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Meta-Analysis

Meta-Analysis: Effect of School-Based Health Promotion Strategy on Smoking Habits in Adolescents

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ABSTRACT

Background: Smoking is the biggest preventable cause of death in the world. Tobacco1 is a global problem experienced by both developed and developing countries, the gap in smoking rates between those in high and low socioeconomic groups has widened over the same period. Smoking behavior is not only in adults but also among school students. Peers have previously been reported to play a role in initiating smoking behavior in school-age students. Students' attitudes and behavior related to smoking behavior are influenced by personal knowledge and how peers behave. The purpose of this study was to determine the effect of school-based health promotion strategies on smoking habits in adolescents based on the results of previous studies.
Subjects and Method: This study is a meta-analysis study with Population: adolescents. Intervention: using school-based health promotion strategies. Comparison: not using school-based health promotion strategies. Outcome: success in not smoking. The article search process is carried out through the Pubmed web search engine and is a research article published from 2013-2022. The articles obtained will be filtered using the stages according to the PRISM flow diagram.
Results: A total of 9 articles used in this study were reviewed and met the requirements for a meta-analysis, the research conducted in these articles was carried out in various continents such as European, America, Africa, Asia, and Australia. Where from the meta-analysis of 9 randomized controlled trial articles, it is known that school-based health promotion strategies increase succes not smoking, and it was statistically significant (OR= 0.49; 95 % CI= 0.43 to 0.56; p= 0.001)
Conclusion: The perceived benefit was not statistically significant in predicting the practice of BSE in women.

Keywords: smoking, school-based health promotion, youth.

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BACKGROUND

Smoking behavior in adolescents is very important influenced by the information policy received by adolescents. The optimal time to provide education related to the prevention of smoking initiation in young people is at the age of 11-12 years, this has the potential to be a good time to intervene (Fuller, 2014). Students' attitudes and behavior around smoking are influenced by personal knowledge and how peers behave (Thomas, McLellan and Perera, 2015).

Based on data from the Tobacco Atlas in 2014, it was stated that the number of cigarette consumption in the world reached 5.8 trillion sticks and is still increasing eve-

ry year. The prevalence of smoking in developed countries has decreased, but on the contrary in developing countries it has increased. Data from The Tobacco Atlas 2015 states that 66% of men in Indonesia smoke. Russia is in second place with 60% of male smokers over the age of 15. Then followed by China (53%), the Philippines (48%), Vietnam (47%), Malaysia (44%), India (24%), and Brazil (22%) (Drope et al., 2018).

Adolescence or school students is a time when teenagers are looking for their identity, causing them to become unstable, and more vulnerable to delinquency and the problems they will face, such as promiscuity, drugs, alcohol, and cigarettes. Teenagers are the most easily influenced target by tobacco product manufacturers. This is evidenced by the fact that 75% of school students have seen advertisements for tobacco products. With this exposure, school students have a high potential to become active smokers into adulthood (Islami et al., 2019).

There are many tobacco products spread all over the world. All of these products are products that threaten health and even cause death from diseases due to tobacco consumption. Tobacco products include e-cigarettes, cigarettes, cigars, smokeless tobacco, pipes and hookahs. In 2019, 1 in 4 middle and high school students have tried to consume tobacco products and to date 3 out of 10 students are active smokers, 10% of whom are smokers aged 13-15 years (CDC, 2020).

There are several reasons why teenagers smoke, including social and physical environmental factors, biological and genetic factors, mental health and other influences such as tobacco product advertising, family support and attention, socioeconomic and lack of school attention. Many policies have been issued by the government to reduce smoking consumption among teenagers, such as increasing the price of cigarettes, limiting the use of cigarettes in several places and making regulations regarding the age limit for smoking. However, these policies cannot fully control smoking rates in adolescents (CDC, 2020).

