Review Article

Mobile Health (mHealth) Interventions for Tobacco Cessation and Oral Health Promotion in Adolescents: A Narrative Review

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ABSTRACT

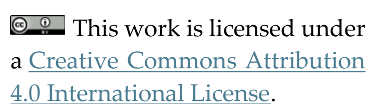
Adolescence is a highly vulnerable period for initiation of tobacco and nicotine use and also a key stage for the formation of lifelong oral health behaviours. Mobile health (mHealth) interventions provide a practical, private, and scalable method to deliver tobacco cessation support and oral health promotion through text messages, mobile applications, and digital multimedia platforms. This narrative review describes the relevance of mHealth for adolescents, summarizes evidence on its effectiveness for smoking and vaping cessation, and discusses its role in improving oral hygiene behaviours. Available research indicates that structured mobile-based cessation interventions can improve quit attempts and abstinence outcomes, especially when messages are tailored, interactive, and sustained over time. Similarly, oral health-focused apps and reminder systems can improve brushing adherence and plaque control in the short term. However, challenges remain in long-term engagement, outcome monitoring, and ensuring evidence-based content. Integrated mHealth approaches that address both tobacco cessation and oral health promotion may offer greater public health benefit by targeting shared behavioural determinants such as motivation, peer influence, and habit formation. Future research should focus on adolescent-specific interventions, longer follow-up periods, and culturally adapted strategies in diverse settings.

Keywords: mobile health interventions, tobacco, digital media, smoking cessation

INTRODUCTION

Tobacco use remains one of the leading preventable causes of morbidity and mortality worldwide, and most tobacco users begin during adolescence. [1] Early initiation increases the risk of long-term nicotine dependence, reduced quitting success in adulthood, and greater cumulative exposure to tobacco-related harms. Adolescents today are also exposed to newer nicotine products such as e-cigarettes, which have changed patterns of nicotine initiation and continued use. [2] These products often appear attractive due to flavours, marketing strategies, and peer influence, leading to experimentation that may progress to dependence. Tobacco and nicotine use during adolescence can negatively affect physical health, mental health, and future risk behaviours, making this group an important target for preventive and cessation interventions.

Oral health is closely linked to adolescent lifestyle behaviours. This age group often experiences irregular routines, inconsistent oral hygiene practices, high intake of sugary foods and beverages, and limited dental attendance. When tobacco use is added, the risk of oral problems increases further. Tobacco use contributes to tooth staining, halitosis, gingival inflammation, periodontal breakdown, impaired wound healing, and increased risk of potentially malignant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oral disorders over time. From a public health perspective, oral health promotion and tobacco cessation should not be viewed as separate goals because they share common behavioural and social determinants.

Mobile health (mHealth) interventions refer to health services delivered through mobile devices such as smartphones and basic mobile phones. These interventions may include text messaging programs, smartphone applications, interactive web platforms, and multimedia-based digital tools. The World Health Organization has emphasized the growing role of digital health interventions for strengthening health systems, improving communication, and supporting behaviour change.[3] Digital interventions can be used to provide reminders, motivational messages, education, counselling support, and monitoring tools.[3] They are especially suitable for adolescents because young people are frequent users of mobile devices and may prefer receiving support privately rather than through face-to-face counselling.

mHealth can offer unique advantages for adolescent tobacco cessation. Many adolescents avoid seeking help due to stigma, fear of disclosure to parents, or lack of access to cessation services. Mobile interventions can overcome these barriers by providing discreet, continuous support. Similarly, oral hygiene behaviours require repeated daily actions, and mobile reminders and habit tools can help adolescents maintain regular brushing and flossing routines. WHO-supported programs such as Be He@lthy, Be Mobile highlight how mHealth can be scaled for prevention and cessation strategies across countries. [4,5]

This narrative review discusses the role of mHealth in tobacco and nicotine cessation and oral health promotion among adolescents. It highlights evidence from systematic reviews and trials, explores how mHealth interventions influence behaviour change, and examines challenges in implementation. The review also considers the potential value of integrated mHealth strategies that address tobacco cessation and oral health improvement together, since these behaviours often co-exist and influence each other.

