

Meta-Analysis the Effect of School Based Intervention on Smoking in Adolescents

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ABSTRACT

Background: Tobacco is a global problem, in which at least 5 million people die from diseases caused by the consumption of tobacco products such as cigarettes each year, such as cervical cancer, heart disease, gastric ulcers, tuberculosis, kidney failure, pancreas, leukemia, pneumonia, gum and mouth disease as well as lung cancer. This study aims to estimate the magnitude of the effect of School based intervention on cigarette consumption based on the results of a number of previous studies.

Subjects and Method: This research is a systematic study and meta-analysis, with PICO as follows Population = junior high school and high school students, Intervention = School based intervention. Comparison = No School based intervention. Outcome = cigarette consumption. The articles used in this study were obtained from several databases including PubMed, ScienceDirect and Google Scholar. This article was collected for 2 months. The keywords for searching articles are as follows: "School-based intervention" AND tobacco OR smoke OR cigarette AND RCT OR "Randomized

Controlled Trial". The articles included in this study are full text articles with a randomized controlled trial study design. Articles were collected using PRISMA flow diagrams. They were analyzed using the Review Manager 5.3 application.

Results: A total of 11 articles reviewed in this meta-analysis study originated from the United States, Sweden, California, Brazil, Germany, Ireland, China, Australia and Indonesia. Studies show that School based intervention has no significant effect on cigarette consumption (Standardized Mean Difference = -0.74; 95% CI = -1.67 to 0.18; p = 0.110).

Conclusion: School based intervention reduces cigarette consumption.

Keywords: School based intervention, tobacco, cigarette consumption

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BACKGROUND

Adolescence or school students is a period where adolescents find their identity, a period where adolescents become unstable, making them vulnerable to delinquency and the problems they will face, such as promiscuity, drugs, alcohol, and cigarettes

that threaten health. According to the GYTS Survey, 25% of school students become active smokers. Adolescents are the easiest targets to be influenced by tobacco product manufacturers, with 75% of school students having seen tobacco product advertisements. With this exposure, school students

have high potential to become active smokers until adulthood (Islami et al., 2019).

Tobacco is a global problem, where at least 5 million people die from diseases caused by tobacco consumption every year. Such as cervical cancer, heart disease, gastric ulcers, tuberculosis, kidney failure, pancreas, leukemia, pneumonia, gum and mouth disease, and lung cancer (Cahill et al., 2012; MINISTRY OF HEALTH, 2017) This number will continue to increase if the problem is tobacco is not treated quickly and appropriately. It is estimated that around 10 million people die in 2030, of which 70% of deaths occur in developing countries. Deadly diseases including diseases caused by the use of tobacco products know no national boundaries, each country can also get the impact of the dangers of tobacco products (FCTC, 2005).

The Tobacco Atlas stated that the number of cigarette consumption in the world in 2014 reached 5.8 trillion sticks and is still increasing every year. The prevalence of smoking in developed countries has decreased, but on the contrary in developing countries it is increasing. The results of a study in the medical journal *The Lancet Infectious Diseases* show that smoking cessation rates are low in most developing countries. Developed countries such as Japan and Singapore make smoking bans in various places, especially tourist spots and public places, even smokers are prohibited from smoking while walking on the highway. In America, the price of cigarettes is quite expensive and not easy to get anywhere. Cigarettes are easily available in developing countries at relatively cheap prices. Cigarette advertisements in developing countries appear 81 times more often than in high-income countries. One of the developing countries with the largest cigarette consumption is Indonesia, which

in 2014 was ranked fourth after China, Russia and America. Indonesia occupies the first position in the country with the largest percentage of male smokers aged 15 years and over in the world. 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 15 years of age. Then followed by China (53%), Philippines (48%), Vietnam (47%), Malaysia (44%), India (24%), and Brazil (22%) (Drope et al., 2018).

There are many tobacco products scattered throughout the world. All of these products are products that threaten health and even cause death due to diseases caused by tobacco consumption. Tobacco products include e-cigarettes, cigarettes, cigars, smokeless tobacco, pipe and hookahs. In 2019, 1 in 4 middle and high school students have tried to consume tobacco products and 3 out of 10 students are active smokers until now (CDC, 2020).

The FCTC or Framework Convention on Tobacco Control is an association formed at the 56th session of the World Health Assembly (WHO) in May 2003 which was attended by 192 WHO member countries unanimously adopting the framework of the tobacco control convention to control the world tobacco epidemic. 172 countries or 87.30% of the world's population are FCTC participants, 168 countries or 91.58% of the world's population have signed the FCTC agreement, 183 countries or 94.89 of the world's population are members of the FCTC and 195 countries are eligible to become FCTC participants (FCTC, 2005).

