. All included studies reported that mHealth apps functioned as interactive educational media used by children, adolescents, and parents. Applications incorporating behavior change techniques through interactive features demonstrated positive effects on users' oral health behavior compared with conventional methods. **Conclusion:** Mobile health apps are effective adjunctive tools for oral health promotion by enhancing oral health knowledge, supporting positive oral hygiene behaviors, and improving short-term clinical outcomes. Their effectiveness appears to be enhanced by integrating interactive behavior change features that encourage sustained user engagement.

KEYWORDS

Mobile health apps, oral health, oral health education, rapid review.

INTRODUCTION

Oral diseases are among the most widespread noncommunicable diseases globally, affecting an estimated 3.5 billion people, or 45% of the world's population, throughout the life course.[1] Dental caries, periodontal disease, tooth loss, and oral cancers remain highly prevalent despite being largely preventable, and continue to impose substantial health, economic, and quality-of-life burdens worldwide.[2]

The prevalence of individuals with dental and oral health problems, as reported in the 2023 Indonesian Health Survey (SKI), was determined by comparing the number of household members who reported complaints or problems related to dental and oral health, including dental cavities, missing teeth, loose teeth, swelling, gum abscesses, or mouth ulcers (perceived need) within the past 12 months—to the total number of household members aged 3 years and older who were interviewed.[3]

The oral health examination results from the 2023 SKI showed that 56.9% of the Indonesian population reported dental and oral health problems.[3] The most prevalent dental problem was decayed, damaged, or painful teeth, with a prevalence of 43.6%, while the most common oral problem was swollen gums or abscesses, at 7.3%.[3] The DMF-T index for permanent teeth in individuals aged ≥6 years was 5.4, according to the 2023 SKI. [3] For primary teeth, the dmf-t index was 4.9 for the 3–4-year age group and 6.7 for the 5-year age group.[3] A DMF-T index is categorized as high when the score is from 4.5 to 6.5, and as very high when the score is ≥6.6.[4] Based on these findings, the DMF-T index for permanent teeth in individuals aged ≥6 years falls into the high category, while the dmf-t index for primary teeth falls into the high for children aged 3–4-year and the very high category for 5-year-old children .[4]

Oral health maintenance behaviors, such as tooth brushing habits, dietary patterns, and dental visits, play a significant role in maintaining oral health and preventing dental disease.[5] Indonesia, as a developing country with a large population, has many residents living in rural areas, where access to dental and oral healthcare services faces numerous challenges, including workforce shortages, unaffordable costs, and poor accessibility. These challenges may require residents to travel long distances to access healthcare services, often with much longer travel times than those experienced by urban populations.[6] The 2023 SKI data also highlighted the oral hygiene behaviors of Indonesians, showing that while 95.6% of respondents brushed their teeth daily, only 6.2% did so at the recommended times (morning after breakfast and at night before bed).[4] These challenges need to be addressed through the establishment of accessible oral health programs for various communities. The 2023 SKI data indicate that the DMF-T index for both children and adults falls into the high and very high categories, necessitating the implementation of programs to address these oral health problems.[4] Preventive strategies and approaches to oral health can be achieved through health promotion programs targeting adolescents.[7] Adolescents represent an important target group, as behaviors established during this period often persist into adulthood.[8]

Technological advancements, particularly in the health sector, have progressed rapidly. Mobile health (mHealth) refers to the use of wireless communication technology and mobile devices to support healthcare services.[9] Mobile health applications are software applications on mobile devices such as smartphones, tablets, and smartwatches designed to support healthcare management by monitoring conditions and delivering healthcare programs.[10] These functions include telemedicine, data collection and decision-making, quick and easy access to health information, patient condition management, and improved treatment adherence.[11] mHealth resources such as websites and applications offer advantages including easy accessibility, adaptability to specific populations, and the ability to promote health behaviors across populations at a low cost.[12]

Two-thirds of the global population owns a personal smartphone.[9] The increase in smartphone use has led to significant growth in the adoption of mobile health applications aimed at improving health status and hygiene behaviors.[11] This is evidenced by the availability of 612 oral health-related applications in 2019.[11] Mobile health applications can support public health, particularly in the field of oral health, by increasing knowledge about oral hygiene, shaping oral-health behaviors, and monitoring patients' habits during treatment.[12,13]