IMPORTANCE OF TOBACCO CESSATION IN ADOLESCENTS

Adolescence is widely recognized as the period when tobacco use is most likely to begin. Many young people experiment with smoking due to curiosity, peer pressure, stress, and social acceptance. Once nicotine dependence develops, quitting becomes difficult. Adolescents may not recognize the long-term risks of tobacco use because health consequences such as cancer and cardiovascular disease appear distant. However, early tobacco use can cause immediate harm, including reduced lung function, decreased physical fitness, and negative impacts on mental well-being. [1,2]

The rise of vaping has created additional challenges. E-cigarettes are often perceived as safer than conventional cigarettes, leading to higher acceptance among youth. Yet, vaping still exposes adolescents to nicotine, which can affect brain development and increase the risk of dependence. Adolescents who vape may also transition to smoking cigarettes or become dual users. This makes youth tobacco cessation programs more complex, as they must address both smoking and vaping behaviours.

Adolescents also experience unique barriers to quitting. Many do not identify themselves as “smokers” if they smoke occasionally or vape socially. They may underestimate addiction, feel confident they can quit anytime, or view quitting as unnecessary. In addition, adolescents may lack access to formal cessation counselling, and they may not feel comfortable discussing tobacco use with healthcare providers. Therefore, accessible and youth-friendly cessation approaches are essential.

mHealth interventions are well suited for adolescent cessation because they can provide timely support during cravings, reinforce motivation frequently, and adapt messages to the user's progress. Digital interventions can also incorporate peer support, interactive content, and behavioural tracking, which align with adolescent engagement preferences.

ORAL HEALTH EFFECTS OF TOBACCO USE IN ADOLESCENTS

The oral cavity is one of the earliest sites where tobacco-related effects become visible. Even in adolescents, tobacco use can lead to noticeable tooth staining, unpleasant breath, altered taste sensation, and increased plaque accumulation. These changes may affect social confidence and self-esteem, which are highly important during teenage years. Tobacco use also increases gingival inflammation and may worsen periodontal health over time.

E-cigarettes are often marketed as less harmful to oral health compared to smoking, but emerging evidence suggests that vaping may still contribute to dry mouth, irritation, changes in oral microbiome, and inflammation. While long-term data are still developing, it is clear that nicotine exposure and aerosol components can negatively affect oral tissues. Adolescents who vape may also maintain poor oral hygiene habits, further increasing risk of caries and gum problems.

Oral health can also serve as a motivational tool for cessation. Adolescents may respond strongly to short-term benefits like improved breath, cleaner teeth, and better appearance. This makes oral health promotion a valuable component of youth tobacco cessation strategies. When adolescents understand that quitting tobacco can quickly improve oral freshness, gum health, and smile aesthetics, their readiness to quit may increase.

CONCEPT AND SCOPE OF MHEALTH INTERVENTIONS

mHealth includes a wide range of digital tools delivered through mobile devices. The simplest form is text messaging, which can deliver motivational reminders, educational content, and coping strategies. More advanced interventions include smartphone applications with interactive features such as progress tracking, gamification, quizzes, and personalized feedback. Some programs also use multimedia content like videos and audio prompts to improve engagement.

The WHO guideline on digital interventions for health system strengthening highlights that digital tools can improve service delivery, patient communication, and health behaviour change.[3] These interventions are particularly useful when healthcare resources are limited or when populations face barriers to accessing in-person services. mHealth can also be scaled easily, making it cost-effective for public health programs.

However, mHealth interventions require careful design. Content must be evidence-based, culturally appropriate, and age-appropriate. Programs should avoid overwhelming users with excessive notifications, and privacy should be protected, especially for adolescents. Equity is also important because not all adolescents have smartphones or stable internet access. In such cases, SMS-based programs remain highly valuable because they can work on basic mobile phones.

mHEALTH FOR TOBACCO AND NICOTINE CESSATION

Mobile-based tobacco cessation interventions have been widely studied in adults, and growing evidence supports their usefulness in younger populations. One of the strongest advantages of mobile cessation tools is the ability to provide continuous support outside clinical settings. Adolescents often experience cravings or triggers during school, social gatherings, or stressful situations, and mobile support can be available immediately in those moments.

