

# Use of e-cigarettes and associated factors among adolescent smokers in Indonesia: Analysis of the Global Youth Tobacco Survey (GYTS) Indonesia 2019

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## Abstract

**Background:** Electronic cigarette (e-cigarette) is an alternative to reduce the harmfulness of conventional cigarettes. However, there are still pros and cons to using the e-cigarette, especially among adolescents. Instead of reducing the health problem, using e-cigarette even make the illness the same as conventional ones.

**Objective:** This study aimed to examine the determinant of using e-cigarettes among adolescents and smokers of school age.

**Method:** This study used the cross-sectional data from the Global Youth Tobacco Survey (GYTS) Indonesia 2019. The national school was selected by proportional random sampling. Around 832 adolescent smokers were eligible for this study.

**Results:** Among 832 adolescent smokers in this study, about 49.64% of them ever used e-cigarettes. The factors significantly associated with the use of e-cigarettes were money pocket and the use of other forms of smoked tobacco. However, other independent variables, such as age, gender, teachers smoking during school hours, and parent smoking, were not significantly associated with using e-cigarettes.

**Conclusion:** The factors associated with e-cigarette use were related to the students' socioeconomic status. The roles of parents and teachers need to be addressed to reduce the harmfulness of using e-cigarettes.

Keywords: e-cigarettes; adolescent; GYTS 2019; Indonesia

## Background

Globally, smoking behavior is one factor that causes death and disability estimated at more than six million people at risk. To prevent the harmful risk of using a cigarette, the scholars give alternatives to reduce the risk, such as smokeless tobacco and electronic cigarettes (e-cigarettes). E-cigarettes are a device powered by a battery that the nicotine is in the form of propylene glycol or glycerine. The study in seven countries, including Russia, Germany, the UK, Poland, France, Italy, and South Korea, found an increase in the number of e-cigarette use from 0.9% to 1.7% from 2013 to 2015. In the US, from 2011 to 2015, comparing conventional and e-cigarettes, the e-cigarettes sales are growing positively but slower (Marynak et al., 2017). One study in the US revealed that one in three students perceived e-cigarettes as less harmful than conventional cigarettes (Ambrose et al., 2014). However, the health risk assessment study found heavy metals in e-cigarettes (Skulberg et al., 2019; Zulkifli et al., 2018).

The electronic cigarette (e-cigarette) is not a new product of cigarette. The e-cigarette is becoming an issue among youth and young adults since the product was established with a lower risk of health problems. However, e-cigarette use remains a con and pro topic because this is used for cessation among smokers and prevents youth from becoming smokers. Using e-cigarettes is also an alternative for smokers to be enabled to smoke anywhere (Bigwanto & Soerojo, 2020; Grana et al., 2014).

In the mid-2000s, some stakeholders, including practitioners, researchers, and policymakers, supported e-cigarettes as a safer alternative to stop smoking (Glantz & Bareham, 2018). The risk and benefits of e-cigarettes have been discussed by previous studies that mentioned that young people have the potential risk of using the e-cigarette while the adults have the potential way to quitting smoking (Balfour et al., 2021; Syamsuriansyah et al., 2022). Most studies mentioned adolescents as the group of people with a higher risk of using e-cigarettes. A study in the US found that adolescents are interested in trying e-cigarettes because of the flavors, such as menthol and fruit (Pepper et al., 2016). They assume that the candy-flavored, fruit-flavored, and menthol-flavored has less harm than tobacco-flavored and alcohol-flavored (Pepper et al., 2016). A study in

Spain revealed the health consequences of using e-cigarettes, which showed that the airborne markers of conventional cigarettes are higher than e-cigarettes (Ballbè et al., 2014).

Some studies about e-cigarettes have been done in Indonesia. The data showed a total of 4,419,622 e-cigarettes user in Indonesia in 2017 (Badan Pusat Statistik Republik Indonesia, 2017). However, the health consequences of using e-cigarettes are not revealed because some studies found no difference in lung illness between mice with conventional cigarettes and e-cigarettes (Rohmani et al., 2018). The negative impact of using e-cigarettes is also shown by a study in the UK that found respiratory failure among e-cigarette users (Bhatt et al., 2020; Gotts et al., 2019). Another study found that e-cigarette users tend to be defensive and perceive that e-cigarettes are an alternative to smoking cessation and a healthier way of smoking (Kusumawardani, 2021). One study in Bandung City found the worse health impact for those who use both conventional and e-cigarettes (Sihaloho & Tambak, 2020). In fact, instead of a solution to stop the use of conventional cigarettes, most e-cigarette users tend to use both.