The potential effectiveness of mHealth applications may be explained by the incorporation of behavior change techniques (BCTs), which are active components of behavioral interventions. Unlike conventional educational approaches that primarily rely on information delivery, BCTs integrate strategies such as prompts and cues, feedback and monitoring, personalization, and goal setting through digital features including reminders, timers, personalized feedback, and

gamification to promote sustained behavior change, reinforce user engagement, and improve adherence to recommended oral hygiene practices.[14]

Mobile health applications have emerged as a promising approach to oral health promotion by providing interactive, accessible, and user-centered educational interventions that extend beyond conventional face-to-face instruction.[15] The advantages of mobile health applications include time and costs savings, accessibility at any time, support for self-assessment, and their use as interactive educational media.[10,16,17] These applications can also be tailored to user characteristics, for example, by incorporating songs and games for children.[11,15] Mobile health applications in the field of oral health typically feature data collection, patient screening and monitoring, oral health education, and reminders for dental care.[9,11,15,18–30]

Mobile health applications have also demonstrated potential for reducing symptom severity, mitigating disease-related impacts, and improving treatment efficacy in other healthcare domains.[31] Research shows that patients using mobile health applications, such as those integrated with electronic health records, demonstrate improved therapy adherence, shorter hospital stays, increased survival rates, and improved overall quality of life.[18] Mobile health applications can also serve as tools for influencing attitudes and motivating users to adopt healthier behaviors.[32]

In contrast, conventional oral health education is frequently constrained by one-way information delivery, limited opportunities for continuous reinforcement, and the absence of personalized feedback, which may reduce its effectiveness in promoting sustained oral hygiene behaviors.[15]

Although previous studies have demonstrated the potential of mHealth applications for oral health promotion, their findings remain heterogeneous because of variations in the study populations, intervention characteristics, and evaluated outcomes.

Furthermore, evidence specific to the Indonesian context remains limited. Therefore, this study aims to determine the role and effectiveness of mobile health applications in oral health promotion programs.

METHODS

The research methodology used in this study was a rapid review conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) guidelines. A rapid review methodology was chosen over a systematic review to enable a timely synthesis of rapidly evolving evidence on mobile health applications in oral health promotion. Given the rapidly evolving nature of digital health technologies and the need for timely evidence to inform practice, a rapid review allows for accelerated knowledge synthesis while maintaining methodological transparency.[31] The literature search was conducted between January and May 2025.

The articles included in this study were required to meet specific inclusion and exclusion criteria. The inclusion criteria were: research articles published between 2020 and 2025; international studies published in English; research articles employing randomized controlled trials (RCTs), prospective studies, retrospective studies, or cross-sectional studies; articles discussing mobile health applications; and articles addressing oral health education. The exclusion criteria were review articles, case reports, and research articles for which the full text was inaccessible. Research on the role and effectiveness of mobile health applications was conducted by retrieving articles from four databases: PubMed, Scopus, ScienceDirect, and Google Scholar.

The research question in this study was formulated using the PICO framework which includes population (P), intervention (I), comparison (C), and outcome (O)The PICO components were defined as follows: P: users of mobile health application, oral health promotion programs delivered through mobile

health apps C: oral health promotion programs delivered through conventional methods, and O: the role and effectiveness of mobile health apps in oral health promotion programs.

The literature search strategy in this study utilized Boolean operators to refine the search process. The first step involved using the Boolean operator "OR" to cover the full scope of each research component. The results from this search were then combined using the Boolean Operator "AND" to conduct a systematic literature search and identify relevant articles for inclusion in the rapid review.[31] The databases used in this study were PubMed, ScienceDirect, Scopus, and Google Scholar, with the following keywords:

Table 1. Article finding keywords

Database	Search Keyword
Pubmed, Scopus, Google Scholar	("mobile health apps" OR "mHealth apps" OR "mHealth" OR "mobile application" OR "app" OR "smartphone app" OR "mobile dentistry" OR "mDentistry") AND ("oral health" OR "oral health prevention" OR "oral health program" OR "oral health education" OR "oral health promotion" OR "oral health behaviour" OR "oral hygiene behaviour")
ScienceDirect	("mobile health apps" OR "mobile application" OR "app" OR "mobile dentistry" OR "mDentistry") AND ("oral health" OR "oral health program" OR "oral health education" OR "oral health promotion")

The study was conducted independently by three authors (ETM, SS, and AAS) following a structured review process. The initial stages included formulating the research question, developing the review methodology, establishing the inclusion and exclusion criteria, and conducting a comprehensive literature search across the selected databases. Following the literature search, duplicate records were identified and removed. The remaining articles were subsequently screened based on their titles and abstracts. Articles with titles that were not relevant to the research topic were excluded. Abstracts of potentially eligible studies were then evaluated to determine their relevance to mobile health applications in oral health.