Text messaging interventions have shown significant effectiveness for smoking cessation. A Cochrane review reported that mobile phone-based interventions, especially text message programs, increase quit rates compared to minimal support. [6] Text programs typically provide structured messages that encourage setting a quit date, coping with cravings, avoiding triggers, and managing relapse risk. They also help reinforce motivation by reminding users of the benefits of quitting.

Digital multimedia interventions can provide more detailed support than SMS alone. The "Happy Ending" randomized trial demonstrated that a digital multimedia smoking cessation intervention could support quitting outcomes. [7] Such interventions are useful because they combine different formats like motivational messages, educational materials, and interactive tasks. This approach can be more engaging for adolescents who may prefer varied and visually appealing content.

Evidence specifically focused on young people was strengthened by a 2023 systematic review and meta-analysis that evaluated mobile phone-based interventions for smoking cessation among youth. This review concluded that mobile interventions can improve cessation outcomes, though results vary depending on program design, intensity, and follow-up duration. [8] This highlights that not all mobile programs are equally effective. Programs that are interactive, tailored, and behaviourally structured tend to perform better.

Vaping cessation has become an urgent priority because e-cigarette use is highly prevalent among adolescents. Youth vaping cessation programs delivered through text messaging have shown promising outcomes. A randomized clinical trial evaluating a vaping cessation text program among young adult e-cigarette users demonstrated improved abstinence compared with controls. [9] This indicates that structured text-based programs can support quitting not only cigarettes but also vaping, which is highly relevant for current adolescent trends.

Despite these benefits, challenges remain. Many commercial cessation apps do not follow evidence-based guidelines. Some apps provide inaccurate information or lack behavioural support components. Adolescents may download an app but stop using it within weeks if it feels repetitive or unhelpful. Therefore, engagement strategies such as personalization, interactive features, and meaningful incentives are essential.

Another important point is that mHealth interventions may work best when combined with human support. Digital tools can provide daily reinforcement, but counselling from healthcare providers or trained facilitators can address deeper psychological factors such as stress, anxiety, or peer pressure. WHO guidance supports using digital interventions as complementary tools rather than complete replacements for healthcare services. [3]

mHEALTH FOR ORAL HEALTH PROMOTION

Oral health promotion through mHealth is increasingly being explored because oral hygiene behaviours require consistent repetition. Adolescents often miss brushing due to busy schedules, irregular routines, or low motivation. Mobile reminders can act as prompts that encourage brushing at appropriate times. Apps can also help adolescents track their brushing frequency, build routines, and receive rewards for consistency.

Mobile applications designed for oral hygiene often include brushing timers, reminders, educational videos, and gamification. A randomized controlled trial evaluating the WhiteTeeth mobile app found that it improved oral hygiene behaviour among adolescents and young adults. [10] This study supports the idea that mobile-based behavioural interventions can positively influence oral health practices. The success of such apps depends on user-friendly design, relevant

content, and features that sustain interest.

Text messaging reminders have also been used in oral health promotion. Adolescents undergoing orthodontic treatment are often targeted because braces increase plaque retention and gingival inflammation. Reminder systems can improve compliance with oral hygiene instructions and reduce plaque-related problems. In high-risk adolescents, digital education combined with reminders may improve oral hygiene knowledge and attitudes.

However, oral health mHealth interventions also face limitations. Many studies focus on short-term outcomes such as brushing frequency over a few weeks or months. Long-term sustainability is less certain. Adolescents may lose interest in apps if they feel repetitive. Additionally, self-reported brushing behaviours may not always match clinical outcomes. Future studies should include objective clinical measures such as plaque index and gingival bleeding scores, along with longer follow-up.

Despite limitations, mHealth remains a promising approach because it is scalable and can reach adolescents in schools, communities, and remote areas. It also supports preventive care, which is essential for reducing long-term oral disease burden.

