SYSTEMATIC REVIEW

Health Promotion Interventions among Adolescents for Smoking Cessation : A Systematic Review

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ABSTRACT

Introduction: Health promotion interventions can determine the success of smoking cessation among adolescents. This article aims to review the previous articles that link health promotion interventions among adolescents for smoking cessation. **Methods:** This study was a systematic review to collect and analyze previous studies. We collected the articles from PubMed and Sciencedirect (2017-2020). We included studies related to health promotion intervention among adolescents for smoking cessation. We found nine articles out of five hundred and seventy-two related to smoking cessation programs. **Results:** The study found that they used short messages (n = six), multimedia (n =two), and Facebook groups (n = one). **Conclusion:** Our review of interventions in health promotion in adolescents needs to consider several things the media and methods used, and cross-disciplinary collaboration is needed in conducting health promotion interventions in adolescents for smoking cessation.

Keywords: Adolescent, Health promotion, Intervention, Smoking cessation

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INTRODUCTION

Smoking is an influential lifestyle contributing to the burden of disease globally. Smoking is the second number of deaths by risk factors globally (1). Unfortunately, there is still a large population of smokers. Smokers have believed that smoking is harmful to health, but smoking can provide psychological relief (2). The WHO report in 2019 stated that tobacco use is the primary cause of the death of millions of people per year worldwide, and it is closely linked to communicable and non-communicable diseases (3).

Smoking negatively affects people's health, especially in adolescents experiencing growth and development. In addition to the physical effects of tobacco use, it affects emotional states. The major diseases associated with smoking were heart disease, respiratory system, cancer, miscarriage, fetal growth, and stress and mood disorders (4). Adolescence is considered a stage full of vulnerability because it faces various situations and risks that can cause health problems immediately or in the future. The role of health practitioners is needed to overcome the adverse effects of smoking through health

promotion with a smoke-free lifestyle (5).

Smoking can increase the burden of chronic disease, so it requires health promotion to stop smoking behavior. Health promotion strategies are the primary tool for creating public awareness in smoking prevention and cessation. Health promotion efforts regarding the adverse effects of smoking can increase knowledge and increase the intention to quit smoking(6). Health promotion is a process that allows individuals to increase control over health that focuses on behavior change with various social and environmental interventions (7).

Several health promotion interventions were used in smoking cessation, positively impacting smoking status. However, the increasing prevalence of adolescent smoking shows that the intervention is still less effective for smoking cessation among adolescents. Health education strategies tailor-made for smoking cessation can determine success in health promotion (8). Several health promotion interventions have been used for smoking prevention and cessation and have shown positive effects. However, studies showing health promotion intervention strategies, especially for adolescents, are still lacking. Therefore, a review to determine effective health promotion intervention strategies for the prevention and cessation of smoking in adolescents is very important to overcome the increasing number of smokers in adolescents. Several health

promotion interventions have been used for smoking prevention and cessation and have shown positive effects. However, studies showing health promotion intervention strategies, especially for adolescents, are still lacking. This study aims to review the strategies and media used in health promotion regarding smoking cessation among adolescents.

METHODS

Types of research
This study is a systematic review by reviewing the literature based on previous research on health promotion interventions on smoking cessation among adolescents. The systematic literature review focused on research with thorough research and development methodologies to collect and evaluate related research (9). The purpose of systematic review is to identify, review, evaluate, and interpret all research with specific topics (10).

Search Strategy
ScienceDirect and Pubmed were used to find published articles on adolescent health promotion interventions for smoking cessation. We used the following combination to search for titles, abstracts, and keywords: (smoking AND youth OR Adolescents AND health promotion and smoking cessation) including relevant Medical Subject Headings (MeSH) terms. The search focused on articles exploring adolescent health promotion interventions for smoking cessation using quantitative methods (RCTs) published from 2017 to 2020. We included all population-based studies on health promotion intervention among adolescents for smoking cessation, published full-text in English, article type RCT, original research. We exclude health promotion intervention involving adolescents with disease and e-cigarette.

Article Screening
The screening process is carried out through the initial title according to the keywords. Then, abstract screening is carried out to identify which articles can match the desired criteria. After that, all articles deemed significant at the baseline were reviewed. The first stage reviews each abstract based on inclusion criteria. All titles and abstracts are examined; the goal is to avoid the repetition of articles and ensure that the reports match the inclusion criteria. The second stage assesses the title and abstract samples according to the same standards for selection. When the two review stages have been carried out, the researcher can decide which articles meet the inclusion criteria (Figure 1).