Case reports and studies that did not address the role or effectiveness of mobile applications in dental and oral health were excluded. When eligibility could not be determined based on the title and abstract alone, the full text was retrieved and assessed. Any disagreements regarding study eligibility were resolved through discussion among all authors until a consensus was reached. The methodological quality of the included studies was subsequently assessed using a risk-of-bias assessment before data extraction and evidence synthesis were performed.

The quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Randomized Controlled Trials, which comprises 13 items. Each item was evaluated using four possible responses: "Yes," "No," "Unclear," or "Not Applicable." A score of one was given for every "Yes" response, and the total score was converted into a percentage to determine the risk-of-bias level. Studies were considered to have a high risk of bias if the percentage of "Yes" responses was 49% or lower, a moderate risk if it ranged from 50% to 69%, and a low risk if it exceeded 70%, then studies were further

classified into low, moderate, or high methodological quality, corresponding respectively to high, moderate, and low levels of bias risk.[33]

The selected articles were then subjected to data extraction and synthesis to generate a stuctured summary of the findings. The data extraction process involved collecting information from each included study, including the authors' names, publication year, study design, type of mobile health application used, the role of the mobile health application, and its effectiveness. The extracted data were analyzed descriptively, a statistical method used to analyze data by describing the information collected as it is, without aiming to draw generalized conclusions.[31,33]

RESULTS

The research was conducted by collecting data from four databases: PubMed, Scopus, ScienceDirect, and Google Scholar. The search yielded 99 articles from PubMed, 136 articles from Scopus, 3,356 articles from ScienceDirect, and 70 articles from Google Scholar, for a total of 3,661 records. After duplicate removal, 42 duplicate records were excluded, leaving a total of 3,619 articles for screening. The final screening was conducted based on the overall relevance of the articles to the research topic, resulting in 9 articles being selected for further analysis. The table below presents the data extracted from the 9 articles included in the review (Diagram 1).