## Methods

### Study Design

This study used secondary data, which was designed as a cross-sectional survey. The use of e-cigarettes and their predictors were asked at the same time.

### Setting

The original study (GYTS 2019) was conducted in 34 provinces in Indonesia in 2019. According to WHO, GYTS aims to control tobacco use among adolescents aged 13 to 17. GYTS 2019 is the latest survey about e-cigarettes that were not asked in the previous round. This study aims to know the proportion of e-cigarette use among all smokers and examine the associated factors.

### Samples/Participants

The original survey GYTS 2019 used the global standardized methodology, a two-stage sample design. The original survey (GYTS 2019) selected the school based on proportional probability. The class was chosen by random sampling method, and all the eligible students in grades 7-12 could join the

survey. This study used eligible samples that met the inclusion and exclusion criteria. The inclusion criteria were students aged 7 to 12 years old, and the exclusion criteria were those who did not complete the questionnaire. After doing the data cleaning and management, the total sample in the original survey was 832 adolescent smokers.

### Instruments

GYTS used the standard core questionnaire under World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) in order to generate comparable data within and across countries. The questionnaire covers some topics, including tobacco use, cessation, secondhand smoke, pro-and anti-tobacco media, and advertising

This current study used e-cigarettes as a dependent variable. It was a dummy variable with categories *yes/no*. The independent variables are age, gender, money pocket, see teachers smoking during school hours, parents smoking, and use of other forms of smoked tobacco. The variable of e-cigarette use is based on the question IDR19, "How old were you when you first tried e-cigarettes?" The potential answers were 1) *I have never tried an e-cigarette*; 2) *7 years old or younger*; 3) *8 or 9 years old*; 4) *10 or 11 years old*; 5) *12 or 13 years old*; 6) *14 or 15 years old*; 7) *16 years old or older*. Those who chose option 1 were included as "ever used e-cigarettes," and those who chose options 2 to 7 were included as "never used e-cigarettes".

### Data Collection

The current study used secondary data, namely GYTS, conducted in 2019 by the National Health Research and Development (NHRD) under the Ministry of Health. Totally, the response rate was 91.0%. The validity and reliability test have been done by the Ministry of Health Indonesia.

### Data Analysis

The statistical analysis used in this study consists of univariate, bivariate, and multivariate. The univariate showed the frequency and percentage of all variables (dependent and independent variables). The bivariate analysis was done using Chi-Square to examine the relationship of each independent variable to dependent variables. The binary logistic regression was done to examine all the independent variables to the dependent variables in three models, which were presented by Adjusted Odd Ratio (AOR).

STATA version 15 Mahidol University licensed was used to analyze the data.

### Ethical Considerations

The original survey GYTS Indonesia 2019 has been approved by the Ministry of Health Indonesia. In addition, all the tools and instruments in the survey have been standardized by World Health Organization (WHO).

## Results

**Table 1** describes the general information about the e-cigarette and potential risk factors that showed by frequency and percentage. Among all adolescent smokers joining the GYTS 2019, about 49.64 percent of them were e-cigarette users. Among them, more than half were aged 15 to 17 years old. In terms of money pocket, most of them get a daily money pocket of more than IDR 11,000 (73.56%). In addition, the majority of adolescent smokers sometimes saw their teachers smoke during school hours (48.92%). According to parent smoking, about a half of them had no parent smoking. Almost all of them did not use the other forms of smoked tobacco (88.10%).

**Table 2** shows the bivariate analysis using the Chi-Square test. Of six independent variables, two variables showed a correlation to the use of e-cigarettes. Money pocket was statistically correlated with the use of e-cigarettes with a p-value of 0.000. In detail, for those who had money pocketed less than IDR 11,000, about 60.91% of them did not use e-cigarettes, and for those who had money pocketed more than or equal to IDR 11,000, about 53.43% of them used e-cigarettes. Another variable related to e-cigarette use was using other forms of smoked tobacco. So, those who use smoked tobacco was correlated with the use of e-cigarette as well. In detail, among those who used other forms of smoked tobacco, about three fourth of them used e-cigarettes (74.75%), and among those who did not use other forms of smoked tobacco, more than a half of them did not use e-cigarettes (53.75%). Furthermore, the rest of the independent variables, such as age group, gender, see teacher smoking during school hours, and parent smoking, were not significantly associated with the use of e-cigarettes, with a p-value of more than 0.05.

