

Effect of Health Promotion Media on Adolescents' Willingness to Use Electronic Cigarettes: A Literature Review

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ABSTRACT

Electronic cigarettes are rapidly emerging into a new trend among adolescents. There are concerns about the impact of electronic cigarettes at both individual and public health levels. Health promotion efforts with various media have been conducted but are not optimal to reduce adolescent electronic cigarettes behavior. This study sought to understand the effect of health promotion media on willingness to use electronic cigarettes among adolescents, a group that is at risk for smoking initiation and may use electronic cigarettes as a “gateway” to smoking. This study uses the literature review method with articles searching in the ScienceDirect, SpringerLink, and Google Scholar databases published for the last five years. This study showed various models of health promotion media, but intervention through social media showed a significant effect in reducing the willingness to use electronic cigarettes in adolescents. The social media approach can build closeness with adolescents to support the success of health promotion efforts. These findings will become a consideration for the Ministry of Health in transforming the health promotion model to be more effective in reducing adolescent electronic cigarettes behavior in Indonesia.

Keywords: health promotion media, electronic cigarettes, adolescents, smoking, willingness

1. INTRODUCTION

Electronic cigarettes are a variant of Nicotine Replacement Therapy (NTR) most popular with people around the world [1]. 3.6 million school-age adolescents (junior and senior high) around the world are electronic cigarette users [2]. 2018 Basic Health Research reports that 2.7% of electronic cigarette users in Indonesia belong to the 10-18 years age group [3]. A large number of young electronic cigarette users engenders the term “e-baby smokers” [3]. Electronic cigarettes first gained traction in 2003 in China as an alternative to conventional cigarettes and made their way to the USA market in 2006 [4].

Liquid electronic cigarettes consist of components such as ultrafine particles, hazardous metals, tobacco-specific nitrosamine, carcinogenic carbonyl (with high or low concentrations) inducing toxicity (the level at which a substance can damage cells), and altering gene

expression [5]. The 2016 Surgeon General’s Report describes the effect of the use of electronic cigarettes such as nicotine addiction, impaired brain development, promoting co-use of conventional and e-cigarettes, encouraging consumption of other illicit drugs, psychosocial health, battery explosion, and accidental nicotine overdose [6]. Users of electronic cigarettes are 5 times more susceptible to contracting COVID-19 while cigarette co-users (conventional and electronic) are 6.8 times more susceptible to COVID-19 [7].

Electronic cigarette control efforts have been performed in several countries through educational media and regulatory approaches. Nearly all ASEAN countries have enacted a law on sales prohibition, advertising restrictions, consumption, and distribution of e-cigarettes [8]. However, Myanmar and Vietnam currently have no regulation in place to restrict the use of electronic cigarettes. Jin and Jiang (2017) also reveal that only Singapore and Brunei use the internet to disseminate

information and education on the dangers of e-cigarettes [8]. Meanwhile, there is still no concrete measure in Indonesia to deal with and control electronic cigarettes.

Education media on the dangers of smoking have been used numerous times as an effort to control electronic cigarettes. Social conditions are a dominant factor that can affect adolescent behavior [9]. A survey by Truth Initiative (2019) shows that 5.7% of young users of electronic cigarettes are exposed to e-cigarette information through the internet. The World Bank also conveys that the majority of internet users (49.72%) are teenagers. Indonesia ranks 40th in the world when it comes to the number of internet users. 8 out of 10 followers of Twitter accounts for e-cigarette products come from the group of teenagers aged 13-20 years. Based on these observations, there is a need for a study on the effect of health promotion media on adolescents' willingness to use electronic cigarettes. Therefore, this study is expected to contribute to the identification of effective health promotion media to suppress the use of electronic cigarettes among adolescents in Indonesia.

2. METHOD

2.1 Search Strategy

This study employed a literature review method. Article search was conducted in September 2020, using databases such as ScienceDirect and SpringerLink. Google Scholar was used as an additional database to expand the search. Articles are sought online using the keywords "health promotion", "e-cigarette", "perceived", "adolescent", "health promotion", "e-cigarette", "willingness", "adolescent". The search was also performed through combinations of keywords, synonyms of keywords, and other words related to the keywords to filter more relevant articles. The search for target articles in this study took into account locations in the Asia Pacific and the original research category. All articles found were listed for sorting.