Cigarettes are a world problem that is touted as a disease of children and the tobacco epidemic. Many junior and senior high school students have started smoking, some of whom started smoking at 18 years of age, and some who started smoking at

less than 10 years of age. 10% of smokers are students aged 13-15 years. According to the statistical data collected, WHO estimates that there will be continuous use or consumption of cigarettes which results in the death of 250 million children and adolescents. There are various factors that cause children and adolescents to smoke, including cultural norms, tobacco distribution, and tobacco control policies and strategies and the tobacco industry in promoting cigarette products which indirectly weakens government strategies and policies (WHO, 2014).

Cigarettes are tobacco products that are rolled using paper with or without using a filter. Cigarettes contain substances that are very dangerous to health, among others; Acetone, Hydrogen Cyanide, Toluidine, Ammonia, Urethane, Toluene, Arsenic, Dibenzacridine, Phenol, Butane, Polonium, Naphtylamine, Methanol, Pyrene, Dime-thylnitrosamine, Naphtalene, Cadmium, Carbon Monoxide, Benzopyrene, and Vinyl Chloride. There are many compounds and substances that threaten health and life. There are 4000 types of chemical compounds, 400 hazardous substances and 43 cancer-causing substances (carcinogenic). Carbon monoxide (CO) is a poisonous gas, lowers oxygen levels in the blood, so that it can reduce concentrations and the emergence of dangerous diseases, Tar is a substance that causes cancer and various other diseases, while nicotine is a dangerous substance that causes addiction or addiction (Ministry of Health, 2017).

There are several reasons why school students use tobacco products, including social and physical environment, biological and genetic factors, mental health, personal views, and other influences such as tobacco product advertising, family support and attention, socio-economic and school attention. Many policies have been imple-

mented, such as increasing cigarette prices, limiting the use of cigarettes in several places and making regulations on the age that can buy tobacco products to 21 years. These policies cannot fully control cigarette consumption (CDC, 2020). Therefore, school-based interventions are very important in addressing the problem of cigarette consumption among school students. Given that students spend more of their time in school, of course the role of teachers and schools is very much needed to educate students to live healthy, especially not to smoke or to stop smoking for students who already smoke.

Based on the background and some of the things above, it is known that cigarette consumption among students continues to increase due to easy access to cigarettes and the lack of control in students so that research on "Meta-analysis of the effect of School-based intervention on cigarette consumption" needs to be done, considering that adolescents spend more time at school than at home. So that researchers are interested in conducting this research.

SUBJECTS AND METHOD

1. Study Design

This was a systematic study and meta-analysis. The articles used in this study were obtained from several databases including PubMed, ScienceDirect and Google Scholar. The keywords for searching articles are as follows: "School-based intervention" AND tobacco OR smoke OR cigarette AND RCT OR "Randomized Controlled Trial".

2. Inclusion Criteria

The article included in this study is a full paper article with a randomized controlled trial study design. The research subjects were junior high school and senior high school students. Selected articles provide an intervention in the form of School based

intervention with cigarette consumption outcomes.

3. Exclusion Criteria

Articles published in this study are articles that are not in English or Indonesian, research designs other than RCTs, articles that are not full text, articles published before 2000.

4. Operational Definition of Variables

The article search was carried out by considering the eligibility criteria defined using the PICO model. The population in the study were junior high school and high school students, intervention in the form of School based intervention, comparison, namely not school based intervention and outcome in the form of cigarette consumption.

School based intervention is a program to prevent and reduce cigarette consumption by schools or using third parties held in schools. Instrument: School-based program (youth resilience intervention) with a categorical measurement scale.

Cigarette consumption is the intensity of smoking or the number of cigarettes consumed. Instruments: ASSIST questionnaire or Alcohol, smoking and substance involvement screening test questionnaire with a continuous measurement scale.

5. Data Analysis

Data processing was carried out by the Review Manager (RevMan 5.3) by calculating the mean difference to determine the research model that was combined and formed the final meta-analysis result.

RESULTS

The process of searching for articles by searching through a database with journals can be seen in Figure 1.

Figure 2 shows the areas where articles were drawn according to the inclusion criteria. Articles obtained from 4 continents, namely America, Europe, Australia and Asia.

