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School-based Smoking Prevention in Adolescents in Developing Countries: A Literature Review

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Abstract

BACKGROUND: The incidence of diseases due to tobacco consumption has increased, especially in developing countries, where around 90% of smokers start consuming tobacco before the age of 18 years. School-based smoking prevention programs can prevent smoking among adolescents. This program is often implemented in developing countries because it is considered cost-effective, and the results are promising. At present, the school-based smoking prevention program is expanding with many methods.

AIM: This study aims to describe the various types of school-based smoking prevention interventions in developing countries.

METHODS: This research applied a literature review approach with the process of collecting data through the Science Direct, ProQuest, EBSCO, and NCBI databases. Search literature was by keyword "smoking AND prevention AND school-based AND adolescent AND randomized controlled trials or randomized controlled trials." Inclusion criteria used for data collection were studies on school-based smoking prevention interventions, full text, and journal publishing from 2015 to 2019, using English. The research conducted in developing countries and prevention interventions was not only for smoking in the traditional way but also in the form of other than the consumption of tobacco such as cigars, smokeless tobacco, and hookah or shisha. Exclusion criteria in this review were publication articles not in the form of original publications such as letters to editors, only abstracts, and books.

RESULTS: The literature search results found 594 journals with details of 99 Science direct journals, ProQuest 385 journals, NCBI 85 journals, and 25 EBSCO journals. The entire database belongs to the inclusion criteria and only seven articles meet the requirements. The results of the analysis revealed that interventions conducted in school-based smoking prevention programs for adolescents in developing countries included the application of the anti-smoking curriculum, behavior change intervention (BCI), and peer education.

CONCLUSION: Interventions considered useful for preventing smoking in adolescents are the anti-smoking curriculum, BCI, and peer education.

Introduction

Cigarettes are the leading cause of death worldwide, where around 6 million people worldwide die from smoking-related diseases each year [1]. In 2030, smoking may cause approximately 10 million deaths from a total of 60 million deaths. In 2012, the number of male smokers was 654 million, and female smokers were 72 million, while the majority of smokers living in developing countries [2], [3]. Global cigarette use is decreasing, but there is a rapid increase in the use of other forms of tobacco, such as cigars, smokeless tobacco (SLT), and hookah or shisha [4].

The same issue happens in developing countries, where tobacco-related diseases have increased with the amount of tobacco consumption, which is still high. Tobacco use is one of the main risk factors for several chronic diseases, including cancer, lung disease, cardiovascular disease, and even musculoskeletal diseases such as the increased risk of fractures and joint disease [5], [6].

About 90% of smokers start consuming tobacco before the age of 18. Data from 68 developing countries from 2006 to 2013, the average prevalence of tobacco use in adolescents was 13.6%, and it established adolescent smokers to remain a significant health problem in developing countries [1]. Adolescence is a high-risk development phase to start smoking. Half of the smokers who smoke during adolescence are estimated to continue smoking for the next 15–20 years, so smoking prevention among teens is essential [7], [8].

Adolescents should be aware of the dangers arising from smoking through health promotion strategies [9]. School-based smoking prevention programs can prevent adolescents from smoking in adolescents. This program is often implemented in developing countries because it is considered cost-effective and the results are promising [10]. Over the past three decades, the school environment has been a significant focus on the prevention of smoking behavior in adolescents. The main benefit felt in school-based programs is that almost all children go to school, and the discussion of education is following

daily activities at school [11]. Tahlil's research (2015) stated that school-based smoking prevention programs can provide long-term benefits to the knowledge and attitudes of adolescents about smoking.

School-based smoking prevention programs develop with many methods, including implementing program information about cigarettes and the dangers of smoking, teaching skills to refuse to smoke, and multimodal taught with parents, teachers, and the community [11]. The many school-based smoking prevention program methods that have developed have made researchers interested in writing literature reviews. The purpose of this paper is to provide an overview of various types of school-based smoking prevention interventions, especially interventions applied in developing countries where the level of cigarette consumption in adolescents is still in the high category.

Methods

The method used in this study was a literature review, in which the researchers objectively criticized, summarized, and made conclusions about a subject through systematic search, categorization, and thematic analysis [12]. A literature review is critical because it summarizes the available literature on a topic, uses scientific steps, and presents literature analysis so that readers do not have to access each research report included in the literature review [13].

