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**Original Research****SMOKING AMONG ADOLESCENT MALES AT PULAU WEH,  
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**ABSTRACT**

**Background:** Use of tobacco may cause severe diseases like cardiovascular diseases and lung cancer. Smoking is a major threat to public health in many low- and middle-income countries.

**Objective:** The aim of this study is to assess the prevalence of smoking among boys in the age group 13-15 years at Pulau Weh in Indonesia, and identify factors associated with smoking.

**Methods:** A cross-sectional study was conducted of 291 male students, aged 13-15 years, in three participating secondary schools. A modified version of the Global Youth Tobacco Survey questionnaire was used to collect data. The association between active smoking within the previous 30 days, and social and demographic factors was analysed by multiple logistic regressions.

**Results:** 40.2% of the male students were habitual smokers at the time of the study. The adjusted odds of current smoking increased with increasing age (odds ratio [OR] = 5.1, 95% CI: 2.2–12.3); having a father with a university or university college education (OR = 2.7, 95% CI: 1.0–7.1); having friends who smoke (OR = 5.2, 95% CI: 1.6–16.5), having sibling who smoke (OR = 2.7, 95% CI: 1.2–6.2); having a father who smokes (OR = 2.1, 95% CI: 1.1–3.9) and attending a rural school (OR = 7.4, 95% CI: 2.8–19.6).

**Conclusions:** Cigarette smoking was found to be prevalent among 13 to 15-year-old male students in Pulau Weh, Indonesia, significantly higher in students attending a rural school compared to those attending an urban school. Indonesia should take steps to redress the smoking epidemic among adolescents by various means, e.g., minimizing access to tobacco products, stricter enforcement of tobacco control laws and changing attitudes to smoking.

**Keywords:** Indonesia, smoking, adolescents

**BACKGROUND**

There are approximately one billion smokers worldwide and nearly 80% of these live in low- and middle-income countries ([WHO, 2017](#)). According to the WHO global report ([WHO,](#)

[2018](#)), smoking prevalence among world's population aged  $\geq 15$  years declined from 24.3% to 20.2% in the period 2005 to 2015, although the number of smokers increased.

Studies since the 1950s have revealed that smoking tobacco may cause severe diseases and ([Bjartveit & Tverdal, 2005](#); [Doll & Hill, 1954, 1956, 2004](#); [Hjermerman, Helgeland, Lund-Larsen, & Leren, 1976](#); [Scanlon et al., 2000](#)) major diseases associated with tobacco use are ischemic heart diseases, stroke, lung cancers and chronic obstructive pulmonary disease.

Several studies have found associations between second-hand smoke and respiratory and cardiovascular diseases among adults ([Oberberg, Jaakkola, Woodward, Peruga, & Pruss-Ustun, 2011](#)). Parental smoking may induce the risk of lower respiratory infection and asthma in childhood ([Oberberg et al., 2011](#)).

Several scientific studies from Indonesia have explored different diseases related to smoking; including lung cancer ([Kristina, Endarti, Sendjaya, & Pramestuty, 2016](#)), cardiovascular diseases ([Sumartono, Sirait, Holy, & Thabrany, 2011](#)), child malnutrition ([Semba et al., 2007](#)), as well as the risk of child mortality ([Semba et al., 2008](#)).

Prevalence of smoking varies between countries and over time. The WHO has developed a questionnaire to monitor tobacco use among adolescents, referred to as the GYTS ([Yach et al., 2002](#)). Valid and reliable data about tobacco use are essential to make a comparison between countries, reveal trends in tobacco use, identify risk groups and evaluate programmes aimed at preventing smoking.

A review study by [Allen et al. \(2017\)](#) has shown clear evidence that the prevalence of smoking is affected by socioeconomic position.

According to Indonesia Basic Health Research ([Risksdas, 2013](#)), 29.3% of the population were daily smokers in 2013 (aged 10 years or

older). In 2016 the current smoking age-standardised prevalence for both genders was 33.9%, the proportion was 65.2% among men and 2.2% among women<sup>2</sup> (aged 15 years or older). In 2014, the WHO used the GYTS to ascertain the prevalence of smoking among Indonesian schoolchildren aged 13-15 and found that 36.2% of boys and 4.3% of girls were active smokers ([WHO, 2015](#)).

