Predictors of smoking exposure in non-smoking adolescents in Indonesia

Julfia Aina Sari,[1] Ferry Efendi,[1,2] Lailatun Nimah,[1] Gading Ekapuja Aurizki,[1] Ronal Surya Aditia,[3] Rifky Octavia Pradipta,[1] Khadizah H. Abdul-Mumin[4]

[1]Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia; [2]School of Nursing and Midwifery, La Trobe University, Melbourne, VIC, Australia; [3]Faculty of Sport Science, Universitas Negeri Malang, Indonesia; [4]Pengiran Anak Puteri Rashidah Sa'adatul Bolkiah Institute of Health Sciences, Universiti Brunei Darussalam, Brunei Darussalam

Abstract

Exposure to secondhand smoke is one of the leading causes of death for non-smokers worldwide. The prevalence of exposure to secondhand smoke is higher among adolescents. Research on predictors of secondhand smoke exposure in adolescents is still rarely conducted in Indonesia. This study aimed to analyze the predictors of exposure to secondhand smoke among non-smoking adolescents in Indonesia. This study used data from the Global Youth Tobacco Survey (GYTS) Indonesia 2019 with a cross-sectional design. A total of 7,594 adolescents aged 13 to 15 were selected using purposive sampling. The dependent variables were exposure to secondhand smoke at home and in public. The independent variables included age, gender, smoking parents, smoking friends, and knowledge of the dangers of secondhand smoke. Data were analyzed using STATA with inferential tests, namely chi-square and logistic regression. The prevalence of adolescents exposed to secondhand smoke at home and in public was 49.57% and 71.86%, respectively. At-home exposure was significantly associated with smoking parents [AOR=3.50, 95% CI=2.97 to 4.12], smoking friends [AOR=1.50, 95% CI=1.30 to 1.73], and knowledge of the dangers of secondhand smoke [AOR=2.11, 95% CI=1.52 to 2.93]. Public exposure was associated with ages 13-15 [AOR=1.32, 95% CI=1.10 to 1.58] and older than 15 [AOR=1.77, 95% CI=1.39 to 2.25], male gender [AOR=1.31, 95% CI=1.11 to 1.53], smoking parents [AOR=1.58, 95% CI=1.36 to 1.84], smoking friends [AOR=2.16, 95% CI=1.85 to 2.53], and knowledge of secondhand smoke dangers [AOR=2.84, 95% CI=2.15 to 3.75]. Adolescents' exposure to secondhand smoke in public spaces is higher in prevalence and has more associated factors compared to exposure at home. Exposure reductions require comprehensive actions from authorities by strictly implementing and expanding non-smoking areas covered by existing regulations. Also, family and school management should be involved in prevention efforts.

Correspondence: Ferry Efendi, Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia. E-mail: ferry-e@fkp.unair.ac.id

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Introduction

The smoking epidemic is one of the biggest public health threats the world has ever faced.[1] Indonesia is among the countries that have a high prevalence of smokers globally.[2] Smoking causes many losses; not only is it harmful to health, but it can also worsen poverty and cause social, economic, and environmental damage.[3] Exposure to secondhand smoke kills approximately 1.2 million non-smokers worldwide.[4] Tobacco comprises a staggering array of 7,000 chemicals, encompassing hundreds of noxious compounds, and approximately 70 of these are known to be carcinogenic substances.[5] These substances can worsen health conditions, especially for non-communicable diseases like heart disease, diabetes mellitus, stroke, and others.[6] There is no safe level of exposure to secondhand smoke.[4] The prevalence of exposure to secondhand smoke is higher among adolescents than adults.[7] The World Health Organization (WHO) reported that 65,000 children die each year due to exposure to secondhand smoke.[4] In Indonesia, around 96 million people are currently exposed to secondhand smoke.[8] Research in Nigeria and West Africa has stated that expo-

sure to secondhand smoke is associated with having parents and friends who smoke, being asked to buy cigarettes by family, and lower social class.[9] In Indonesia, research related to predictors of secondhand smoke exposure among non-smoking adolescents using data analysis from the Global Youth Tobacco Survey (GYTS) has never been carried out.