2.2 Article Selection

The sorting of articles was guided by inclusion criteria, namely, articles must be published in the last 5 years, the research in the articles must be carried out in the last 10 years, articles must use a cross-sectional design, and articles must use quantitative methods. Articles were excluded from the list if they were published in more than one database, did not involve adolescents, and did not investigate the effect of health promotion media on willingness. Articles were also assessed based on feasibility and quality using indicators such as clarity of population and sample size, accuracy and validity of research instruments, data normality, clarity of results, and use of relevant and up-to-date

references. The article sorting processes were identified through a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart.

A total of 1017 articles were identified after the search. 6 articles were discarded due to duplicate titles in 2 different databases. Furthermore, 944 articles were eliminated due to incompatibility in research time, population, sample, and research dependent variables. Lastly, 60 articles were removed because the research methods and the results were not suitable for our research objective. After removing the unfit articles, 7 articles were obtained for analysis.

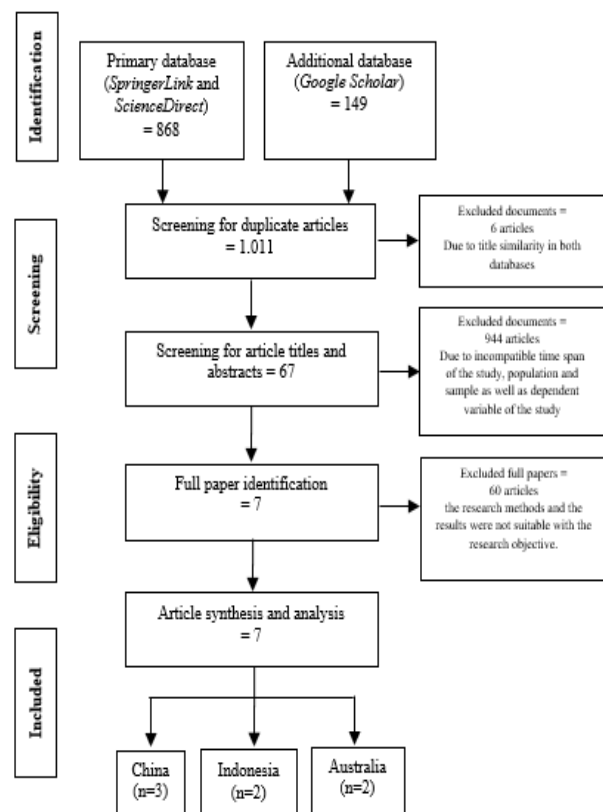


Figure 1. The PRISMA Flow Diagram of The Systematic Search and Data Extractions

2.3 Data Extractions

The extracted data were compiled in Microsoft Excel including article identity (i.e., author's name, publication year, journal name, and index status), research methods (i.e., location, study design, data collection technique, sampling technique, category, and the number of respondents), and research results (i.e., respondent characteristics, smoking habit, health promotion media intervention type, effect of health promotion media intervention). This strategy facilitated a comparison between articles and kept the extracted data from each article consistent.

3. RESULTS

Studies on the effect of health promotion media on the willingness to smoke in adolescents in the last 5 years tend to fluctuate. 7 articles reviewed were published in a different period, with 2 articles in 2016, 1 article in 2017, 2 articles in 2018, 1 article in 2019, and 1 article in 2020. Most of the articles were already indexed in Google Scholar, SINTA, and Scopus. All articles used quantitative methods with a cross-sectional design. The majority of the articles employed validated questionnaires. The smallest number of samples was in

the article from Xu et al. (2020) with 30 respondents selected through purposive sampling, while the largest number of samples was found in the article from Lippert, Corsi and Venechuk (2019) with 65.067 respondents through a cluster sampling technique. Based on the data analysis method, 4 articles used bivariate analysis and 3 articles used multivariate analysis. In addition, some articles performed combined analysis. An article by Chen *et al.* (2019) used bivariate and multivariate analysis, while an article by Jiang *et al.* (2016) used univariate and multivariate analysis.