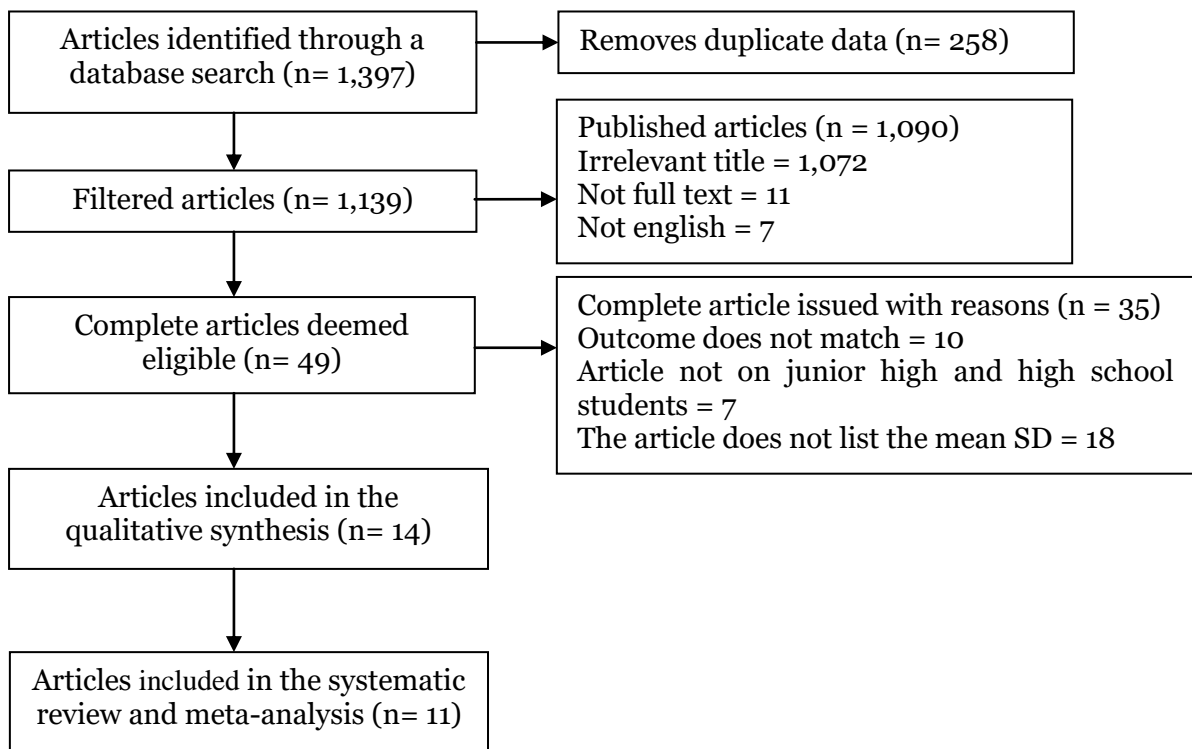


Figure 1. PRISMA flow diagram

Table 1. Assessment of Study Quality

Checklist questions	Publication (Author and Year)										
	Blaakman et al. (2011)	Sarin et al. (2013)	Sun et al. (2007)	Lisboa et al. (2019)	Gianota et al. (2013)	Muller et al. (2014)	Tahlil et al. (2013)	Tahlil et al. (2015)	Wen et al. (2010)	Thruston et al. (2018)	Hodder et al. (2017)
Does this study address a clear research focus?	1	1	1	1	1	1	1	1	1	1	1
Is the Randomized Controlled Trial research method suitable for answering research questions?	1	1	1	1	1	1	1	1	1	1	1
Are there enough subjects in the study to establish that the findings were not made by chance?	1	1	1	1	1	1	1	1	1	1	1
Were subjects randomly allocated to the experimental and control groups? If not, could this be biased?	0	1	1	1	1	0	1	1	0	1	0
Are inclusion / exclusion criteria used?	1	1	1	1	1	1	1	1	1	1	1
Were the two groups comparable at study entry?	0	1	0	1	1	0	0	1	1	1	1

Are objective and unbiased outcome criteria?	1	1	1	1	1	1	1	1	1	1	1
Are objective and validated measurement methods used to measure the results? If not, were the results scored by someone who did not know the group assignment (i.e. was the grading blinded)?	1	1	1	1	1	1	1	1	1	1	1
Is the effect size practically relevant?	1	1	1	1	1	1	1	1	1	1	1
How precise is the estimated effect? Is there a confidence interval?	1	0	0	1	0	0	1	1	1	1	1
Could there be confounding factors that have not been taken into account?	0	0	0	0	0	0	0	0	0	0	0
Are the results applicable to your research?	1	1	1	1	1	1	1	1	1	1	1
Total	9	10	9	11	10	8	11	11	10	11	10