The necessary steps in the literature review used four stages. They are (1) designing a review which includes the selection of exciting topics, determining objectives, scope, and research questions; (2) reviewing, searching for samples using keywords that fit the inclusion criteria, selecting quality articles by reading the title and abstract first, then the full text before becoming a sample; (3) sample analysis is adjusted to the purpose of the study; and (4) systematic review writing [14].

The researchers conducted the data collection process during December 2019 through the Science Direct, ProQuest, EBSCO, and NCBI databases. Inclusion criteria used for data collection were research related to school-based smoking prevention interventions, full text, and journal publishing from 2015 to 2019. The language used in the text was English, and the analysis took developing countries. Prevention interventions were not only for smoking in the traditional way but also for other forms of tobacco consumption such as cigars, SLT, and hookah or shisha. Exclusion criteria in this review were publication articles not in the form of original publications such as letters to editors, only abstracts, and books. The search results journals were according to inclusion criteria, and analysis followed the research objective of identifying school-based smoking prevention interventions for adolescent students, especially in developing countries.

Results

A literature search by entering keywords that match the title of the study is "smoking AND prevention AND school-based AND adolescent AND randomized controlled trials" or randomized controlled trials (RCT). The literature search results found 594 journals with details of science direct found 99, ProQuest found 385, NCBI found 85, and EBSCO found 25. After being categorized with inclusion criteria and filtered based on the research location, the entire database was seven developing countries that met the requirements. An overview of the process of searching and reviewing the literature is in the following Figure 1.

School-based smoking prevention interventions, two of these journals are a follow-up of a school-based smoking prevention intervention conducted to determine the short-term and long-term benefits of the intervention on the knowledge, attitudes, and behavior of teenage students about smoking. Short-term gains received an evaluation after 3 months of intervention and long-term benefits after 6 months of intervention [15], [16]. Tobacco consumption in this review is not only by traditional methods but also tobacco consumption in other forms such as waterpipe tobacco smoking or shisha, SLT, and betel quid or betel [17], [18].

The research locations chosen in the journal were developing countries, where smoking prevention interventions were still necessary for adolescents due to their high tobacco consumption rates. The countries were Pakistan, Lebanon, Korea, Iran, Uruguay, Malaysia, and Indonesia. The age of respondents used is adolescents between the ages of 11 years and 16 years. The overall results of the study showed the effectiveness of school-based interventions proved by the increase in knowledge and attitude changes in all journal respondents. There is one journal that shows the results of increased knowledge and attitudes, but no change in behavior existed in the intervention group [17].

The results of the review showed that there were broadly three school-based cigarette prevention interventions, namely, the adoption of an anti-smoking curriculum, behavior change intervention (BCI), and peer education. An explanation of the seven journals used in this literature review is in the following characteristic study (Table 1).