Table 2. Article Characteristics

Authors	Country	Data Collection	Sampling	Respondent	Data Analysis
I Gusti, et al.	Indonesia	Researcher's questionnaire	Cluster random sampling	200 high school students	Paired t-test
Nan Jiang, et al.	China	GYTS questionnaire (self-administered questionnaire)	Stratified random sampling	45,857 high school students	Univariate and Regression Multivariate Tests p<0,05
Damayanti, Apsari	Indonesia	Researcher's questionnaire	Total sampling	31 vaporizer members	Paired t-test
Pei-Ching Chen, et al.	China	GYTS questionnaire	Stratified random sampling	8676 adolescents (high school age)	Chi-square Test, Logistic Regression Test with p<0,05
Xinsong Wang, et al.	China	Questionnaire	Total sampling	10.477 adolescents (high school age)	Logistic Regression Test P<0,05
Adam M., et al.	Australia	Pre- and post-questionnaire	Cluster Sampling	65,067 students	Multiple logistic regression test P<0,05
Angela Xu, et al.	Australia	Pre- and post-questionnaire	Purposive Sampling	12 females, 18 males (teenage age)	Paired t-test p<0,05

Sociodemographic characteristics were explained based on four aspects, namely gender, age, geographic location, and family income level. This study found that the vast majority of electronic cigarette users were male and most of them were adolescents (12-18 years old). Adolescents living in big cities are more likely to use electronic cigarettes. The majority of the young electronic cigarette users came from middle- to upper-class households. Adolescent smoking behavior was described based on the type of cigarette and the level of consumption. This study explains that e-cigarettes are the most widely used type of cigarette among teenagers. The level of consumption of e-cigarettes in adolescents is in the heavy category. This study also found family support factors that influence the formation of e-smoking behavior in adolescents.

Articles from I Gusti et al. and Angela Xu found that health promotion media through the internet, especially social media, boost knowledge of the

dangers of smoking and the willingness and motivation of adolescents to quit smoking. Different findings were observed in Jiang's et al. article, showing that internet-based health promotion media are limited in their effectiveness in inducing the desire to quit smoking in adolescents.

The results of this study show that the use of health promotion media has an effect in the effort to diminish interest in electronic cigarettes in adolescents. It results in better outcomes compared to conventional health promotion methods. The active participation model through social media is more effective in restraining and reducing the desire to use electronic cigarettes in adolescents.

Table 3. Demographic Characteristics and Smoking Habits of Respondents

Authors	Sex	Age	Location	Education	Income	Smoking habit			
						Freq.	Type	Average consumption per day	Smoking status (friend, family)
I Gusti et al.	Male Female	16-17	School	Senior high school	-	-	Cigarettes, electronic cigarettes	-	-
Nan Jiang et al.	Male Female	12-18	School	Junior and senior high school	Average (45,1 %) Poor (27 %) Rich (27,8 %)	-	Waterpipe, electronic cigarettes	< once per day (28,8 %) > once per day (50,8%)	Living with smokers (66,1%)
Damayanti, Apsari	Male Female	20-35	Urban Community	Senior high school and college	-	-	Electronic cigarettes	3-11 drippings per day (45,2%) 12-20 drippings per day (54,8%)	-
Pei-Ching Chen et al.	Male Female	13-19	School	Junior and senior high school	US\$0, US\$1-\$46.38 (27.11%) US\$46.39-\$108.27 (27.76 %) US \$≥108.28 (40%)	Last one month	Shisha, pipes, electronic cigarettes	2-5 times per day (33%)	93,3 % used electronic cigarettes, 40,13 % of the fathers used electronic cigarettes
Xinsong Wang et al.	Male Female	12-18	Urban and Rural Areas	Senior high school and college	Well-off (9.7%) Upper middle (29.92%) Middle (49.12%) Lower middle (7 %) Poor (4.26%)	-	Electronic cigarettes	≥ 20 times per day (6,37 %) < 20 times per day (9,01 %) 1-2 times per day 11,07 %)	-
Adam M et al.	Male Female	12-18	School	Junior and senior high school	-	Last 30 days	Electronic cigarettes	-	-
Angela Xu et al.	Male Female	18	School	Senior high school	-	Last 30 days	Electronic cigarettes	-	-