Globally, there are 1.2 million smokers from developing countries.[10] According to a survey involving adolescents aged 12-16 years from 1999-2018 in 142 countries, the prevalence of exposure to secondhand smoke everywhere was 62.9%, while at home and in public were 33.1% and 57.6%, respectively.[11] In 2019, nearly 7 million students in the US were exposed to secondhand smoke at home, and 6 million were exposed in vehicles.[5] In Indonesia and Pakistan, for example, more than 80% of people are exposed to secondhand smoke in restaurants.[12] GYTS Indonesia 2019 reported exposure to secondhand smoke in closed public places reached 66.2%, while in open public places and at home were 67.2% and 57.3%, respectively.[13] In Indonesia, regulations that limit exposure to secondhand smoke have been established, but their implementation has not been optimal (Ref). The 2018 Basic Health Research in Indonesia reported that 32.4% of people were exposed to secondhand smoke in a closed room.[14] Many people are not aware of the dangers of passive smoking regarding smoking-attributable diseases.[15] Research in Semarang showed that 42.86% of places do not put up a sign for the area. Six out of ten teenagers are exposed to secondhand smoke in public, and exposure to secondhand smoke is higher than exposure to secondhand smoke at home. There is still high exposure to secondhand smoke in Indonesia, so it is necessary to supervise the implementation of the regulations on non-smoking areas that have been made.[16] The Southeast Asia Tobacco Control Alliance states that Indonesia is among the weakest in tobacco control in Southeast Asia.[17] The Indonesian government must implement best practices in tobacco control to reduce the burden of tobacco-related diseases.[18] Factors reported to be associated with exposure to secondhand smoke were age, ethnicity, place of residence (rural), and current smoking.[19] Gender and education of the head of the household are also associated with exposure to secondhand smoke at home.[20]

Considering the impact of exposure to secondhand smoke on the body, the lack of optimal supervision of smoke-free regulations, and the limited research on predictors of exposure to secondhand smoke, it is hoped that the results of this study can provide additional information regarding predictors of secondhand smoke exposure among non-smoking adolescents in Indonesia. These findings should be taken into consideration in developing policies to control secondhand smoke exposure in the country.

Materials and Methods

Design

This study used secondary data from GYTS Indonesia 2019 with a cross-sectional design.

Population and sample

This study's population was based on the GYTS survey population, totaling 9,992 adolescents. The GYTS is a national school-based survey of students in classes aged 13-15 years that uses a two-stage cluster sample design to obtain a representative sample.[13] The study purposively selected the sample based on the inclusion criteria of non-smoking adolescents and obtained 7,594 participants.

Data collection

Data can be downloaded for free at the Centers for Disease Control (CDC) website (https://www.cdc.gov/tobacco/global/index.htm). The cleaning process involves meticulously curating the dataset by discerning and extracting relevant data points, culminating in the vital step of recoding variables essential for the study's execution.

Variables

The dependent variable in this study was exposure to secondhand smoke at home and exposure in public. Exposure to secondhand smoke at home was determined based on the answers to the following question: "During the past 7 days, on how many days has anyone smoked inside your home, in your presence?" Adolescents were considered not exposed if the answer was "0 days"; any other answer indicated exposure.

Meanwhile, the questions used to determine exposure in public spaces were: "During the past 7 days, on how many days has anyone smoked in your presence inside any enclosed public place, other than your home (such as schools, malls, restaurants, shopping centers, theaters, cafes, health service facilities, public transportation, indoor sports venues)?" and "During the past 7 days, on how many days has anyone smoked in your presence at any outdoor public place (such as playgrounds, curbside, building entrances, parks, beaches, sports fields)?" Adolescents were considered not exposed if both questions were answered within "0 days"; any other answer to at least one question was considered exposure.

This study included several independent variables, namely age, gender, smoking parents ("Do your parents smoke tobacco?"), smoking friends ("During the past 30 days, did you see anyone smoke inside the school building or outside on school property?"), and knowledge about the dangers of secondhand smoke ("Do you think smoke from other people's cigarettes is harmful to you?").