Based on this background description, students need school-based support or intervention in overcoming smoking behavior problems by conducting school-based health promotion in adolescents. The purpose of this study was to determine the effect of school-based health promotion strategies on smoking habits in adolescents based on the results of several previous studies

SUBJECTS AND METHOD

1. Study Design

This research is a meta-analysis study with PRISMA flow chart guidelines. Article searches were performed using the PubMed database. Some of the keywords used are: “school-based services” OR “school-based health services” AND “smoking behavior” AND “teenager” OR “adolescenct”.

2. Inclusion Criteria

The inclusion criteria for this research article are full paper articles with a research design in the form of a cross-sectional study articles using English, research subjects in the form of junior high school students or high school students. Selected articles provide interventions in the form of school-based health promotion strategies with successful results of not smoking.

3. Exclusion Criteria

The exclusion criteria for this research article are articles that are not in English, research designs other than cross-sectional and articles that are not full text.

4. Operational Definition of Variables

The articles included in this study were PICO-adjusted. The search for articles was carried out by considering the eligibility cri-

teria determined using the following PICO model: Population = adolescents, Intervention= using school-based health promotion strategies, Comparison = not using school-based health promotion strategies, Outcome = success in not smoking.

School-Based Health Promotion is a program to prevent and reduce cigarette consumption by schools or third parties organized by schools. The measurement scale is categorical.

Smoking is the intensity or number of cigarettes consumed. The measurement scale is categorical.

5. Data Analysis

Articles were analyzed using the Review Manager (RevMan) 5.3 application to calculate effect size and heterogeneity, and form the final results of the meta-analysis. The results of data processing are presented in the form of forest plots and funnel plots.

RESULTS

Process of searching article wascarried out by searching several journal databases PubMed, Sciencedirect, and Googlescholar. it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

The initial search for articles sourced from various databases obtained initial results of 1085 articles, after which they will be filtered again by going through various processes such as checking for duplicates. , checking the suitability of the title and abstract and the last is checking the full text. Where after going through several processes obtained 9 articles that meet the inclusion and exclusion criteria that have been set previously.