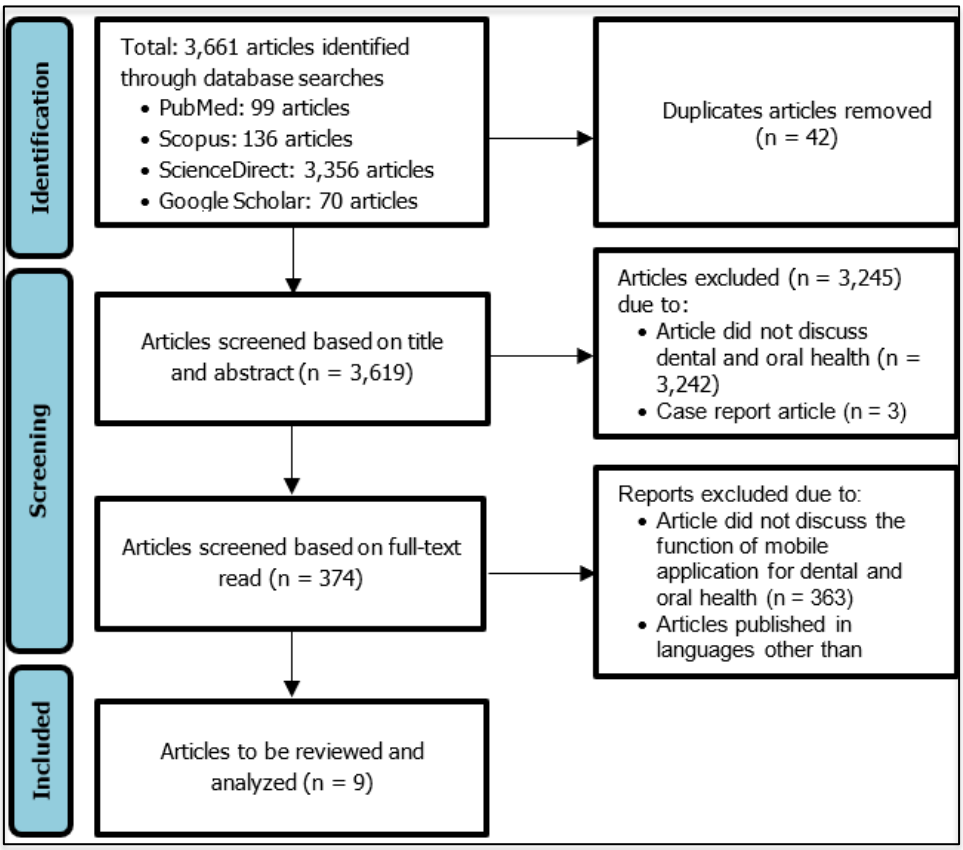

Diagram 1. PRISMA flowchart

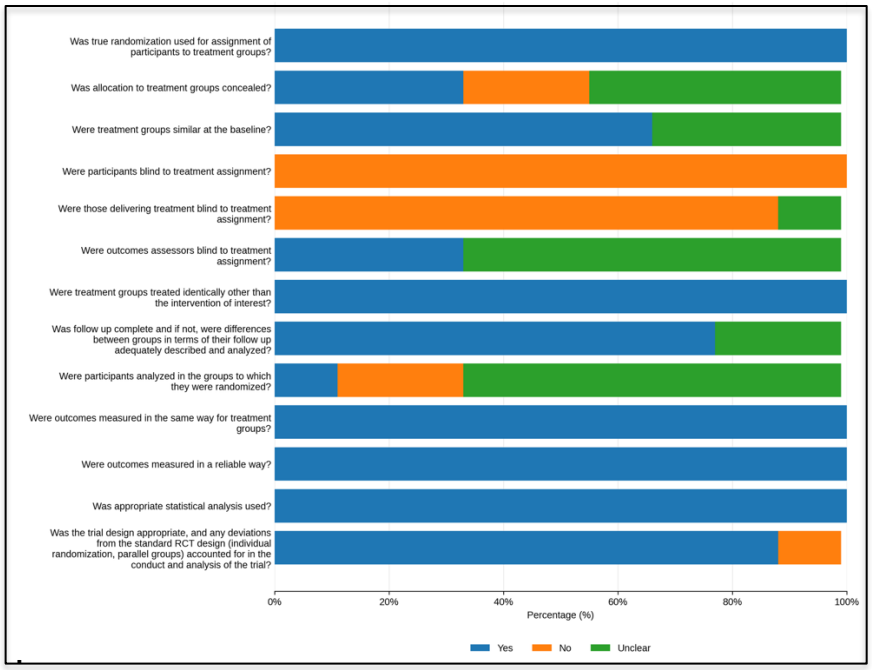

Figure 1. Risk-of-bias of randomized control trial (RCT) studies

The randomized controlled trial (RCT) articles included in this review demonstrated an overall moderate level of methodological quality. This classification is reflected in the risk of bias assessment by JBI results, where Marash et al.[34] and Azizzade et al.[35] obtained scores of 54%, Desaia et al.[36], Kitsaras et al.[37], Fageeh et al.[38], and Scheerman et al.[39] each achieved 62%, while Gurnani et al.[15], Zolfaghari et al.[11], and Obukavitha et al[40]. reached 69%. These findings indicate that all included studies fall within the moderate risk of bias category. The appraisal findings are presented in Figure 1.

The selected articles were analyzed based on their roles and effectiveness in dental and oral health. All 9 articles assessed the role of mobile health applications in providing dental and oral health education through diverse approaches and targeting different populations, including children, adolescents, and parents.[11,15,34–40] Six articles assessed the role of mobile health applications in improving tooth brushing behavior including frequency, duration, and brushing technique.[15,34,36,37,39,40] One article assessed the role of mobile health applications in providing oral health education adapted for individuals who are blind and deaf.[38]

Four articles assessed the effectiveness of mobile health applications in reducing plaque and dental debris index among users.[15,36,39,40] Three articles assessed the effectiveness of mobile health applications in improving users' knowledge of dental and oral health or dental trauma management.[11,35,38] Four articles assessed the effectiveness of mobile health applications in changing tooth brushing behavior of its users.[15,35–37]