The aim of this study was to identify the prevalence of smoking among male pupils at secondary schools at Pulau Weh, Indonesia, and explore the association between active smoking, and demographic and social factors.

## METHODS

### *Setting and Study Design*

This study was conducted at Pulau Weh, in the Aceh province of Indonesia. The island had 32,739 inhabitants in 2014.

All boys in Pulau Weh between 13 and 15 years of age attend secondary school, either ordinary public schools or Quranic schools. The number of male students attending the 12 secondary schools totalled 2143.

This cross-sectional study was carried out among male pupils between the ages of 13 and 15 years in January 2017.

### *Sample/Participants*

The 12 secondary schools were classified into three categories: “Public urban school”, “Quranic school” and “Public rural school”. The largest school in each category was invited to participate and all three gave their consent. 390 male students at the three selected schools were invited to participate and 291 volunteered (Table 1). Female students were not included in this study.

**Table 1** Total Number of Participants Distributed Among the Three Schools

School	Total number	Number participating in the study	Participation (%)
Quranic school	150	91	60.7
Public urban school	192	158	82.2
Public rural school	48	42	87.5
Total	390	291	74.6

### *Instrument*

A modified version of the GYTS questionnaire (Gaffar, Alsanosy, & Mahfouz, 2013; Zhao, Palipudi, Ramanandraibe, & Asma, 2016) was used for data collection. This questionnaire has also been used in previous Indonesian studies (Aditama et al., 2008). The original questionnaire was modified to refer only to cigarette use and a question was added about the type of school attended.

The modified questionnaire includes age, religion, type of school, address, paternal and maternal education level, and the student's weekly disposable income. The questionnaire also addresses former and current smoking habits, frequency of smoking in the last 30 days, age of initiation, smoking among friends and family, influence by the mass media, smoking behaviour, and attitudes towards smoking.

### *Data Analysis*

For the purposes of this study, an active smoker is defined as someone who has smoked at least one cigarette daily, non-daily or occasionally in the past 30 days.

Data were managed and analysed using IBM SPSS Statistics 24 (SPSS, Chicago, IL, USA). Unadjusted odds ratios (OR) with 95% confidence intervals (95% CI) were calculated to measure the strength of the association between each of the categorical variables and

an "active smoker", the binary outcome variable. The variables were also analysed by multiple logistic regression, using conditional backward stepwise elimination, to estimate the adjusted association for the statistically relevant factors.

### *Ethical Consideration*

The Norwegian Centre for Research Data considered the ethical aspects of this research study. No approval was required because neither direct nor indirect identifying personal data were registered.

The Head of the Education Agency in the Pulau Weh Municipality and the principals of all three schools, granted authorization in December 2016. Informed consent to participate in the study was obtained from parents of the participants and participants were allowed to withdraw at any point during the study.

## **RESULTS**

Most participants were 13 or 14 years old. 95.5% were Muslim and most had parents who had attended higher education. Table 2 gives background information about the study sample.

**Table 2** Characteristics of the Study Group

Variable	Value	Number	Percent (%)
Age (N=291)	13 years old	130	44.7
	14 years old	113	38.8
	15 years old	48	16.5
Religion (N=291)	Muslim	278	95.5
	Another religion	13	4.5
Place of living (N=290)	Town	226	77.9
	Rural	64	22.1
How much money can you freely spend in a week? (N=291)	Less than 10.000 IDR	132	45.4
	10.000 to 20.000 IDR	82	28.2
	More than 20.000 IDR	77	26.5
Education of the father (N=291)	No education, primary school or secondary school	54	18.6
	High School	143	49.1
	University college/University	79	27.1
Education of the mother (N=291)	No education, primary school or secondary school	64	21.9
	High School	133	45.7
	University college/University	81	27.8

40.2% were active smokers and 14.5% had smoked earlier. Table 3 shows the smoking habits of the active smokers. 87.9% of the

active smokers smoked elsewhere rather than at home or in school. 73.5% of smokers bought their cigarettes in local kiosks.