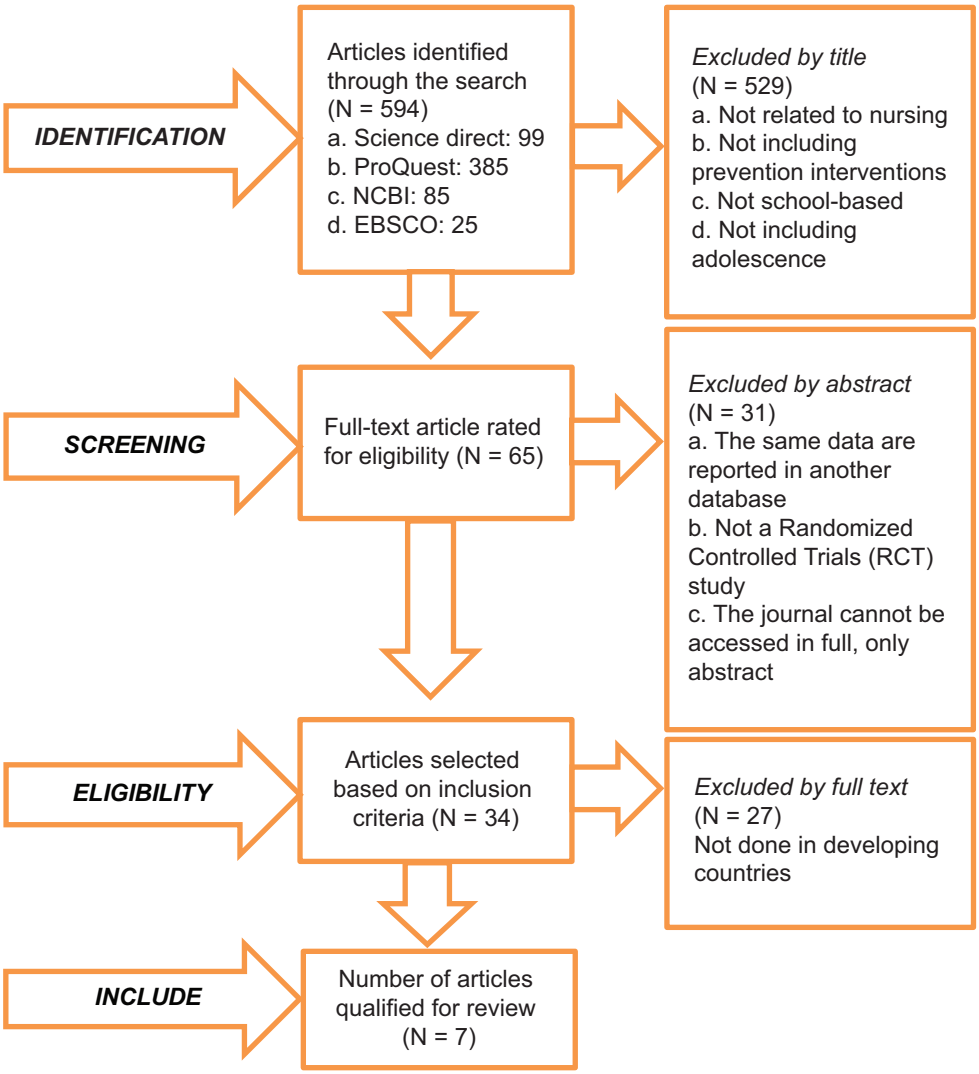

Figure 1: Article search process

Discussion

The focus of this review literature is to find out forms of school-based smoking prevention interventions for adolescent students. The results of the review indicated that there were three school-based smoking prevention interventions applied to adolescent students in developing countries.

1. Application of anti-smoking curriculum

School-based programs are a comprehensive strategy that is generally accepted to limit tobacco use among children and adolescents. It is an implementation of the program with a health education curriculum taught by teachers or trained professionals [19]. The purpose of this program is to minimize the intention and initiation to smoke, increase student awareness and knowledge about smoking, increase understanding of the effects of cigarette smoke on those around him, teach and practice the skills to reject cigarettes, and develop positive attitudes towards students toward smoking [7].

School-based prevention programs have been implemented internationally in recent decades [20]. The intervention in applying the anti-smoking curriculum has several models adapted to the culture and educational provisions of each country. For example, in Yu's *et al*., the research ex-smoking prevention program implemented in schools is an ex-adaptation program developed in California that has received international recognition and then adapted to culture in Korea. Tahlil *et al*. modify the plan by incorporating religious concepts in the anti-smoking curriculum that is culturally appropriate in the Province of Aceh, Indonesia.

School activities in the anti-smoking curriculum, according to López *et al*., include smoking prevention modules, workshops with role play, debates, construction practices for simulations about smoking, studies on the components of tobacco, the effects of tobacco on the body, and diseases caused, learning through the experience of people with laryngeal or lung cancer with a history of smoking.

Research on the cigarette prevention curriculum program has been widely out in the world. There is a systematic review that uses 135 RCT studies that discuss smoking prevention programs for children and adolescents with school-based interventions, namely, the application