Table 2. Data extraction results

No	Author and year of publication	Title	Study design	Analysis	
				Role	Effectiveness
1	Gurnani, et al.[27] (2023)	Using a mobile phone-based application as an adjunct to facilitate oral hygiene practices in children with Attention Deficit Hyperactivity Disorder (ADHD)	Randomized Controlled Study	Providing dental care education through videos demonstrating correct tooth-brushing techniques, information on age-appropriate toothpaste and toothbrushes, and a timer indicating the recommended brushing duration. The application also increased motivation through positive reinforcement, such as an applause reward for brushing for two minutes).	1. Children who received education through The Brush DJ App had a higher percentage of brushing their teeth twice a day (88.9%) than those who receive conventional education (44.40%). 2. Children who received education through The Brush DJ App had a higher percentage of brushing for two minutes (81.50%) than those who received conventional education (14.80%). 3. The debris index decreased significantly following the Brush DJ App intervention.
2	Zolfaghari, et al.[9] (2021)	Development and evaluation of a gamified smart phone mobile health application for oral health promotion in early childhood	Randomized Controlled Trial	Providing oral health education to mothers with limited knowledge of dental care practices for children.	The application increased mother's oral health knowledge .
3	Desaia, et al.[42] (2020)	"Brush Up": An Innovative Technological Aid for Parents to Keep a Check Of Their Children's Oral Hygiene Behaviour	Randomized Controlled Trial	Training and motivating users in proper tooth brushing practices	1. Children who used the Brush Up application had lower plaque scores than those who received video-based and manual demonstrations. 2. Children who used the Brush Up application showed significant improvements in brushing frequency, brushing duration, and lingual surface cleaning.
4	Marash, et al.[43] (2024)	The effect of educational intervention based on self-efficacy theory on promoting adolescent oral health behaviors through mobile application	Randomized Controlled Trial	Providing education on dental care and and oral health behavior.	Mobile app-based education among adolescents aged 13-15 years improved awareness, attitudes, self-efficacy regarding toothbrushing and tooth cleaning, dental visits and oral-related behavior.
5	Azizzade, et al.[44] (2023)	Impacts of educational interventions on the knowledge of prevention and emergency management of traumatic dental injuries in 11–17-year-old martial arts athletes	Randomized Controlled Trial	Providing education on the prevention and emergency management of sports-related Traumatic Dental Injuries (TDIs) among karate and taekwondo athletes.	Mobile health application-based educational interventions were effective in improving knowledge and practices related to TDI prevention and emergency management.
6	Obukavitha, et al.[45] (2024)	Effectiveness of Plaque Removal Using Different Toothbrushes in Children	Randomized Controlled Trial	1. Helps determine the effectiveness of children in brushing their teeth.	Children using the app-based toothbrush showed greatest plaque reduction compared with those using powered toothbrushes (PTBs) and conventional toothbrushes.

				2. Motivates to brush teeth better. (Supporting effective toothbrushing and motivated children to improve their brushing practices.)	
7	Kitsaras, et al.[46] (2025)	Exploring the potential of a school brushing program using a connected brush in underserved areas	Randomized Controlled Trial	1. Storing information on the duration and frequency of children's toothbrushing, which could be monitored by children and parents. 2. Providing direct feedback on tooth brushing performance. 3. Educating parents and children on proper toothbrushing techniques.	The intervention increased children's responsibility and independence in toothbrushing, improved parental awareness of children's toothbrushing behavior, and increased children motivation to brush their teeth.
8	Fageeh, et al.47 (2024)	"Teledentistry" using a mobile app (Telesmile) to improve oral health among the visually impaired and hearing-impaired populations in Saudi Arabia	Randomized Controlled Trial	Provided dental and oral health education adapted for individuals who were blind (audio recordings) or deaf (video-based education with sign language).	Telesmile improved knowledge dental and oral health and hygiene practices among blind and deaf participants compared with conventional education methods using booklets and verbal instructions.
9	Scheerman, et al.[48] (2025)	The effect of using a mobile application ("WhiteTeeth") on improving oral hygiene	Randomized Controlled Trial	Assisted and monitoring users in maintaining oral and dental care habits.	WhiteTeeth users experienced significant reductions in plaque accumulation and gingival bleeding scores.