**Table 3** Smoking Habits Among Active Smokers in Secondary Schools at Pulau Weh

Variable	Value	Number of active smokers	Percent (%) of active smokers
Where do you smoke? (N=116)	At the school	1	0.9
	At home	6	5.2
	Other places	102	87.9
	More than one answer	7	6.0
With whom do you smoke? (N=113)	Together with the family	2	1.8
	Together with close friends	68	60.2
	Together with other persons	28	24.8
	More than one answer (friends and other)	15	13.3
How do you become money to buy smoke? (N=114)	From family	19	16.7
	Working myself	14	12.3
	From my bank account	0	0.0
	From friends	35	30.7
	I smoke, but I did not buy cigarettes	24	21.1
	Other	7	6.1
Where do you buy your cigarettes? (N=102)	More than one answer		13.2
	In the shop	6	5.9
	In the kiosk	75	73.5
	Other	21	20.6

96.1% reported that they knew smoking could be dangerous to their health, and 59.9% answered that they had received information on smoking and health risks during the previous 12 months at school. 80.5% had seen information about health on cigarette packets and 35.8% reported that these health warnings deterred them from taking up smoking or made them consider quitting. 73.2% of all participants had close relatives who smoked and 85.5% of all participants had close friends who smoked.

The proportion of smokers increased with age in the group studied. 69.0% of participants attending the rural public school were active smokers, whereas 34.8% and 36.3% of those in the two urban schools were active smokers. As can be seen in Table 4, 56.3% of participants living in rural areas smoked, compared with 35.8% of participants living in the town. 45.1% of participants had friends who smoked.

**Table 4** Unadjusted and adjusted risk of active smoking by individual background variables and social influence factors using logistic regression analysis. (Odds ratios with 95% confidence intervals.)

Variable	Value (number responding)	Number and % of active smokers	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Age	12-13 (N=130)	39 (30%)	1	1
	14 (N=113)	46 (40.7%)	1.6 (0.9-2.7)	1.3 (0.7-2.4)
	15-16 (N=48)	32 (66.7%)	4.7 (2.3-9.5) *	5.1 (2.2-12.3) *

**Table 4** Unadjusted and adjusted risk of active smoking by individual background variables and social influence factors using logistic regression analysis. (Odds ratios with 95% confidence intervals.) Cont.

Variable	Value (number responding)	Number and % of active smokers	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Religion	Muslim (N=278)	115 (41.4%)	1	-
	Another religion (N=13)	3 (15.4%)	0.3 (0.1-1.2)	-
Type of school	Public school in the town (N=158)	55 (34.8%)	1	1
	Quranic school (N=91)	33 (36.3%)	1.1 (0.6-1.8)	1.2 (0.6-2.4)
	Public school in a rural area (N=42)	29 (69%)	4.2 (2.0-8.7) *	7.4 (2.8-19.6) *
Place of living	Town (N=226)	81 (35.8%)	1	-
	Rural (N=64)	36 (56.3%)	2.3 (1.3-4.0) *	-
Education of the father	No education, primary school or secondary school (N=54)	32 (51.9%)	1	1
	High School (N=143)	54 (37.8%)	0.6 (0.3-1.1)	1.6 (0.7-3.6)
	University	28 (40.5%)	0.6 (0.3-1.2)	2.7 (1.0-7.1) *
	college/University (N=81)			
How much money can you freely spend in a week?	Less than 10.000 IDR (N=132)	62 (47.0)	1	-
	10.000 to 20.000 IDR (N=82)	27 (32.9%)	0.6 (0.3-1.0) *	-
	More than 20.000 IDR (N=77)	28 (36.4%)	0.6 (0.4-1.2)	-
Influence by close related persons who smoke	Friends do not smoke (N=40)	5 (12.5%)	1	1
	Friends smoke (N=235)	106 (45.1%)	5.3 (2.0-14.1) *	5.2 (1.6-16.5) *
	Father do not smoke (N=106)	30 (28.3%)	1	1
	Father smoke (N=175)	87 (47.0%)	2.2 (1.3-3.8) *	2.1 (1.1-3.9) *
	Sibling do not smoke (N=254)	95 (37.4%)	1	1
	Sibling smoke (N=37)	22 (59.5%)	2.5 (1.1-5.4) *	2.7 (1.2-6.2) *
	Grandfather do not smoke (N=260)	105 (40.4%)	1	1
	Grandfather smoke (N=31)	22 (71.0%)	0.8 (0.3-1.8)	-
Influence by advertising in mass media	Have not seen any advertising (N=58)	21 (36.2%)	1	-
	Have seen tobacco advertising (N=215)	81 (37.7%)	1.1 (0.6-2.0)	-
Influence by advertising in stores or kiosks	Have not seen any tobacco advertising (N=158)	48 (30.4%)	1	-
	Have seen tobacco advertising (N=131)	58 (44.3%)	1.6 (1.0-2.6) *	-
Constant				0.2