*The item question no.11 is given a score of 0 because the question is a positive score

1. School based intervention in cigarette consumption

11 The article proves that there is a relationship between School based intervention in cigarette consumption

Table 2. Descriptions of primary studies included in the primary study meta-analysis

Author (Year)	Country	Study Design	Sample	P (Population)	I (Intervention)	C (Comparison)	O (Outcome)
Blaakman et al. (2011).	Amerika Serikat	Randomized Controlled Trial.	SBI : 111 No intervention: 29	JHS	Looking at the potential effects of School based intervention on consumption of smoking *, alcohol and drugs.	Did not see the potential effect of School based intervention on consumption of smoking *, alcohol and drugs	Consumption of cigarettes *, alcohol and illegal drugs
Sarin et al. (2013).	Amerika Serikat	Randomized Controlled Trial.	SBI : 26 No intervention: 25	SHS	Analyzing the intervention from School based intervention on smoking behavior and cigarette consumption * as well as analyzing the long and short term effects.	No Analyzing interventions from School based intervention on smoking behavior and cigarette consumption * as well as analyzing long and short term effects.	Consumption of cigarettes
Thurston et al. (2018).	Irlandia	Randomized Controlled Trial.	SBI : 150 No intervention: 141	JHS	Assessing the efficacy of a school-based intervention program on smoking-related outcomes in Grade 8 school students.	Does not assess the efficacy of a school based intervention program on smoking-related outcomes in Grade 8 school students.	Consumption of cigarettes
Giannota et al. (2013).	Swedia	Randomized Controlled Trial.	SBI : 143 No intervention: 143	SHS	Analyzing the School Based Intervention on the use of tobacco *, alcohol, and marijuana.	Not Analyzing School Based Intervention on the use of tobacco *, alcohol, and marijuana.	Consumption of cigarettes *, alcohol and marijuana
Wen et al. (2010).	China	Randomized Controlled Trial.	SBI : 626 No intervention : 357	JHS	Assessing School Based Intervention in standard health curricula on attitudes, behavior and * consumption of cigarettes.	Not Assessing School Based Intervention in standard health curricula on attitudes, behaviors and * cigarette consumption.	Consumption of cigarettes
Tahil et al. (2013).	Indonesia	Randomized Controlled Trial.	SBI : 239 No intervention : 226	JHS	This study aims to test the effectiveness of the School Based Intervention on smoking habits.	It does not aim to test the effectiveness of the School Based Intervention on smoking habits.	Consumption of cigarettes

Author (Year)	Country	Study Design	Sample	P (Population)	I (Intervention)	C (Comparison)	O (Outcome)
Sun et al. (2007).	California	Randomized Controlled Trial.	SBI : 487 No intervention : 391	JHS	To assess the effectiveness of the School Based Intervention in affecting smoking consumption.	No To assess the effectiveness of the School Based Intervention on smoking consumption *.	Consumption of cigarettes.
Tahlil et al. (2015)	Indonesia	Randomized Controlled Trial.	SBI : 109 No intervention : 107	JHS	To investigate the impact of School Based Intervention, on the prevalence of cigarette consumption	No To investigate the impact of School Based Intervention, on the prevalence of cigarette consumption	Consumption of cigarettes
Muller et al. (2014)	Jerman	Randomized Controlled Trial.	SBI : 1142 No intervention : 679	JHS and SHS	Evaluating smoking prevention strategies in school students with School based intervention	No Evaluating smoking prevention strategies in school students with School based intervention	Consumption of cigarettes
Lisboaet al. (2019)	Brazil	Randomized Controlled Trial.	SBI : 116 No intervention : 127	JHS and SHS	Measuring the effectiveness of the Education curriculum against tobacco in schools on cigarette consumption	Not Measuring the effectiveness of the Education against tobacco curriculum in schools on cigarette consumption	Consumption of cigarettes
Hodderet al. (2017)	Australia	Randomized Controlled Trial.	SBI : 406 No intervention : 235	JHS and SHS	Investigating the effectiveness of School based intervention in the use of tobacco or cigarettes *, alcohol and illegal drugs	Not investigating the effectiveness of School based intervention in the use of tobacco or cigarettes *, alcohol and illegal drugs	Consumption of cigarettes *, alcohol and illegal drugs