Study Quality Assessment
Each article has been assessed for quality using the standard format from the JBI for Randomized Controlled Trial, consisting of thirteen checklist items (11). The results of the review concluded that the higher the JBI value, the better the quality of the articles.
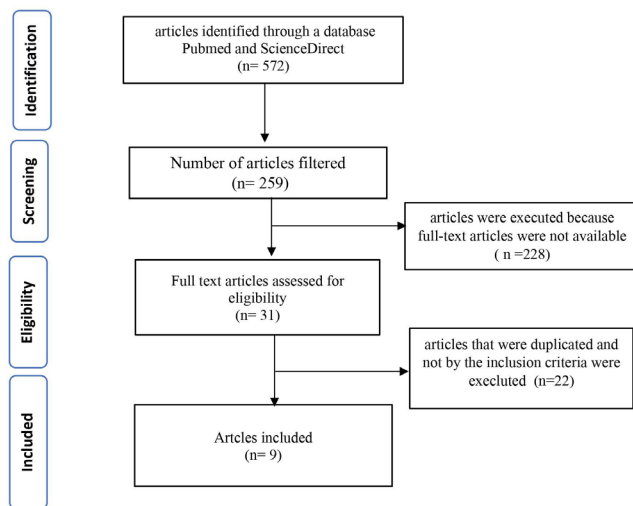

Figure 1: Article Search and Filtering Process Diagram

RESULT

Article Selection
Based on the results of a search conducted through Pubmed and ScienceDirect, five hundred and seventy-two articles were obtained using a combination of the keywords adolescent, health promotion, and smoking cessation. Two hundred and fifty articles were found according to the search keywords then filtered. Two hundred and twenty-eight articles were executed because the full-text articles were not available. Furthermore, thirty-one full-text articles were reviewed, and those that were duplicated and did not meet the inclusion criteria were executed as many as twenty-two articles. Only nine full-text articles were reviewed (Table I).

Characteristics of The Included Studies
Nine articles were found regarding health promotion interventions among adolescents for smoking cessation. Research has been conducted in various countries in the USA, China, Turkey, Sweden, and California. Most of the participation characteristics came from a minimum age of eighteen years (n=seven articles), ages twelve until eighteen years (n=two articles), and smokers. Adolescence is the stage of life between childhood and adulthood, namely the age of ten to nineteen years (3). The research is carried out in various conditions, such as rural and urban communities, schools, and clinics. The study was conducted in multiple settings, such as urban and rural communities, schools, and clinic settings.

Types of Interventions
Research that uses text messages given to participants through short messages about anti-smoking impacts the prevention and cessation of smoking. Research with text messages via telephone to reduce cellular smoking behavior has been carried out in China, named "Happy Quit"(12). Providing interventions through