Note: R<sup>2</sup>= 0.20 (Cox & Snell) 0.28 (Nagelkerke). Model  $\chi^2=60.2$ , p < 0.000

Note: \* = p<0.05 and 1 = reference category

Table 4 also shows the adjusted risk of active smoking by background and social factors. Factors associated with an increased risk of active smoking are expressed as OR (95% CI): “the pupil’s age” 5.1 (2.2-12.3); “belonging to the rural public school” 7.4 (2.8-19.6); “high

education of the father” 2.7 (1.0-7.1); “having friends who smoke” 5.2 (1.6-16.5); “having a father who smokes” 2.1 (1.1-3.9) and “having sibling who smoke” 2.7 (1.2-6.2).

## DISCUSSION

### Statement of principal findings

Forty percent of male students between 13 and 15 years old in Sabang, Indonesia, were current smokers. Most smoked with friends and were able to purchase single cigarettes in local kiosks. Factors found to be positively associated with a smoking habit are age, attending a rural public school, a highly educated father, and a father, sibling or friends who also smoke. Disposable income or advertisements in the mass media or at the kiosk/store have not been found to be associated with smoking.

### Strengths and weaknesses of the study, discussing important differences in results in relation to other studies

The Global Youth Tobacco Survey (GYTS) has been developed to collect information about tobacco use among youths in many countries ([Yach et al., 2002](#)). The survey uses a standardized questionnaire and results may be compared within a country as well as between countries.

The GYTS study in Indonesia, completed in 2014, found that 33.9% (95% CI 26.1-42.7) of boys smoked in the age group 13-15. The corresponding finding in the study presented here is 40.2%, which is within the 95% CI of the GYTS study.

Comparison of data from this study with neighbouring countries, indicates a lower prevalence of active smokers among young male adolescents aged 13-15 years, in places such as Vietnam (15.4%) ([Giang et al., 2016](#)) and Malaysia (27.9%) ([Lim et al., 2017](#)). Comparison of the prevalence of current smoking among 13 to 15-year-old boys in 61 countries, using GYTS, reveals a figure of 20.7% in Thailand, 20.5% in the Philippines and 6.3% in Vietnam ([Arrazola et al., 2017](#)).

In a cross-sectional study of 15 to 17-year-old students in Java, Indonesia, 29.6 % were current smokers ([Bigwanto, Mongkolcharti, Peltzer, & Laosee, 2017](#)). Of the male students, 55.6% were current smokers. However, the mean age

of the study population was 16.4 years, as compared to 13.7 years in the study being presented here. When examining the incidence of smoking among youths, distribution of ages in the study group is of great importance in determining the prevalence of smokers. Analysis has shown that increased age is positively associated with smoking. This result is in accordance with results from the Indonesian GYTS ([WHO, 2015](#)). 66.7% of the 15-year-old boys were active smokers. However, most of the 13 to 15-year-old boys were not yet heavy smokers. These findings highlight the pressing need to prevent youngsters from taking up smoking, with an emphasis on effective tobacco cessation interventions focusing on males between 13 and 15 years old.

In earlier studies, religion has been found to deter individuals from smoking ([Lim et al., 2017](#)). In the study presented here, 95.5% of the population were Muslims, but the prevalence of smoking remained high. A more detailed analysis of the association between religion and active smoking has not been feasible due to the small number of non-Muslim participants.