DISCUSSION

The results of the review of nine selected research articles show that these applications play a role in interactive and efficient educational media as mobile health (mHealth) applications demonstrate potential effectiveness in improving oral health knowledge, behaviors, and selected clinical outcomes across diverse populations.[11,15,34–40]This discussion critically interprets the findings by identifying overarching patterns, examining contributing intervention features, and considering methodological and contextual limitations relevant to their application.

The findings indicate that mHealth applications may be more effective when they incorporate interactive and behaviorally oriented features, such as gamification elements, reminders, timers, and real-time feedback.[11,15,36] This is supported by the study conducted by Gurnani et al[15] which reported improvements in oral hygiene-related outcomes among children with attention-deficit/ hyperactivity disorder (ADHD) as indicated by a decrease in OHI-S results obtained from the frequency of tooth brushing and the time of brushing which was getting better in 12 weeks. *The Brush DJ app*, used in the study by Gurnani et al.[15]

provided education on proper toothbrushing, along with a timer and reward features designed to motivate users. Children with ADHD who used the application showed a significant increase in the frequency of twice-daily toothbrushing and in brushing for two minutes compared with those in the conventional education group. Experimental evidence indicates that working memory limitations in children with ADHD not only impair sustained attention but also interfere with the successful execution of goal-directed behavior, suggesting a causal rather than merely correlational relationship.[41] Recent evidence indicates that computerized training targeting working memory and executive function is more effective than traditional cognitive training interventions.[15]

This suggests that behavioral reinforcement mechanisms play a key role in supporting oral hygiene practices in pediatric populations.[11,15] These effects appear to be more pronounced in interventions that combined educational components with monitoring and feedback systems, such as applications integrated with smart toothbrushes or connected brushing programs.[37,40] Gamification features also play an important role in improving oral health knowledge and motivating users to maintain appropriate oral hygiene practices.[11,36] Four studies reported favorable clinical outcomes, including reductions in plaque and debris indices, with interventions that actively engaged children yielding more consistent improvements in brushing frequency, brushing duration, and plaque reduction than those relying solely on passive information delivery.[15,36,37,40] Children may be encouraged to adopt more effective toothbrushing practices through the use of instructional toothbrushing videos and integrated timer features, which allow them to brush their teeth while simultaneously following visual guidance displayed on the screen.[11,36]

The study by Desai et al.[36] demonstrated that *The Brush Up* application improved children's toothbrushing practices and motivation through character-guided toothbrushing training, which resulted in greater improvements than conventional demonstration methods and educational videos. The study by Zolfaghari et al.[11] showed that maternal involvement in monitoring children's oral health through plaque index (PI) assessment was associated with a significant reduction in PI scores by 0.5, which is relevant for caries prevention, although the PI reflects only short-term clinical outcomes and is expected to contribute to improved long-term oral health. Parental involvement also emerged as an important factor potentially influencing intervention effectiveness.[15]

Studies targeting parents of young children reported improvements in parental knowledge and engagement, which were associated with better oral hygiene practices among children.[11,36] These findings suggest that mHealth

applications may exert indirect effects at the family level, reinforcing the role of caregivers in early oral health promotion.[11]

Among adolescents, mHealth interventions demonstrated positive effective not only on knowledge but also on attitudes and preventive oral health behaviors.[34,35,39] Applications grounded in behavioral theories, particularly self-efficacy theory, were associated with improvement in motivation and responsibility toward oral health maintenance.[34] This finding underscores the importance of theory-based design in adolescent-focused digital health interventions.[34,39] The reviewed studies also demonstrated the adaptability of mHealth applications to specific population needs. Interventions tailored for athletes improved knowledge and practices related to the prevention and emergency management of traumatic dental injuries.[35]

A study by Azzizade et al.[35] examined the use of educational applications among karate and taekwondo athletes aged 11-17 years. The application provided information on the prevention and emergency treatment of Traumatic Dental Injuries (TDIs). The results showed that the use of the application was effective in improving knowledge and practices linked to TDI prevention.[35] Similarly, applications adapted for individuals with visual or hearing impairments, using audio guidance and sign-language-based videos, respectively, were effective in improving oral health knowledge.[38]