Table I: Articles Analysis

No	Title	Objective	Participants	Intervention	Outcome	Conclusion
1	Effectiveness of a text-messaging-based smoking cessation intervention ("Happy Quit") for smoking cessation in China: A randomized controlled trial	to identify the acceptability, feasibility, and efficacy of a mobile phone-based text message intervention for smoking cessation	Smokers, > 18 years n = 1369, China	The intervention group was divided into high-frequency messaging (HFM) and low-frequency messaging (LFM), where HFM was given 3 to 4 messages per week while LPM was given 1 to 2 messages per week for 12 weeks.	Participants' self-reported smoking status and verified biochemically through urine samples	intervention Happy Quit, with messaging was successful for smoking cessation
2	From the Experience of Interactivity and Entertainment to Lower Intention to Smoke: A Randomized Controlled Trial and Path Analysis of a Web-Based Smoking Prevention Program for Adolescents	to evaluate the impact of a Web-based intervention, A Smoking Prevention Interactive Experience (ASPIRE), on adolescents' intention to smoke	12-18 years, n=101, Houston	This program displays entertainment interactivity to involve teenagers through text (tobacco education), videos in animated cartoons and testimonials from high school students, and activities in the form of assignments	Adolescents in the ASPIRE group were significantly more likely to show a decrease in their intention to smoke	Web-based smoking prevention program, this study contributes to the understanding of adolescents' psychological experience and its effect on Their intention to smoke.
3	Using graphic text messaging to promote smoking cessation among first-generation Chinese and Korean male immigrants	to test a graphic, native-language text-messaging intervention to promote smoking cessation	Smokers > 18 years n=71, setting: USA	Participants received either graphic plus text or text-only health messages depicting the physical and social harms	Participants completed an expired air carbon monoxide (CO) assessment and self-reported	The graphic text messages showed a more significant positive change in quitting attitudes and report more substantial negative emotions, compared with those receiving the text-only
4	WhatsApp embedded in routine service delivery for smoking cessation: effects on abstinence rates in a randomized controlled study	This study aims to evaluate the effect of support messages through WhatsApp application added to the usual care	Smokers >18 years, n= 132, Turkey	Both groups received standard outpatient care from the clinic, including 45 minutes of individual counseling at first contact, and were given a smoking cessation. Routine service delivery was in progress at the time of the intervention. WhatsApp and booklet and follow-up.	the intervention group had higher abstinence rates since the first month	the benefit of providing Compared to usual care alone, additional support via WhatsApp is confirmed at all follow-up points.
5	Web-Based Contingency Management for Adolescent Tobacco Smokers: A Clinical Trial	examined a remote form of contingency management among non-treatment-seeking adolescent smokers	Smokers > 18 , n= 127, USA	A breath monitoring system with CO2 measurement to verify the smoking cessation of adolescents is web-based called Motiv8, and participants can use computers and internet services.	this study represents a rigorous examination of a CM therapy delivery can be delivered remotely and meaningful in adolescent smoking cessation.	Reduced CO levels during treatment suggest there was some efficacy in reducing smoking while contingent rewards were in place
6	A Text Message Delivered Smoking Cessation Intervention: Design and Rationale of the Text My Quit Study	to test the efficacy of TMQ; for Smoking cessation intervention delivered through text messaging.	smoker>18 years n =280, USA	All participants are randomly assigned to receive 12 weeks of either; (1) a tailored smoking-cessation intervention delivered 100% through text messaging (TMQ) (2) non-smoking-related text messages serving as a control for contact and subject burden (Mojo).	smoking cessation verified by saliva sample for cotinine test,	Studies of smoking cessation internet programs have shown that user engagement with an online intervention
7	mHealth smoking cessation intervention among high school students: 3-month primary outcome findings from a randomized controlled trial	to determine the effectiveness of a text-based smoking cessation	smoker, 16-18-years n= 535 Sweden	The intervention consists of a 12-week automated program with a total of 121 text messages.	prolonged abstinence,	smoking cessation programs by mHealth can affect quit rates among adolescents.
8	Chat-based instant messaging support integrated with brief interventions for smoking cessation: a community-based, pragmatic, cluster-randomized controlled trial	to assess the effect of chat-based instant messaging approval combined with brief interventions on smoking cessation	Smoker >18 years n= 1185, China	Participants in the intervention and control groups received brief face-to-face smoking cessation advice and received a self-help booklet. The counselor sends participants via what apps to start the interaction, and messages were sent to participants on a tapering schedule.	smoking abstinence verified by exhaled carbon monoxide concentrations	Chat-based instant messaging support integrated with brief cessation interventions increased smoking abstinence and could complement existing smoking cessation service
9	Connectedness Based on Shared Engagement Predicts Remote Biochemically Verified Quit Status Within Smoking Cessation Treatment Groups on Facebook	to examine relationships between group, size, monetary incentive, readiness to quit with group density, and between individual degree centrality and personal smoking abstinence.	Smokers, 18-25 years n= 251 California	Participants were assigned to one of 29 secret Facebook groups tailored to their readiness to quit smoking and were assessed for remote biochemically verified smoking abstinence at the end of the intervention.	Individual degree centrality was significantly associated with biochemically verified smoking abstinence for both comments and likes	Participants in a smoking cessation intervention delivered through Facebook groups were more likely to have biochemically verified smoking abstinence if they were more connected to the rest of the group via shared engagement.

health promotion in the form of messages that increase motivation to stop smoking and how to change behavior for smoking cessation for twenty-four weeks, the results of which will be verified biochemically. The group was divided into two groups, where HFM is given three to four messages per week and LFM is given one to two massages per week for twelve weeks. Then for one month, no messages were delivered, but participants were encouraged to continue messages to family and close friends. Encouraging participants to reduce smoking, maintain continuous smoking cessation, and provide ways to avoid smoking urges, stress management, and weight management focus on the messages that have been conveyed (12).