Analysis

Data analysis used were univariate and inferential analysis, namely Chi-square test and logistic regression using STATA version 15 application for Windows.

Ethical approval

In August 2019, the Global Youth Tobacco Survey (GYTS) in Indonesia obtained official authorization from the National Institute of Health Research and Development, solidifying its credibility and legitimacy.

Results

Table 1 shows that the percentage of exposure to secondhand smoke at home was 49.57%, which is lower than the exposure in public (71.86%). The average age of adolescents was 13-15 years (51.29%), and 69% were girls. Approximately half of the adolescents had smoking friends (53.29%), and a similar proportion had smoking parents (42.07%). Almost all adolescents were aware of the dangers of secondhand smoke (96.22%).

Exposure at home

The results of the bivariate analysis indicated that four out of five independent variables were significantly associated with exposure at home, namely age (p=0.039), smoking parents

(p<0.001), smoking friends (p<0.001), and knowledge of secondhand smoke dangers (p<0.001). Only gender was not significantly associated with at-home exposure (p=0.416) (Table 2).

Meanwhile, based on the logistic regression analysis (Table 3), three independent variables could be significant predictors for exposure at home. Adolescents with smoking parents and smoking friends have 3 times (95% CI=2.97 to 4.12) and 1.5 times (95% CI=1.30 to 1.73) higher odds of getting exposed to secondhand smoke at home compared to those with non-smoking parents and friends. Also, adolescents who knew of secondhand smoke dangers had higher odds of getting exposed compared to those who did not know (95% CI=1.52 to 2.93).

Exposure in the public

The bivariate analysis shows that all independent variables were significantly associated with exposure to secondhand smoke in public, namely age (p<0.001), gender (p=0.033), smoking parents (p<0.001), smoking friends (p<0.001), and knowledge of the dangers of secondhand smoke (p<0.001; Table 2).

Furthermore, the logistic regression results indicate that all significant variables could significantly predict exposure to secondhand smoke in public (Table 3). The older the adolescents, the higher the odds of getting exposed. Adolescents aged 13-15 years had 1.32 times higher odds (95% CI=1.10 to 1.58) compared to adolescents aged <13. The odds were even higher in those aged >15 (AOR=1.77; 95% CI=1.39 to 2.25). Meanwhile, male adolescents had 1.31 times higher odds of getting exposed to the public compared to their female counterparts. Adolescents with smoking parents had 1.58 times higher odds (95% CI=1.36 to 1.84) of public exposure. The odds were even higher for those having smoking friends (AOR=2.16; 95% CI=1.85 to 2.53). Meanwhile, adolescents with knowledge of the dangers of secondhand smoke had 2.84 times higher odds of secondhand smoke exposure in public (95% CI=2.15 to 3.75) compared to those without knowledge.

Discussion

Age is one of the predictors associated with exposure to secondhand smoke in public but is not a predictor for exposure at home. This aligns with a study from Nigeria, which demonstrated that age as a predictor for secondhand smoke exposure depends on settings; it is significant outside the home but not inside the home.[9] At home, adolescents may have difficulties avoiding exposure, regardless of their age groups. Individuals in their age group have a lower chance of confronting older members of their family, such

Table 1. Results of univariate predictors of secondhand smoke exposure among adolescent non-smokers in Indonesia (n=7,594).

Variable	N	%
Exposure to secondhand smoke at home		
Yes	3,764	49.57
No	3,830	50.43
Exposure to secondhand smoke in the public		
Yes	5,457	71.86
No	2,137	28.14
Age (Years)		
<13	1,236	16.27
13-15	3,896	51.29
>15	2,464	32.44
Gender		
Female	5,240	69.00
Male	2,354	31.00
Smoking parents		
Yes	3,195	42.07
No	4,399	57.93
Smoking friends		
Yes	4,047	53.29
No	3,547	46.71
Knowledge of secondhand smoke dangers		
Yes	7,307	96.22
No	287	3.78

Table 2. Results of bivariate predictors of secondhand smoke exposure among non-smoker adolescents in indonesia (n=7,594).