A study by Fageeh et al.[38] evaluated Telesmile, an application adapted to the needs of individuals who are blind or deaf. The application provided oral health education to participants who were blind through voice recordings, while participants whoe were deaf received educational videos incorporating sign language. Telesmile was shown to improve knowledge of dental and and oral health and hygiene practices compared among both groups compared with conventional education provided through booklets and verbal instructions.[38] These findings emphasize the potential of inclusive, user-centered design to enhance accessibility and support the delivery of oral health education to diverse user groups.[35,38]

Despite generally positive findings, substantial heterogeneity exists among the included studies with respect to study design, sample size, intervention duration, and outcome measures.[15,34] Randomized controlled trials tended to report more robust behavioral and clinical effects.[34] Most studies assessed short-term outcomes, limiting conclusions regarding the long-term sustainability of observed behavioral and clinical improvements.[14,34,40] The lack of standardized outcome measures and limited follow-up periods further constrain the comparability of results and the assessment of long-term effectiveness.[36,39] In addition, the predominance of studies reporting positive outcomes suggests the possibility of publication bias, as studies with null or negative findings may be underrepresented.[11,15,35] This potential bias may lead to an overestimation of the effectiveness of mHealth interventions and should be considered when interpreting the overall findings of this rapid review.

Although all included studies were conducted outside Indonesia, the findings of this rapid review may have important implications for the Indonesian context. According to the 2023 Indonesian Health Survey (SKI), dental caries and poor oral hygiene remain highly prevalent, particularly among children and adolescents.[3,4] Given the increasing use of mobile technologies in Indonesia, mHealth applications incorporating behavior change techniques, including reminders, timers, personalized feedback, and gamification, may represent a potentially scalable and cost-effective strategy to complement existing oral health promotion programs.[15,36]

The positive outcomes observed across the included studies may be attributed to the integration of behavior change techniques, which are designed to reinforce user engagement and encourage the adoption and maintenance of oral hygiene behaviors beyond conventional educational approaches. Nevertheless, differences in healthcare infrastructure, digital literacy, cultural

characteristics, and access to digital technologies should be considered when implementing these interventions in the Indonesian population. Therefore, future research should prioritize the development and evaluation of culturally adapted, evidence-based mHealth applications through well-designed randomized controlled trials conducted in Indonesia to determine whether the benefits observed in international studies can be replicated within the Indonesian context and effectively integrated into existing national oral health promotion programs.

This study has several limitations, including the inclusion of only English-language international publications, which may have introduced language bias and limited the representation of evidence from the Indonesian context. The exclusion of studies published in Indonesian may have reduced the comprehensiveness of the available evidence base by underrepresenting findings from the local context. This also limits the generalizability of the findings, especially in assessing the extent to which these applications can contribute to equal access to health services across all levels of society.

The grey literature search was restricted to the 2023 Indonesian Health Survey (SKI), which may have resulted in the underrepresentation of relevant unpublished or non-commercially published (non-peer-reviewed?) evidence and reduced the comprehensiveness of this review. As a rapid review, this study employed a streamlined methodology to synthesize evidence within a limited timeframe. Consequently, the review was restricted to studies published between 2020 and 2025, which may have resulted in a less comprehensive evidence base than that of a full systematic review. Furthermore, all studies included in this review were assessed as having a moderate risk of bias. Therefore, additional high-quality studies with a low risk of bias are needed to strengthen the evidence base regarding the effectiveness of mobile health applications for oral health promotion.

CONCLUSION

Mobile health apps have demonstrated potential effectiveness in supporting oral health promotion by improving oral health knowledge, encouraging oral hygiene behaviors, and reducing dental plaque. Applications incorporating behavior change techniques through interactive features, including gamification, reminders, timers, animated videos, and real-time feedback, appeared to provide more consistent benefits than conventional or passive educational approaches. However, several included studies reported only short-term improvements in clinical outcomes, particularly reductions in dental plaque. The effectiveness of mobile health applications ultimately depends on users' motivation and commitment to maintaining good oral hygiene practices.

The findings of this study suggest that evidence-based mobile health applications may serve as valuable adjunctive tools for oral health promotion and could be considered for integration into existing preventive oral health programs, particularly in Indonesia, where oral diseases remain highly prevalent. Furthermore, well-designed systematic reviews and high-quality primary studies with a low risk of bias are warranted to provide more robust evidence and support the development of culturally appropriate and context-specific mHealth interventions for implementation in Indonesia.

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