Another study conducted among Chinese and Korean immigrants in the US that used explicit text messages containing risk information, motivating quitting, tested specifically quitting tips that promote smoking cessation showed expired CO level decreased. For four weeks, text messages have been given and started one day after the primary procedure. The health messages given have been adapted to Chinese culture in graphics with or without text describing the physical and social adverse effects of smoking that participants have received. This study shows that mobile phones' graphical text message intervention approach positively changes smoking behavior (13).

Text messages (Text My Quit) provided for health promotion interventions, including motivating to quit smoking by sending or posting messages online, showed significant results. The treated participants received text messages about smoking cessation, and the control participants were given messages that were not related to smoking cessation. In the beginning, the assessment was carried out and then continued for the next six months. An intent-to-treat approach is used to obtain prolonged abstinence. The assessment was carried out three times, namely at the beginning, in the third month, and as a follow-up in the sixth month (14).

Health promotion research on smoking cessation conducted in high schools in Sweden through text messages can affect the rate of smoking cessation among adolescents. The treatment group has received one hundred and twenty-one automated messages for twelve weeks. Messages given to the treatment group for twelve weeks are as many as one hundred and twenty-one messages. Two to four messages were sent per day for the first two weeks, then during the third week, two messages per day, and the fourth to seventh week, one message per day was given. Only one message per week is given from the eighth week to the twelfth week. The results showed prolonged abstinence, where participants smoked less than five cigarettes during the last eight weeks (15).

WhatsApp for additional treatment can be used to promote smoking cessation in university hospital cessation units, Turkey. Sending text, audio, video, and document messages will be more accessible to WhatsApp because it has low costs and good encryption. The provision of health promotion interventions that help participants in smoking cessation will be more effective at the time and place of counseling through WhatsApp, especially in the first and third months. At the beginning of the study, the treatment group and control group were given the same treatment according to the treatment guidelines given at the clinic and individual counseling for forty-five minutes related to smoking cessation. Sending messages via WhatsApp is given to the treatment group for follow-up care. Routine service delivery was in progress at the time of the intervention. The main topic was sent via WhatsApp message to the intervention group. After the standard procedure was carried out from the hospital, the treatment group received a message via WhatsApp with the main topic: the day before stopping (Having an action plan) and after the day stopping (preventing recurrence).booklet and follow-up the following week. The control group was given motivational interviews or smoking cessation counseling depending on quitting smoking. The treatment group received orders for three months and was followed up for six months. This study showed that additional support through WhatsApp messages was beneficial for confirmed participants at all follow-up points compared to the control group (16).

Smoking cessation services can be improved by using chat-based short message assistance integrated with smoking cessation programs. The smoking cessation ambassador provided literature and guidance to both groups (treatment and control) at the start of the intervention. Six months following therapy, smoking cessation was achieved, as evidenced by lower carbon monoxide and cotinine levels. Both groups (treatment and control) received a brief face-to-face meeting from the smoking cessation ambassador, and both groups were also given self-help books to assist them in quitting their cigarettes. WhatsApp to enhance communication between treatment group participants and counselors is encouraged. The therapy group got nineteen messages for three months, varying in frequency. The communications contained smoking cessation advantages, smoking reduction tactics, smoking cessation programs, and participation reminders, as well as three months of smoking cessation assistance. Counseling utilizes acceptance and commitment therapy (ACT) to build psychological capacity (17). Participants were helped to identify values that could reinforce smoking cessation and overcome the urge to smoke using metaphors and mindfulness. The results of this study state that chat-based text messages affect increasing smoking abstinence and perfecting smoking cessation behavior that is being undertaken (17).

Research in a clinical setting conducted in Texas was web-based contingency management (CM) for Adolescent

tobacco smokers (18). This study replicated the feasibility of remote convergence management, showing that CO was reduced in the active state of reducing smoking, but after further treatment, it was inconsistent. A breath monitoring system with CO measurement to verify the smoking cessation of adolescents is web-based called Motiv8, and participants can use computers and internet services. The program requires three breath samples per day and a gap of at least five hours but not more than eight hours. The Motiv8 server accepts video-recorded CO sample uploads. Participants can see CO results on a graph displayed by the web that participants can access for free. Both groups were given the same program, and the CO reduction criteria determined the difference in the intervention group. Baseline phase (seven days), participants waited for three breath samples. Shaping phase (four days) receiving reinforcement to reduce CO levels gradually. Abstinence phase (twenty-one days) giving breath samples of more than four ppm, thinning phase (five days) tapered off incentive for abstinence, and back to baseline phase (18).