Table 1: Journal characteristics study

S. No	Researcher/ year	Title	Purpose	Research design, population, and instrument	Result
1	Nakkash *et al*. (2018)	A RCT of a theory-informed school-based intervention to prevent waterpipe tobacco smoking: Changes in knowledge, attitude, and behaviors in 6th and 7th graders in Lebanon	Evaluating school-based interventions to prevent the use of waterpipe tobacco smoking (waterpipe tobacco smoking) or shisha, assessed in this study are changes in the knowledge, attitudes, and behavior of 6th- and 7th-grade students (13–15 years) in Lebanon	Study design: RCT with double-blind; Population: Students in grades 6 and 7 from 31 schools in Lebanon Sample: 1279 random stratified sampling, 6th- and 7th-grade students from 31 schools divided into 14 school intervention groups and 17 school control groups Instrument: Questionnaire about knowledge of 15 questions (true/false), the attitude of 13 questions (agree/disagree) and behavior of 2 questions (smoking shisha/not)	The results of the intervention in the provision of knowledge and skills for smoking prevention in this study are (a)Increased knowledge about shisha and its impact on health (b) Changing attitudes about shisha, students become assumed there is no benefit to using shisha (c) No change in behavior found in the intervention group due to the time lag of the intervention and a concise assessment of behavior change
2	Hussain *et al*. (2018)	School-based behavioral intervention to reduce the habit of SLT and BQ use in high-risk youth in Karachi: A RCT	Changing adolescent perceptions about the dangers of using SLT and BQ/betel and encouraging them to stop using it	Study design: RCT Population: adolescent students ages 11–16 at government and private schools located in Karachi, Pakistan Sample: 2140 students from 26 schools divided into two groups, namely the intervention group of 1185 students and the control group of 955 students Instrument: Questionnaire	BCI is effective in increasing adolescent knowledge and awareness of the dangers of using SLT and BQ/betel. After being followed up by 8% in the control group and 29% in the intervention group, it stopped using SLT and BQ
3	Yu *et al*. (2019)	Three-month effects of project EX: A smoking intervention pilot program with Korean adolescents	Evaluation of follow-up interventions after 3 months of project EX implementation to prevent tobacco use among adolescents in Korea	Research design: Quasi-experiment Population: Students in grades 10 to 12 at a school located in Gyeonggi-do Province, Korea Sample: 160 students smokers in grades 10–12, divided into two groups: An intervention group of 85 students and a control group of 75 students Instrument: Questionnaire for pre- and post-test	Project EX or the application of the anti-smoking curriculum in Korea shows the following results: (a) Both groups reported a reduction in smoking dependency in the past 30 days (b) The intervention group indicated the number of cigarettes every day reduced compared to the control group (c) The intervention group showed greater intention to quit smoking when compared to the control group
4	Khayyati *et al*. (2019)	Effectiveness of a community and school-based intervention to control and prevent of tobacco use in adolescents: A field RCT	Preventing and reducing smoking in high school students in Iran	Study design: RCT Population: High school students in the 2014/2015 school year in Eastern Azerbaijan, Iran Sample: 4422 high school students divided into two groups: The intervention group of 1965 students and the control group of 2457 students Instrument: Questionnaire	The results of peer education interventions showed that after 6 months, cigarette use increased in the control group, whereas in the intervention group, decreased. The intervention was considered more effective in students who had never smoked compared to students who had smoked
5	Springer *et al*. (2019)	¡Activate Ya! Co-learning about school-based tobacco prevention and physical activity promotion in secondary school students in Uruguay	This study aims to develop and evaluate the impact of school-based interventions to prevent smoking and promote physical activity in high school students in Uruguay	Study design: RCT Population: students in 16 secondary schools in Uruguay Sample: 654 students aged 11–15 years from 16 schools divided into two groups, eight intervention groups, and eight control groups Instrument: Questionnaire	School-based health promotion or "Active Ya!" Effective short-term programs to prevent tobacco use in Uruguay. Interventions are more useful for female students than male students
6	Nurumal *et al*. (2019)	Effectiveness of school-based smoking prevention education program among nonsmoking adolescents: A quasi-experimental study (Malaysia)	This study evaluates the effectiveness of smoking prevention education programs among nonsmokers	Research Design: Quasi-experiment Population: Elementary school students in Kuantan, Malaysia Sample: 140 5th-grade students (11 years old) from four elementary schools (two in urban areas and 2 in rural areas) in Kuantan, Malaysia, who have never smoked Instrument: Questionnaire	The smoking prevention education program intervention is effective in reducing the intention and initiation of smoking and improving attitudes, norms, and behavioral control among Malaysian youth. In the intervention group, no adolescents initially did not smoke then smoked for 3 months of follow-up (short term)
7	Tahlil *et al*. (2015)	Six-month follow-up of a cluster-randomized trial of school-based smoking prevention education programs in Aceh, Indonesia	To investigate the long-term impact of smoking prevention program interventions that focus on health and Islam among Indonesian students	Research design: RCT Population: Middle school students aged 11–14 years Sample: 427 students divided into two groups, namely, 128 students in the control group and 299 students in the intervention group Instrument: Questionnaire	School-based programs with the application of a cigarette prevention curriculum can provide long-term benefits on increasing knowledge and attitudes in smoking prevention, as well as reducing smoking behavior among teenagers. Health and Islamic-based programs have a stronger effect than those separate from health and Islam