*Variables included in the meta-analysis
SBI : School Based Intervention

2. Forest plot

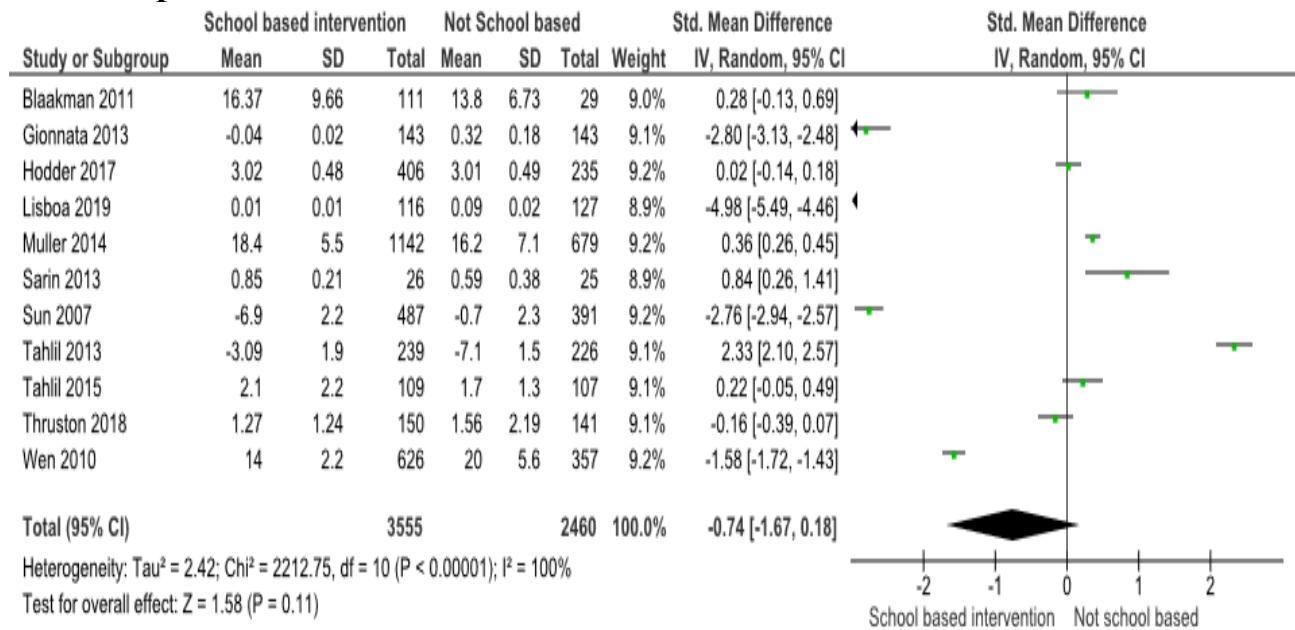


Figure 3. Forest plot for the effect of School based intervention against cigarette consumption

3. Funnel plot

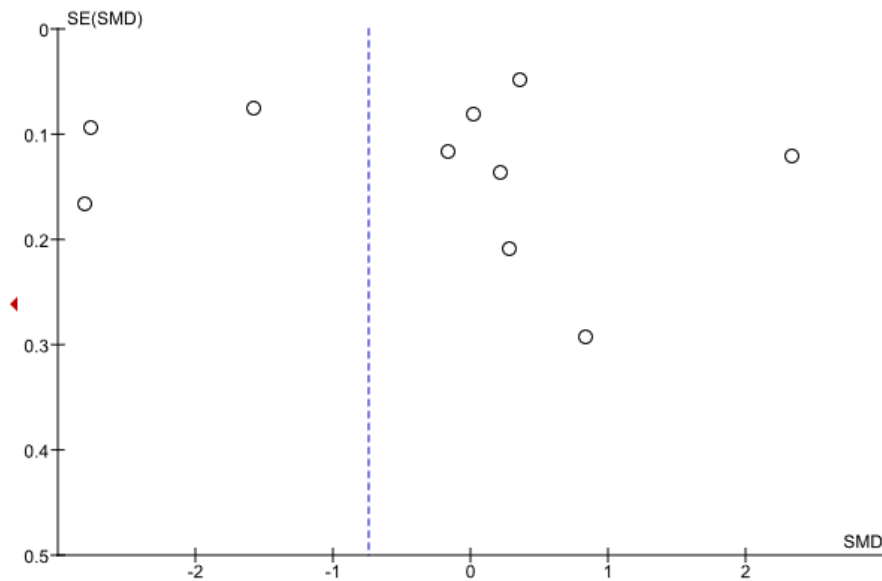


Figure 4. Funnel plot of the effect of School based intervention on cigarette consumption

Based on the results of the forest plot (Figure 3), it shows that School-based intervention -0.74 units affects cigarette consumption and it is not statistically significant (p = 0.110). The heterogeneity of

the research data shows I² = 100% so that the distribution of the data is heterogeneous (random effect model).