Variable Predictors	Exposure to Secondhand Smoke (SHS)											
	At home						In public					
	Yes		No		p	X^2	Yes		No		p	X^2
	n	%	n	%			n	%	n	%		
Age (Years)					0.039	11.42					<0.001	79.15
<13	574	7.56	662	8.72			773	10.18	463	6.10		
13-15	1981	26.09	1915	25.22			2775	36.54	1121	14.76		
>15	1209	15.92	1253	16.50			1909	25.14	553	7.28		
Gender					0.416	1.48					0.0332	9.63
Female	1155	15.21	1199	15.79			3719	48.97	1521	20.03		
Male	2609	34.36	2631	34.65			1738	22.89	616	8.11		
Smoking parents					<0.001	684.73					<0.001	83.24
Yes	2151	28.32	1613	21.24			2476	32.60	2981	39.25		
No	1044	13.75	2786	36.69			719	9.47	1418	18.67		
Smoking friends					<0.001	89.74					<0.001	260.30
Yes	2215	29.17	1832	24.12			3240	42.67	807	10.63		
No	1549	20.40	1998	26.31			2217	29.19	1330	17.51		
Knowledge of SHS dangers					<0.001	41.13					<0.001	94.13
Yes	3672	48.35	3635	47.87			5314	69.98	1993	26.24		
No	92	1.21	195	2.57			143	1.88	144	1.90		

as parents, older siblings, or other close relatives. The case is different in public, where older adolescents are more at risk of getting exposed. This aligns with studies conducted in Malaysia,[19,21] West Africa,[22] and Kuwait.[23] This is possible because older adolescents are usually given more freedom by their parents and are thus more likely to visit places where smokers are common. Also, parents usually become less protective as their children grow older. Although some studies[24-26] found no significant associations between age and these factors, this should not discourage parents from being involved in monitoring their children's behaviors while at home.

Similar to age, gender was also a predictor for exposure to secondhand smoke in public but not for exposure at home. This aligns with a study in Thailand, where gender was not strongly associated with exposure at home,[27] and in Gambia, which shows significant associations between gender and exposure in indoor and outdoor public spaces.[28] Nevertheless, studies conducted in India[29] and Virginia, United States,[24] found that gender was not significantly associated with exposure to secondhand smoke in any setting. Despite these contrasting findings, in general, men have higher odds of getting exposed to secondhand smoke than women.[21,27-29] The similarity in the percentage of secondhand smoke exposure at home among both women and men can be attributed to the hesitancy of teenagers to confront individuals smoking indoors, making it challenging to evade such exposure. Conversely, men face a higher risk of encountering secondhand smoke in public spaces, possibly due to the predominant prevalence of male smokers in Indonesia, which amplifies their likelihood of being exposed to secondhand smoke.

Having a smoking parent was a predictor associated with secondhand smoke exposure at home and in public. The results were consistent with studies conducted in India, [29] South Korea,[25,30] Africa,[22,31] United States,[24,32,33] Malaysia,[21,34,35] Thailand,[27] and Europe.[36] Despite being significant in both settings, the odds of getting exposed were far higher at home for those with smoking parents. Home is where family members have close interactions, and the chance of getting exposed to smoking parents is high if adolescents live with their smoking parents; it is challenging to avoid such exposure. Moreover, for most Indonesians, asking parents to stop smoking is considered impolite, hindering adolescents from expressing concerns about their parents' unhealthy behavior.

Having smoking friends was also a predictor associated with all types of secondhand smoke exposure. The results correspond with studies in Africa,[9,22,31,37,38] the United States,[24,33] and Saudi Arabia.[39] In contrast to having smoking parents, the odds of getting exposed were higher in public for those with smoking friends. Adolescents who associate with peers who smoke are highly susceptible to secondhand smoke exposure. Furthermore, since adolescents frequently spend a substantial amount of time in the company of their peers, avoiding such exposure becomes a challenging task. In the context of Indonesia, smoking is deeply ingrained as a societal norm, leading non-smoking adolescents to perceive secondhand smoke exposure as routine. However, proactive measures to mitigate this issue involve educating both adolescent smokers and non-smokers about the hazards of secondhand smoke. By fostering awareness, it is anticipated that smoking adolescents will refrain from smoking in the presence of others, and non-smokers can take steps to steer clear of secondhand smoke exposure.