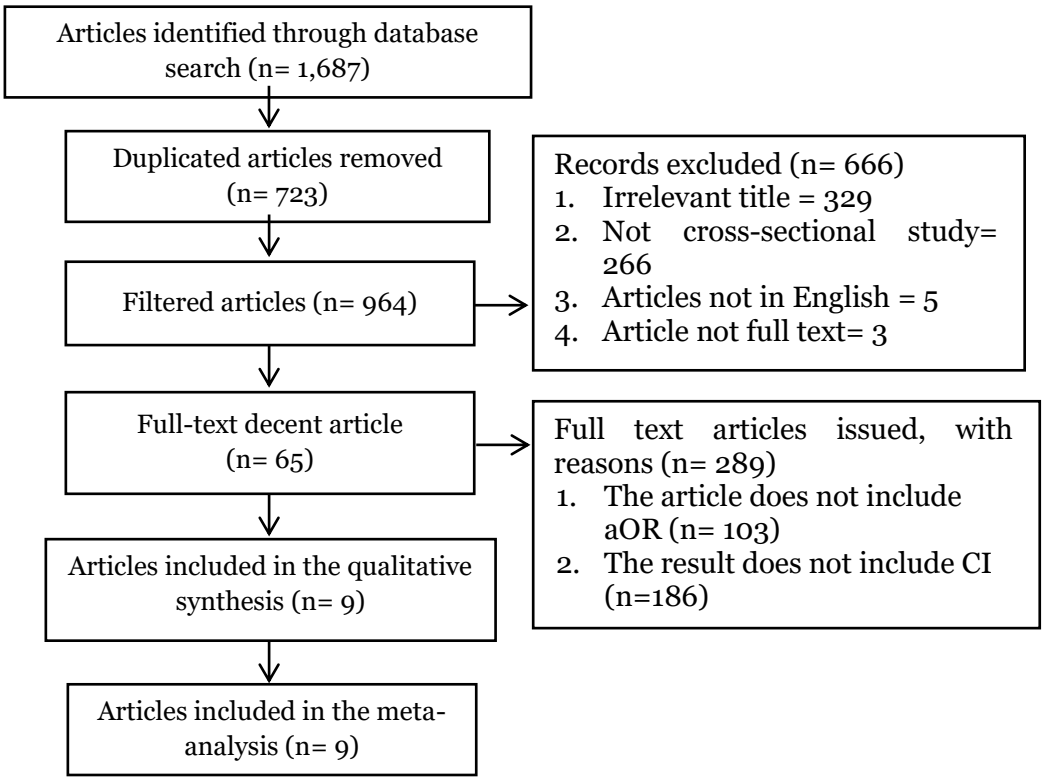

Figure 1. Results of Prisma Flow Diagrams

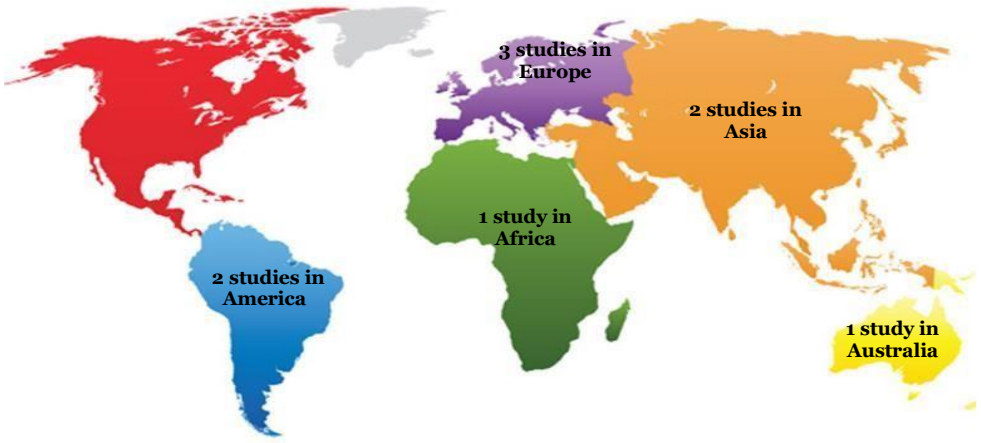

Figure 1. Resarch Distribution Map

figure 1. Research related to effect of school-based health promotion strategy on smoking habits in adolescents consisted of 9 articles from the initial search process yielding 1,687 articles, after the deletion process, articles were published with 964 requirements for full-text review more carry on. A total of 9 articles that met the quality assessment were included in the quantitative synthesis using a meta-analysis.

It can be seen in Figure 2 that the research articles come from five continents such as Europe, America, Africa, Asia, and Australia.

An assessment of the quality of the articles used in this study can be seen in table 1. Then Table 2 shows that 9 articles from a randomized control trial study provide evidence about the effect of school-based health promotion strategy on smoking habits in adolescents. Then in table 2 it can be seen about the details of the articles used in this study, such as the study population, intervention, comparison, and the results of each study. All articles used in this study are articles with a randomized controlled trial study design.

Based on the results of the forest plot (figure 3) of the randomized controlled trial study design, it is known that effect of school-based health promotion strategy increase success not smoking by 0.49 times compared not using school-based health promotion strategies (OR= 0.49; 95% CI= 0.43 to 0.56; $p<0.001$). In the results of the analysis, it is also known that I^2= 86%, which means that the distribution of the data is heterogeneous (random effect model).

In (Figure 4) it can be seen about the Funnel Plot from the results of the data analysis that has been carried out, where it can be seen that the shape of the funnel plot is asymmetrically distributed. This asymmetrical funnel plot distribution indicates that there is a potential for bias. Funnel plot has bias, right side 6 plots, left side 3 plots. The plot on the right side had a standard error between 0 and 0.8, and on the left side hadstandard error between 0 and 0.4.