**Table 1** General characteristics of adolescent smokers

Characteristics	Frequency	Percentage
<b>Using e-cigarette</b>		
Yes	413	49.64
No	419	50.36
<b>Age group</b>		
11 to 14 years old	374	44.95
15 to 17 years old	458	55.05
<b>Gender</b>		
Male	791	95.07
Female	41	4.93
<b>Money pocket</b>		
Less than IDR 11,000	220	26.44
More than IDR 11,000	612	73.56
<b>See teacher smoking</b>		
Everyday	222	26.68
Sometimes	407	48.92
Never	203	24.40
<b>Parent smoking</b>		
No	423	50.84
Yes	409	49.16
<b>Use other forms of smoked tobacco</b>		
No	733	88.10
Yes	99	11.90

**Table 2** The correlation between each independent variable and the use of e-cigarettes

Variables	Use of e-cigarettes		<i>p</i> -value (Chi-Square)
	Yes (%)	No (%)	
<b>Age group</b>			0.517 (0.4204)
11 to 14 years old	181 (48.40)	193 (51.60)	
15 to 17 years old	232 (50.66)	226 (49.34)	
<b>Gender</b>			0.283 (1.1532)
Male	396 (50.06)	395 (49.94)	
Female	17 (41.46)	24 (58.54)	
<b>Money pocket</b>			0.000 (13.312)
Less than IDR 11.000	86 (39.09)	134 (60.91)	
More than IDR 11.000	327 (53.43)	285 (46.57)	
<b>See teacher smoking</b>			0.132 (4.0516)
Everyday	101 (45.50)	121 (54.50)	
Sometimes	200 (49.14)	207 (50.86)	
Never	112 (55.17)	91 (44.83)	
<b>Parent smoking</b>			0.097 (2.7585)
No	198 (46.81)	225 (53.19)	
Yes	215 (52.57)	194 (47.43)	
<b>Use other forms of smoked tobacco</b>			0.000 (28.3376)
No	339 (46.25)	394 (53.75)	
Yes	74 (74.75)	25 (25.25)	

**Table 3** describes the binary logistic regression result for to use of e-cigarettes. Among all potential predictors of e-cigarette use, two independent variables were significantly associated with the use of e-cigarettes after being adjusted to all independent variables. Money pocket and other

forms of smoked tobacco significantly influenced smokers to use e-cigarettes. In detail, money pocket was significantly associated with the use of e-cigarettes after being adjusted to other independent variables. Those with a daily money pocket of more than IDR 11,000 were 1.77 times more likely to use

e-cigarettes than those with daily money of less than IDR 11,000. Another variable associated with the use of e-cigarettes was the use of other forms of smoked tobacco. After adjusting to other independent variables, those who used other forms of smoked tobacco were 3.4 times more likely to use

e-cigarettes. Other independent variables, such as age, gender, see teacher smoking during school hours, and parent smoking, were not found to have any significance related to e-cigarette use (p-value more than 0.05).

**Table 3** The binary logistic regression result between all predictors and the use of e-cigarettes

Variables	Adj. Odds Ratio	95% Confidence Interval		p-value
		Lower	Upper	
<b>Age group</b>				
11 to 14 years old (ref)	1			
15 to 17 years old	1.03	0.78	1.37	0.840
<b>Gender</b>				
Male	1.27	0.67	2.43	0.478
Female (ref)	1			
<b>Money pocket</b>				
Less than IDR 11,000 (ref)	1			
More than IDR 11,000	1.77	1.28	2.45	<b>0.001</b>
<b>See teacher smoking</b>				
Every day (ref)	1			
Sometimes	1.13	0.81	1.59	0.474
Never	1.47	0.99	2.18	0.056
<b>Parent smoking</b>				
No (ref)	1			
Yes	1.12	0.83	1.47	0.477
<b>Use other forms of smoked tobacco</b>				
No (ref)	1			
Yes	3.4	2.06	5.41	<b>0.000</b>

Log likelihood = -552.99 | LR chi2(7) = 47.36

Prob > chi2 = 0.000 | Pseudo R2 = 0.0411

## Discussion

This study found the main determinant of e-cigarette use was money pocket. In line with this current study, the study in Jakarta found having enough money to buy e-cigarettes and parental acceptance of e-cigarette use were the higher odds of using e-cigarettes (Bigwanto et al., 2019). Similar to this study, the study among high school students in Jakarta revealed the determinants of e-cigarettes such as the use of conventional cigarettes, the perception that e-cigarettes are less addictive, and the perception that e-cigarettes do not cause cancer (Bigwanto et al., 2019). Generally, the main factor that influences adolescents to use e-cigarettes is the acceptance of adolescents themselves and their parents. However, there is no influence from the teacher.