Table 4. Respondent Response to Health Promotion Media

Authors	Country	Media Type	Smoking Status	Age	Knowledge of Dangers of Smoking	p value	Smoking willingness	p value	Motivation to smoke	p value
I Gusti Ngurah Edi Putra et al.	Indonesia	Internet social media	Electronic Cigarette Users	Adolescent	Knowledge of electronic cigarettes (enough)	>0.05	Perception of electronic cigarettes (negative)	>0.05	Using electronic cigarettes (no)	>0.05
		Internet social media	Not an Electronic Cigarette Users	Adolescent	Knowledge of electronic cigarettes (poor)	>0.05	Perception of electronic cigarettes (Positive)	<0.05	Using electronic cigarettes (Yes)	<0.05
Nan Jiang et al.	China	Dissemination of the dangers of smoking	Electronic Cigarette Users	Adolescent	Knowledge of the use of electronic cigarettes	<0.001	Attitudes toward the use of electronic cigarettes	<0.001	-	-
		Dissemination of the dangers of smoking	Not an Electronic Cigarette Users	Adolescent	Knowledge of the use of electronic cigarettes	<0.001	Attitudes toward the use of electronic cigarettes	<0.001	-	-
Apsari Damayanti	Indonesia	Internet ads	Electronic Cigarette Users	Young Adult	Knowledge of the use of electronic cigarettes (poor)	>0.05	Perception of electronic cigarettes (negative)	>0.05	Using electronic cigarettes	<0.05
		Internet ads	Electronic Cigarette Users	Young Adult	Knowledge of electronic cigarettes (poor)	>0.05	Perception of electronic cigarettes (Positive)	<0.05	Using electronic cigarettes	<0.05
Pei-Ching Chen et al.	China	Anti-smoking health message. Health pictures on the packaging. Dissemination of the dangers of smoking	Electronic Cigarette Users	Adolescent	-	-	Desire to quit smoking	<0.001	-	-
Xinsong Wang et al.	China	Internet ads. TV. advertisement in public space (pamphlet). newspaper	Active smoker	Adolescent	-	-	Perception of electronic cigarettes not being addictive	<0.001	Awareness of electronic cigarettes	<0.001
		Internet ads. TV. advertisement in public space (pamphlet). newspaper	Ex-smoker	Adolescent	-	-	Perception of electronic cigarettes not being addictive	<0.001	Awareness of electronic cigarettes	<0.001
		Internet ads. TV. advertisement in public space (pamphlet). newspaper	Non-smoker	Adolescent	-	-	Perception of electronic cigarettes. safe smoking alternatives	0.01	Advertisement	0.043
Adam M et al.	Australia	Smoke-free areas. health campaign	Beginner Electronic Cigarette Users	Adolescent	-	-	Perception of electronic cigarettes	<0.001	Using electronic cigarettes at school with	<0.001

Authors	Country	Media Type	Smoking Status	Age	Knowledge of Dangers of Smoking	p value	Smoking willingness	p value	Motivation to smoke	p value
							not being addictive		high frequency	

4. DISCUSSION

Chen et al. (2018) (n=74%), supported by Damayanti (2017) (n=96.8%) states that more than 50% of electronic cigarettes are men. Electronic smoking habit implies masculinity status among men and negative stigma among women [10]. Other studies reveal that there is a significant probability that men smoke to elicit taste, social, and energy enjoyment while women do it to control weight [10]–[12].