Table 1. Assessment of study quality published by Joanna Briggs Institute (JBI)

No	Indicator	Publication (Author and Year)								
		Amoah *et al.* (2021)	**Brinker *et al.* (2017)**	**Hodder *et al.* (2017)**	**Lisboa *et al.* (2019)**	**Muller *et al.* (2014)**	**Sarin *et al.* (2013)**	**Tahlil *et al.* (2013)**	**Tahlil *et al.* (2015)**	**Thruston *et al.* (2021)**
1	Does the objective clearly address the research focus/problem?	1	1	1	1	1	1	1	1	1
2	Is the research method (research design) suitable for answering research questions?	1	1	1	1	1	1	1	1	1
3	Is the research subject selection method clearly written?	1	1	1	1	1	1	1	1	1
4	Does the sampling method give rise to selection bias?	1	1	1	1	1	1	1	1	1
5	Is the sample representative of the research target population?	1	1	1	1	1	1	1	1	1
6	Was the sample size based on pre-study considerations?	1	1	1	1	1	1	1	1	1
7	Is the measurement (questionnaire) valid and reliable?	1	1	1	1	1	1	1	1	1
8	Was a satisfactory response achieved?	1	1	1	1	1	1	1	1	1
9	Has statistical significance been tested?	1	1	1	1	1	0	1	1	1
10	Did the researcher report confidence intervals?	1	1	1	1	1	1	1	1	1
11	Are there any confounding factors that have not been taken into account?	1	1	0	1	0	1	1	1	1
12	Are the results applicable in practice/community?	1	1	1	1	1	1	1	1	1
	Total	**11**	**11**	**10**	**11**	**10**	**10**	**10**	**11**	**11**

Table 2. Description of Primary Research included in the Meta-Analysis

No	Author (Year)	Country	Study Design	Sample	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)	aOR (95 % CI)
1	Amoah, *et al.* (2021)	Ghana	Cross-sectional	848	General high school students	health education interventions and physical activity modules	did not receive health education interventions and physical activity modules	Possibility of quitting smoking behavior in the intervention group	OR= 0.34 (0.28 to 0.41)
2	Brinker, *et al.* (2017)	Germany	Cross-sectional	1.504	school students (14–19 years) from four schools	Education Against Tobacco (EAT) intervention from medical students	did not receive the Education Against Tobacco (EAT) intervention	To prevent smoking behavior, especially in women and students with low educational background	OR= 0.74 (0.21 to 2.61)
3	Hodder, *et al.* (2017)	Australian	Cross-sectional	2.105	Teenagers from 9 German secondary schools, 11-15 years old in grades 6-8	Pragmatic interventions that involve	Participants did not receive pragmatic intervention.	The success of students in quitting smoking behavior	OR= 1.25 (0.92 to 1.70)
4	Lisboa *et al.* (2019)	Brazil	Cross-sectional	2.348	Middle school students grades 7-10 ages 15–16	school staff	did not receive the Education Against Tobacco (EAT) intervention	The EAT program encourages cessation and prevention of smoking, among men and students with low education.	OR= 0.63 (0.42 to 0.95)
5	Muller *et al.* (2014)	Germany	Cross-sectional	2.801	Grade 7 middle school students (11–16 years old)	“Berlin evaluates tobacco prevention” in schools (BEST)	not participate in incentive-based smoking cessation	Acceptability and effectiveness of smoking prevention strategies in middle school students	OR= 0.36 (0.26 to 0.50)