INTEGRATED MHEALTH APPROACHES FOR TOBACCO CESSATION AND ORAL HEALTH

An integrated mHealth approach that targets both tobacco cessation and oral health promotion may provide greater benefits than separate interventions. Tobacco use and poor oral hygiene often occur together, and both behaviours are influenced by motivation, self-control, stress, and social environment. Adolescents may be more likely to engage with an intervention that addresses multiple aspects of health and provides immediate, visible benefits.

Oral health outcomes can be used as motivational tools for cessation. For example, adolescents may feel encouraged to quit tobacco when they notice improvement in breath freshness, reduced staining, and healthier gums. Similarly, quitting tobacco can make oral hygiene efforts more effective because nicotine exposure reduces healing and increases inflammation. Therefore, combining both messages can create a reinforcing cycle of behaviour change.

Integrated interventions can also reduce program fatigue. Adolescents may not want to use separate apps for cessation and oral health. A single platform that includes quitting support, brushing reminders, oral hygiene education, and progress tracking may be more practical. Such programs can also include peer-based challenges, rewards, and interactive educational content.

Behaviour changes techniques used in integrated programs may include goal setting, self-monitoring, reminders, coping strategies, and relapse prevention. Programs can encourage adolescents to set a quit date while also establishing a brushing routine. Tracking tools can allow adolescents to see improvements in both tobacco abstinence and oral hygiene habits.

CHALLENGES AND LIMITATIONS OF mHEALTH INTERVENTIONS

While mHealth offers many advantages, there are important challenges that must be addressed. Engagement is a major issue because adolescents may stop using apps or ignore messages after initial interest. Sustaining motivation requires varied content, personalization, and interactive features. Programs that send too many repetitive reminders may cause notification fatigue, leading users to disable alerts or uninstall apps.

Privacy is another concern. Adolescents may share phones with family members, or parents may monitor phone use. Sensitive cessation messages could lead to unintended disclosure. Therefore, programs should allow adolescents to control

notification settings and ensure discreet message formats.

Equity is also important. Not all adolescents have access to smartphones or high-speed internet, especially in low-resource settings. SMS-based programs remain essential for reaching broader populations because they can function on basic phones. mHealth interventions should be designed with flexibility to ensure they do not widen health inequalities.

Another limitation is the quality of evidence. While many studies show positive results, there is variation in study design, sample size, follow-up duration, and outcome measurement. Some interventions are tested only in high-income settings, making generalizability difficult. More adolescent-focused trials are needed, especially in low- and middle-income countries.

FUTURE DIRECTIONS

Future research should focus on developing adolescent-specific mHealth interventions that address both smoking and vaping cessation. Programs should include culturally adapted content, local language support, and realistic strategies for adolescent triggers such as peer influence and stress. Longer follow-up studies are necessary to understand whether mHealth interventions produce sustained quitting outcomes and long-term oral health improvements.

Integration with school health programs and dental services may improve effectiveness. For example, school-based oral health promotion combined with mobile cessation support could create a supportive environment. Dental clinics can also use mHealth tools to provide follow-up support for adolescents receiving counselling.

Artificial intelligence and adaptive messaging may improve personalization by tailoring content based on user behaviour, cravings, or engagement patterns. However, ethical concerns related to privacy and data security must be carefully managed. WHO guidance emphasizes the need for evidence-based, safe, and equitable digital health interventions. [3]

CONCLUSION

mHealth interventions provide a valuable opportunity to support tobacco and nicotine cessation and oral health promotion among adolescents. Evidence supports the effectiveness of mobile-based cessation programs, particularly text messaging interventions and structured digital multimedia approaches.[6–8] Youth-focused vaping cessation programs delivered through mobile messaging also show promising results.[9] For oral health, mobile apps and reminders can improve oral hygiene behaviours in adolescents, although long-term sustainability requires further research.[10] Integrated mHealth approaches may provide stronger public health impact by addressing shared behavioural determinants and offering adolescents immediate, visible benefits. Future work should emphasize adolescent-specific designs, longer-term evaluation, cultural adaptation, and equitable access to ensure these interventions are effective and widely usable.

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