This is corroborated by studies from Nan Jiang et al. (2016) (n=66%); Xinsong Wang et al. (2018) (n=89%); Adam et al. (2019) (n=50,3%), finding that 50% of electronic smokers were in the adolescent age group (12-18 years old). In contrast with previous articles indicating that the majority of electronic smokers were in the age range of 15 to 39 years old [13]. Adolescent’s tendency to seek identity and social recognition is also what triggers their interest in e-cigarettes [9], [14]. The Desire to stop and avoid tobacco cigarettes also affects an adolescent interest in e-smoking [14].

Wang et al. (2018) state that the vast majority (93%) of electronic cigarette users lived in urban areas. A similar finding is also observed in Indonesia, where smokers in big cities are more likely to try and use electronic cigarettes compared to those living in rural areas. This finding contradicts the findings in America which show that statuses of an area of residence did not show any difference. Meanwhile, in Poland and Europe, the level of use of e-cigarettes in urban areas is higher than in rural areas [6]. Several studies also find a difference between electronic cigarette users living in urban and rural areas [15]. More heterogeneous social trends and faster access to information are also reasons why teenagers in urban areas use e-cigarettes [15], [16].

This study shows that the majority of e-cigarette users belong to the middle and upper economic groups. Another study shows different results where around 76.7% of electronic smokers were people with high incomes (more than 2 million rupiah) [11]. Another study explains that exposure to advertising in high socioeconomic status is greater than in other economic statuses which in turn is associated with an increase in the frequency of e-cigarette users [13]. This study shows that the number of e-cigarette users is quite large, especially among adolescents with diverse sociodemographic characteristics.

Damayanti (2017) states that 89% of adolescents prefer electronic cigarettes. This could be attributed to the lack of knowledge of adolescents about the dangers of e-cigarettes and the emergent perception that e-cigarettes are healthier than tobacco cigarettes in general [17]. Studies by Damayanti (2016); Jiang *et al.* (2016); Wang *et al.* (2018); Chen *et al.* (2019) show similarity in the category of heavy consumption of e-cigarettes. E-cigarette liquid flavor variants are the main appeal for teenagers to use e-cigarettes [18]. This causes the level of consumption of e-cigarettes in adolescents to reach the heavy category with consumption of more than 10 dripping/day. The high level of consumption is motivated by various flavored liquid variants affecting user spending rates [16].

Family influence is another factor motivating the use of electronic cigarettes. Jiang et al. (2016); Chen et al. (2018) show similar results that every household with electronic cigarette users would have an adolescent electronic cigarette user. A contrasting result is presented by Hasna et al. (2017), saying that family influence does not affect on the use of electronic cigarettes in adolescents [9]. Adolescents’ interest in electronic cigarettes is also influenced by the communication pattern of the family with the adolescent [19], [20]. This study shows that the description of smoking behavior of adolescents who tend to use e-cigarettes is dominated by adolescent social factors.

Media models also play a role in electronic cigarette smoking habits. I Gusti et al. and Angela Xu found that health promotion media through the internet, especially social media, boost knowledge of the dangers of smoking and the willingness and motivation of adolescents to quit smoking. Different findings were observed in Jiang et al. (2016) article, showing that internet-based health promotion media are limited in their effectiveness in inducing the desire to quit smoking in adolescents.

Simon *et al.* (2018) explain that using the internet as a means to spread health promotion media or health campaigns is more effective with sig. value of 0.03 (p<0.05). Similarly, The use of social media can improve adolescent knowledge and reduce their interest in using electronic cigarettes [21], [22]. The disease-prevention campaign model provides important knowledge and induces willingness in adolescents to prevent a certain disease [23].

5. CONCLUSION

The results of this literature review show that health promotion through social media has the potential to reduce willingness and desire to use electronic cigarettes among adolescents compared to other models. This review should contribute to the Ministry of Health's consideration to transform the model of health promotion to improve its effectiveness in suppressing adolescent e-smoking behavior in Indonesia. Future studies are expected to examine empirically the effect of the intervention of social media on the desire to use electronic cigarettes among adolescents so that the analysis can be more comprehensive.

AUTHORS' CONTRIBUTIONS

AY, SM, NDM, DM contributed to the design, study selection, data collection, data analysis, and manuscript writing. SM, DM contributed to the revision of the manuscript. All authors read and approved the final manuscript.

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