No	Author (Year)	Country	Study Design	Sample	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)	aOR (95 % CI)
6	Sarin *et al.* (2014)	Amerika Serikat	Cross-sectional	82	Middle school students (14–17 years)	Participate incentive-based smoking cessation intervention	not participate in smoking behavior prevention education programs	The success of students in quitting smoking behavior	OR= 0.84 (0.26 to 2.71)
7	Tahlil *et al.* (2013)	Indonesia	Cross-sectional	465	11 year old 7th and 8th graders	take part in the smoking behavior prevention education program	not participate in school-based smoking prevention	The success of students quitting smoking among teenagers in Indonesia.	OR= 0.90 (0.20 to 4.05)
8	Tahlil *et al.* (2015)	Indonesia	Cross-sectional	216	11 year old 7th and 8th graders	participate in school-based smoking prevention in education programs after 6 months of intervention	not participate in controlled school-based smoking prevention	The success of students quitting smoking after receiving school-based smoking prevention education	OR= 0.40 (0.20 to 0.80)
9	Thruston *et al.* (2018)	Irlandia	Cross-sectional	291	8th grader in Irish secondary school	participate in controlled school-based smoking prevention	did not receive health education interventions and physical activity modules	Success in preventing students from smoking behavior,	OR= 1.56 (0.39 to 6.24)

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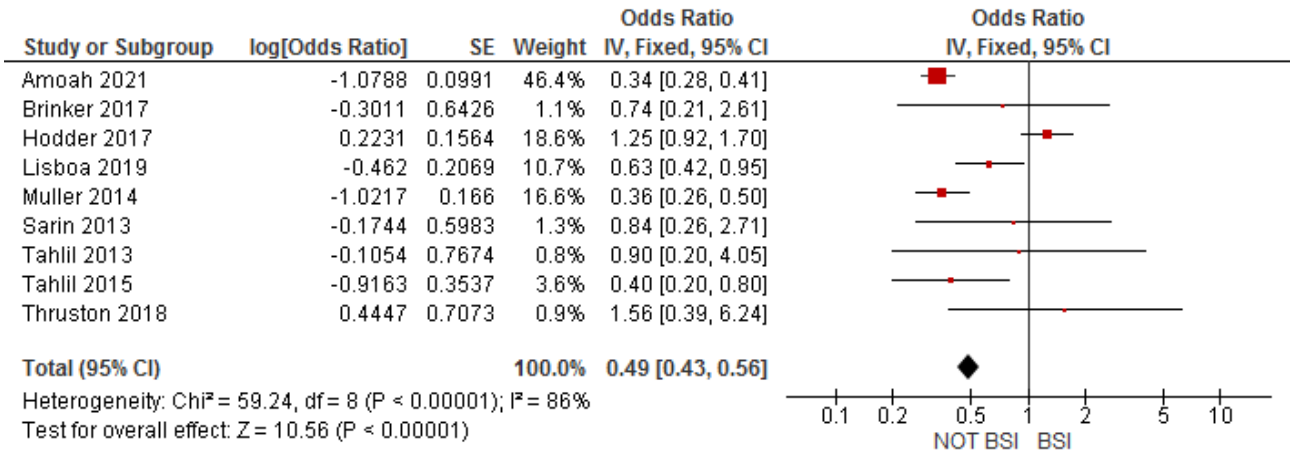

Figure 4. Forest plot of the Effect of School-Based Interventions Against Cigarette Consumption