The result of this study is different from the study among high school students in Bekasi City, which

found money pocket was not associated with e-cigarette use (El Hasna et al., 2017). However, availability and affordability are the main factors that influence adolescents to use an e-cigarette. Besides the factors from the adolescent itself and support from the parents, there is a role of peers that also affects the use of e-cigarettes. It also found in a previous study indicated that undergraduate students found using e-cigarettes with peers was the most influential factor (Diana et al., 2020). The study in Pontianak City also found that source affordability and friend support were the main factor in using e-cigarettes (Cleopatra, 2017). Supporting this study, the study among young adults found that socioeconomic factor is the main determinant of using the e-cigarette. The nationally representative survey, namely SUSENAS (National Social Economic Survey) in 2017, presented that social economics is associated with electric smoking behavior (Elsa & Nadjib, 2019). Furthermore, other factors related to using e-cigarettes are smoking

status (conventional cigarette), age, and educational level (Elsa & Nadjib, 2019)

The determinants of e-cigarette use have been done by previous studies. E-cigarette use was strongly associated with conventional cigarettes and heavy drinking (Lee et al., 2016). In addition, the use of e-cigarettes was associated with sex, school locations, traditional cigarette smoking status, peer use, availability, and perceptions that e-cigarettes aid conventional cigarette smoking cessation (Fauzi & Areesantichai, 2020; Pitriyanti et al., 2018; Puteh et al., 2018). The use of e-cigarettes is also related to being a self-image and a part of social activities (Puteh et al., 2018). Generally, the factors associated with the use of e-cigarettes are gender, tobacco use, alcohol use, and coming from a smoking household (Pitriyanti et al., 2018). However, the main factor is related to the double use of conventional and e-cigarettes. Besides the effect on respiratory disease, using e-cigarettes also decreases the quantity and quality of spermatozoa in the mice (Mandasari et al., 2019).

The health problem that might be occurred by using e-cigarettes has been discussed in previous studies. One study found the risk of pulmonary toxicity of e-cigarettes, especially among adolescents (Chun et al., 2017). In some areas in Indonesia, the use of e-cigarettes is a new trend. The study comparing awareness of e-cigarettes found that Indonesia had the lowest (10.9%) awareness of e-cigarettes compared with Malaysia, Qatar, and Greece (21.0%, 49.0%, and 88.5%, respectively) (Palipudi et al., 2016).

The regulation banning smoking in public areas has been established in many areas. In Samarinda, East Kalimantan Province, the regulation is not implemented well because of a lack of communication between stakeholders and minimum socialization in the society (Elsa & Nadjib, 2019). Most of the national and sub-national regulations only cover conventional cigarettes and do not mention e-cigarettes. That means the use of e-cigarettes is still allowed even in public areas. The regulation of e-cigarettes in Indonesia is complex and not implemented well due to incompetence, corruption, or global economic trends (Newman & Nurfaiza, 2022). In Indonesia, the legacy of e-cigarettes has not been done, and the country is only orienting the profit (Kresnayana & Bagiastra, 2021).

## Conclusion

The result of this study found the strong influence of socioeconomic factors, such as money pocket related to the use of e-cigarettes. The use of e-cigarettes is related to money pocket that might also be related to the household income and economic status. Another factor associated with the use of e-cigarettes is the use the others form of smoked tobacco. This factor is related to the tendency of adolescents to try everything. Generally, this study found the factors influencing e-cigarette is the factors in the scope of the household. So, the control from parents and teachers is very important to reduce the harmfulness of e-cigarette use.

### Declaration of Conflicting Interest

All of the authors declare no conflict of interest in this study.

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### Author Contribution

All authors contributed to all phases of the study and concurred with the last version of the article to be issued and accountable in all stages of the work.

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