RCT: Randomized controlled trials, BCI: Behavior change intervention, BQ: Betel quid, SLT: Smokeless tobacco.

of curricula on cigarettes [22]. School-based programs in the form of this curriculum can provide long-term benefits to young students in developing countries, for example, in Indonesia [15]. The application of the cigarette prevention curriculum has already been in developed countries. Most of the results show the effectiveness of the curriculum. Still, some failed, for example, in Catalonia, Spain, which did not show a statistically significant reduction in the prevalence and incidence of smoking [21].

According to Thomas *et al*., there are five types of anti-smoking curriculum in schools. They are (1) information curriculum: Interventions provided to correct inaccurate perceptions about the prevalence of tobacco use, (2) social competency curriculum, interventions that help adolescents improve social competence and personal skills. Intervention teaches problem-solving, decision making, developing self-control, and coping strategies for stress; (3) social influence curriculum, interventions teach adolescents to be aware of social influences that encourage the use of cigarettes, teach skills to refuse cigarette offers, and face peer pressure; (4) multimodal curriculum, programs that involve

parents, the community, and government; and (5) Other curriculum programs which include anti-smoking policies in schools and motivation for good behavior.

2. BCI

BCI is an active intervention whose components are observable, replicated, and reduced from interventions designed to change or direct the process of behavior change, for example, setting goals, solving problems, and planning actions [23]. Interventions conducted to change adolescent behavior by increasing adolescent knowledge and awareness of the dangers of tobacco use. The role of BCI is quite promising in increasing adolescent knowledge and changing their perceptions in a positive way [18].

The development of behavioral change interventions needs to be supported by an analysis of factors that influence success, possible obstacles, and the presence of a facilitator. Factors that influence the development of behavioral change interventions are social influence, environmental context, knowledge, belief in abilities, and emotional levels. The steps in implementing BCI are (1) identifying barriers and willingness of facilitators; (2) identifying techniques that are effective for behavior change; and (3) mapping the theoretical domain of behavior change [23].

The application of BCI in schools for the prevention of smoking in adolescents is in general with health promotion interventions about healthy food and physical activity in schools such as sports [24]. In this review, there is also a study that identifies students' physical activity to prevent smoking, with positive research results that physical activity can avoid smoking in the short term [25]. Some BCI studies inform that BCI interventions are useful to use, but most historical research does not provide enough intervention details to ascertain their theoretical basis. Besides, the application of BCI is adjustable to the population and context in which it is applied [26].

3. Peer education

The interventions carried out in the Khayyati *et al*., the research used peer education or peer education, where students considered to be leaders should contribute to the intervention program. Researchers and physical education teachers trained the students then asked to share information and knowledge about tobacco use with their friends [27].

Peer education is teaching or various information about health, values, and behavior with a delivery approach by peers of the same age or older. This approach stems from the idea that peers have greater credibility among young people, have the same cultural background, and have greater understanding and empathy. The results of a systematic review state that there is evidence that peer intervention can change behavior while increasing knowledge. Peer education process evaluations report positive views on peer interventions such as: Finding peer-led sessions more enjoyable, feeling peers as credible sources of information, and preferably peer-led sessions [28].

According to Ayaz's and Açıl research comparing classical teaching methods with peer education about the dangers of smoking in school students, the average post-test score of students with peer education increased significantly, indicating a higher level of knowledge. Other results showed that the possibility of smoking are lower in the group receiving peer education interventions compared to the control group [29].

Conclusion

Reviews in the literature review of this study obtained the results of interventions conducted in school-based programs for the prevention of smoking in adolescents in developing countries, including the application of the anti-smoking curriculum, BCI, and peer education. All three interventions are effective in preventing smoking in adolescents. The program implementation is adjustable according to the conditions and conditions in each country.

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