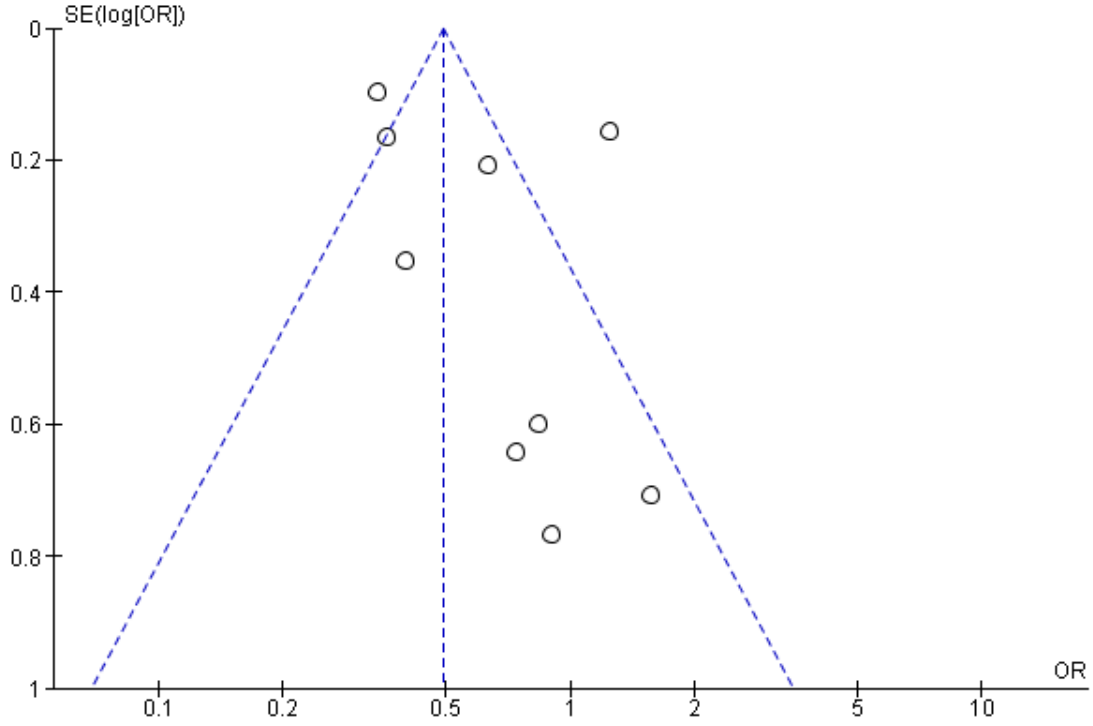

Figure 4. Funnel plot of the Effect of School-Based Interventions Against Cigarette Consumption

DISCUSSION

This meta-analysis study raised the theme of the effect of school-based health promotion strategies on smoking habits in adolescents. This study focuses on high school students on smoking behavior. The independent variable in this study was the smoking behavior of middle school students. The dependent variable in this study is the school-based health promotion strategy.

This systematic study and meta-analysis uses studies that have been controlled for confounding factors that can be viewed from the inclusion requirements of the study, namely standardized homogeneous disparities. Confounding factors can cause

research results to be invalid because confounding factors also affect the relationship or affect the population being studied (Anulus et al., 2019).

Application of the benefits felt by students after receiving school-based health promotion education

The results of a systematic study and meta-analysis provide an overview of the results that the smoking prevention program for middle school students using school-based health promotion shows that this program is successful in increasing students' knowledge of health and can build self-awareness to stop smoking. The results of this study are in line with research conducted by Lisboa et al, (2019), which stated that

that students benefit from evidence that they quit smoking. Amoah et al (2021) also stated that the intervention of providing school-based health promotion education was significant in reducing the number of students who smoked.

The perceived benefit is the extent to which students perceive behavioral changes as a form of increasing knowledge of health information and the extent to which they believe that this behavior can prevent the risk of disease caused by smoking.

The benefits felt by middle school students in the success of this program in the short term decreased spending money and improving student nutrition because the money previously used to buy cigarettes was diverted to nutritional food consumption, this is in line with research conducted by Thurston et al (2019), the high potential health benefits and finances of students receiving school-based health promotion interventions.

The results of other studies recommend additional interventions in this school-based health promotion, namely in the form of awards for students who successfully quit smoking, or awards for schools that successfully implement or provide maximum interventions. So that these additional interventions can increase students' motivation to quit smoking and schools in implementing the program (Sarin et al., 2013).

AUTHOR CONTRIBUTION

Bhre Diansyah Dinda Khalifatulloh, Bibit Irawan is the main researcher who selects the topic, searches for and collects research data.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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