This study considers interactive experiences and entertainment to reduce the desire to smoke through a transitional user experience model with the smoking prevention interactive experience (ASPIRE) program. ASPIRE has interactive and entertaining features according to the needs of adolescents through texts, animations, videos, and task-oriented activities. Participants were divided into two groups and were given the ASPIRE program. The intervention group was assigned the ASPIRE program equipped with interactive features. This program displays entertainment interactivity to involve adolescents through text (tobacco education), videos in animated cartoons and testimonials from high school students, and activities in the form of assignments. ASPIRE is also equipped with instructions for viewing objects/characters and messages. Meanwhile, the control group does not have interactive features. Adolescent psychological experiences and intentions towards smoking can be addressed with web-based smoking prevention programs (19).

Research-based on Co-involvement in smoking cessation treatment in Facebook groups may contribute to biochemically predicted smoking cessation status conducted in California. Participants were divided into twenty-nine Facebook groups and grouped randomly according to the stages of smoking cessation. All participants received daily postings for three months, and abstinence from smoking behavior was biochemically validated at the end of the intervention. The relationship between the number of participants in the group, reward conditions, and good intentions to smoking cessation, and the relationship between group members based on their involvement in the same content was assessed in all groups. Biochemical verification through saliva cotinine test strips was sent to participants to identify successful smoking abstinence. This study found that

active participation in the contemplation group had lower connectedness than the pre-contemplation group. Participants who are actively involved in the group tend not to smoke and are not dependent on early readiness, and also provide rewards for commenting (20).

Study Outcomes
Outcomes of nine articles related to smoking cessation included smoking status, decreased smoking intention, smoking abstinence. Participant self-reported smoking status or abstinence verified biochemically through urine or saliva samples and expired CO.

DISCUSSION

We identified nine studies using RCTs related to health interventions among adolescents for smoking and found several interventions that used technology-based social media to support these interventions. Media through mobile phones seems to offer a good platform for adolescents to support smoking cessation efforts. Mobile phone and web-based interventions can facilitate changes in health behaviors, including smoking cessation (21). The existence of social media technology that is overgrowing is an opportunity to provide health content that is easily accessible, affordable, and can be used by people with a broad geographical location as long as there is access to the internet (22).

Short messages in support, motivation, and behavior change techniques are used in health promotion that supports smoking cessation. Still, adolescents' involvement in conveying these messages to other users has a better effect. Smoking cessation health promotion through smartphone applications is very efficient because it can be enjoyed by anyone and save costs on the health system (18). WHO supports text messaging as an intervention in tobacco control (23).

Counseling through mobile phones has a more beneficial effect than just text messages so that adolescents can be interactive in increasing knowledge and reducing smoking intentions. The platforms used in the study were WhatsApp, SMS, and Facebook, which were programmed to provide periodic messages to participants. Web-based research presents more multimedia interventions such as videos, entertainment, interactive programs. Multimedia should be following the needs of adolescents and must also be followed by positive self-efficacy to be able to follow the program to completion. Decision-making to stop smoking among adolescent girls in developing countries is obtained through multimedia interventions to increase support and empowerment in smoking prevention (24).

The intervention duration of the study was found to range from twelve weeks to six months, after which participants would be observed from one to three months after the intervention to see the consistency of

the results. intervention results reported by participants to be verified biochemically or with CO levels will be better.

Several limitations are taken into consideration in this study. First, the age of the participants is still heterogeneous even though they are still in the adolescent age range. Second, article searches were conducted only on PubMed and Sciencedirect, possible that some strategies used in smoking cessation health promotion were not reviewed.

CONCLUSION

After analyzing nine articles on adolescent health promotion interventions for smoking cessation, the participants ranged from twelve to over eighteen years of age. Found all articles using social media in the delivery of text messages. Three articles and text messages plus video messages and interactive methods of providing intervention. Using social media can provide health promotion interventions in adolescents, and verified biochemically or with CO levels is required. Cross-disciplinary collaboration is needed in conducting health promotion interventions in adolescents for smoking cessation. Healthcare researchers can collaborate with computer science, engineering, data science, marketing, and communications to provide affordable and tailored interventions for adolescents.

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