The funnel plot (figure 4) shows a publication bias which is characterized by

asymmetry of the right and left plots where 4 plots are on the left and 7 plots are on the right. The plot on the left has a standard error between 0.0 and 0.2 and the plot on the right has a standard error between 0.0 and 0.3.

DISCUSSION

This systematic study and meta-analysis research raises the theme of the effect of School-based intervention on cigarette consumption. This study discusses data on cigarette consumption which is considered important because of the high rate of cigarette consumption, especially among school children.

Confounding factors affect the relationship or effect of exposure to the occurrence of disease estimated (predicted) by the study is not the same as the relationship or effect that actually occurs in the target population, or the results of the study are invalid (not true) (Murti, 2018a). This systematic study and meta-analysis uses research that has controlled for confounding factors which can be seen from the research inclusion requirements, namely the standardized mean difference.

The estimated combined effect of School-based intervention on cigarette consumption was processed using RevMan 5.3 with the Continuous method, this method was used to analyze the effect size or standardized mean difference in the bivariate data of two groups that had been controlled for confounding factors by randomization.

The results of the systematic study and meta-analysis are presented in the form of a forest plot and a funnel plot. Forest plots provide an overview of information from each of the studies examined in the meta-analysis, and estimates of the overall results (Murti, 2018a). The forest plot shows visually the

amount of variation (heterogeneity) between study results (Akobeng in Murti, 2018a).

A funnel plot is a diagram in a meta-analysis used to demonstrate possible publication bias. The funnel plot shows the relationship between the effect size of the study and the sample size or standard error of the effect size of the various studies studied (Murti, 2018a).

The funnel plot shows visually the amount of variation (heterogeneity) (Akobeng, 2005 in Murti, 2018a). The funnel plot shows the relationship between the effect size of the study and the sample size of the various studies studied, which can be measured in a number of different ways (Murti, 2018a).

Systematic review and meta-analysis in this study were conducted with the aim of increasing the generalizability of the findings and obtaining convincing conclusions from the results of various similar studies regarding school-based intervention -0.74 units affecting cigarette consumption.

The results of the forest plot show that School-based intervention -0.74 units affects cigarette consumption, compared to without intervention. (SMD= -0.74; 95% CI -1.67 to 0.18 p= 0.110). The heterogeneity of the research data shows $I^2 = 100\%$ so that the distribution of the data is stated to be heterogeneous (random effect model).

Hodder et al (2017) states that school based intervention or intervention conducted by schools in the form of adolescent resilience interventions has not been proven to significantly reduce cigarette consumption in school children due to several things such as lack of resources from schools to run or provide maximum intervention to students, as well as the lack of time the interventions are carried out. In his research, he recommends a combination of interventions to prevent or reduce

cigarette consumption in school students, such as combining School based intervention, Family based intervention and Peer based intervention so that students get protection or resilience from various sides, such as from family, school and peers.

This study is in line with the research of Robinson et al. (2003) which states that both the intervention group and the control group tend to show the same changes in smoking behavior, so that the School based intervention has not been able to show significant evidence of its effect on cigarette consumption. In his research, he recommends developing a good methodology and randomizing schools and students as research samples to be in different environments. Because in his research it was stated that the factors that caused the failure of the intervention, one of which was that students who were the intervention and control groups were in the same environment, so that they could exchange information about the intervention being carried out, which led to the similarity of information between the intervention and control groups.

Sarin et al. (2013) recommend additional interventions in this School based intervention, which is in the form of awards for students who successfully quit smoking, or awards for schools that succeed in implementing or providing good or maximum interventions. So that it will increase the motivation of students and schools in implementing the interventions given by researchers. Although in his study there was no significant effect of School based intervention on cigarette consumption, the authors recommend offering intervention and strengthening methodology for future researchers, so that there will be a significant increase in the effect of School based intervention on cigarette consumption.

AUTHOR CONTRIBUTION

Muhammad Rifqi Azhary is the principal researcher who selects topics, searches and collects research data. Eti Poncorini Pamungkasari and Yulia Lanti Retno Dewi played a role in analyzing data and reviewing research documents.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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