This study has found that the odds of being an active smoker are 7.4 times higher among students at the public rural school, as compared to the public school in town. Rural residency may be a risk factor for tobacco use among adolescents ([Bigwanto et al., 2017](#); [Lutfiyya et al., 2008](#)). In a study of the Jazan region in Saudi Arabia, no difference in smoking prevalence was found between urban and rural living, but a lower prevalence of smoking, compared to other regions in Saudi Arabia, was explained by large rural areas having increased control from the family ([Gaffar et al., 2013](#)).

Most participants in this study had relatives or close friends who also smoked, potentially exposing them to second-hand smoke. These results are in accordance with findings of the Indonesian GYTS report ([WHO, 2015](#)), which revealed that 57.3% were exposed to smoke in their homes while 60.1% were exposed to second-hand smoke in enclosed public places. In a review article by [Oberge et al. \(2011\)](#), 40%

of children were found to have been exposed to second-hand smoke worldwide.

Pulau Weh is an island with a defined population and the study was conducted over a short period. Furthermore, the study used a validated questionnaire. With a response rate of 74.6 %, the results are believed to provide reliable information on smoking prevalence among young boys in Pulau Weh. The higher prevalence in the rural school suggests that future assessments perhaps should include more than one rural school in the sampling, and underscores the importance of proportional sampling between rural and urban areas to obtain a good prevalence estimate.

The cross-section design has a weaker scientific design than the RTC design. However, it may be a useful tool for recording the prevalence of smoking in the population and may focus on the impact of smoking on public health. This may also prompt interventions, aimed at smoking prevention or smoking cessation, at a societal level. Indeed, a school-based education programme focusing on smoking prevention has been implemented in the Aceh province of Indonesia.

#### **Meaning of the study: possible explanations and implications for policymakers**

This cross-sectional study may have implications for policymakers' work on reducing the incidence of smoking among male adolescents.

In the GYTS 2014 report ([WHO, 2015](#)), the Minister for Health in the Republic of Indonesia stated the need for proactive and sustained tobacco control efforts. Interventions guarding against the use of tobacco could be implemented by various legislative means. Given that most smokers in this study bought single cigarettes from kiosks, a ban on selling single cigarettes may effectively contribute to a reduction in the prevalence of smoking among male adolescents. Moreover, stricter controls and sanctions for kiosks that violate cigarette sales regulations will also reduce the availability of cigarettes for this age group

Indonesian tobacco companies use, among others, small retail outlets to advertise tobacco products ([WHO, 2012](#)). At Pulau Weh, tobacco product advertisements are visible in many places, especially the kiosks where adolescents buy their single cigarettes. The multivariate analysis in this study has not confirmed the influence of advertising on smoking status. However, other studies have found that a ban on tobacco advertising and promotion may reduce the exposure of adolescents to tobacco products ([Long et al., 2016](#); [WHO, 2017](#)). Indonesia needs to make a concerted effort to halt the smoking epidemic among adolescents by measures which could include the banning of cigarette marketing aimed at adolescents.

#### **Unanswered questions and future research**

Future research into smoking among youths in Indonesia should quantify the varying impact of rural versus urban housing, religion, social inequality and cultural differences. Smoking among male youths in Indonesia is widespread and will lead to major health concerns for individuals and society in the future. Further research should include assessment of the efficacy of different adolescent anti-smoking interventions at a societal level.

## **CONCLUSION**

At Pulau Weh in Indonesia, more than a third of boys in the 13-15 age group were found to smoke. Increasing age, and the influence of friends, sibling and father who smoke were found to constitute risk factors in habitual smoking. Furthermore, attending a rural school rather than an urban school, was a high-risk factor. These findings emphasize the need for urgent, effective action to reduce cigarette use among young males on both an individual and social level.

#### **Competing interests**

The authors declare that they have no competing interests.

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## Authors' contributions

KRS and SH were responsible for designing the study, analysing the data and writing the first drafts. SH was responsible for organizing and conducting data retrieval at Pulau Weh, Indonesia. AV had input into design of the study, the analysis plan and interpretation of the results. All three authors contributed to the writing of the final manuscript.

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