Knowing the dangers of secondhand smoke is a predictor associated with all types of exposure to secondhand smoke. The percentage of exposure to secondhand smoke is higher among adolescents who are aware of the dangers of secondhand smoke. The results of this study align with studies conducted in West Africa,[9,38,40] Bangladesh,[41] and India.[42] However, the results of this study contrast with other studies, such as those in Medina,[39] Africa,[43,44] India,[45,46] China,[47] and Vietnam[48] which stated that having knowledge was associated with reduced exposure to secondhand smoke. The results of this study indicate that almost all adolescents are aware of the dangers of exposure to secondhand smoke for their health, but very few take proactive action to avoid exposure to secondhand smoke as a whole. Due to this reason, there is a need for modification in providing education to avoid exposure to secondhand smoke, especially for adolescents. A good strategy is also needed to communicate the dangers of smoking to

Table 3. Results of multivariate predictors of secondhand smoke exposure among non-smoker adolescents in Indonesia (n=7,594).

Predictors	Exposure to Secondhand Smoke					
	At home			In public		
	AOR	95% CI	p	AOR	95% CI	p
Age (Years)						
<13 (ref)	1	1		1	1	
13-15	1.08	0.92 to 1.26	0.311	1.32	1.10 to 1.58	0.003**
>15	0.98	0.82 to 1.17	0.869	1.77	1.39 to 2.25	<0.001**
Gender						
Female (ref)	1	1		1	1	
Male	1.04	0.90 to 1.19	0.547	1.31	1.11 to 1.53	0.001**
Smoking parents						
No (ref)	1	1		1	1	
Yes	3.50	2.97 to 4.12	<0.001**	1.58	1.36 to 1.84	<0.001**
Smoking friends						
No (ref)	1	1		1	1	
Yes	1.50	1.30 to 1.73	<0.001**	2.16	1.85 to 2.53	<0.001**
Knowledge of SHS dangers						
No (ref)	1	1		1	1	
Yes	2.11	1.52 to 2.93	<0.001**	2.84	2.15 to 3.75	<0.001**

SHS, Secondhand Smoke; * <0.05 ** <0.01.

smokers themselves and others. Currently, social media can be considered and developed as a tool for interventions to improve behavior to avoid exposure to secondhand smoke among adolescents in Indonesia.

Conclusions

Six out of ten adolescents are exposed to secondhand smoke in public. The prevalence of exposure to secondhand smoke in adolescents is much higher in public than at home. Having parents and friends who smoke, as well as knowledge of the dangers of secondhand smoke and cigarettes, significantly increases exposure to secondhand smoke at home and in public. It is necessary to promote health regarding predictors associated with exposure to secondhand smoke in Indonesia and enhance avoidance behavior against exposure to secondhand smoke. The government must provide oversight of smoking-free regulations and disseminate these regulations to the wider community. Furthermore, researchers can explore and modify additional variables related to exposure to secondhand smoke using existing GYTS data.

Strengths and limitations

One of the key strengths of this study is its large sample size, which greatly enhances its representativeness as a national survey. With a substantial and diverse participant pool, the findings are more likely to accurately reflect the broader population's characteristics, behaviors, and attitudes, thereby bolstering the study's validity and generalizability to the entire nation.

However, a limitation of this study is that it relies on secondary data from the Global Youth Tobacco Survey (GYTS) Indonesia in 2019, while this research was conducted in 2022. Differences in adolescent characteristics may arise due to the time gap, potentially leading to variations in the results compared to the current situation. Additionally, the variables considered in this study were limited to those already existing in the results of the Global Youth Tobacco Survey (GYTS) survey.

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