Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.00159

RESEARCH ARTICLE

Analysis Of Risk And Protective Factors Of Smoking Behaviour Among Adolescents In Pelitakan Health Centre Working Area, Tapango Sub-District, Polewali Mandar District

Diah Pithaloka Sumarna[1] , Muhammad Arsyad[1], Sudirman Nasir[1], Muhammad Syafar[1], Ridwan Amiruddin[2], Masni[3]

[1] Department of Health Promotion, Faculty of Public Health, Hasanuddin University
[2] Department of Epidemiology, Faculty of Public Health, Hasanuddin University
[3] Department of Health Reproduction, Faculty of Public Health, Hasanuddin University

ARTICLE INFO

Received: Oct 2, 2024

Accepted: Dec 8, 2024

Keywords

Smoking

Teenagers

Health

Environment

Risk

***Corresponding Author**

ABSTRACT

Smoking has a significant impact on health and economy, especially in Indonesia with the highest number of active smokers in Southeast Asia. Adolescents are a vulnerable group with an increasing prevalence of smoking, influenced by various factors. To analyse and explore the risk factors and protective factors of smoking behaviour of school adolescents in the Pelitakan Health Centre Working Area, Tapango District, Polewali Mandar Regency. This study used a mixed method with a sequential explanatory design, starting with quantitative data collection through a case control design conducted in the work area of UPTD Puskesmas Pelitakan, Tapango District, Polewali Mandar Regency, with a sample of 95 respondents and eight qualitative informants, using CTC-YS and GYTS-based instruments that have been tested for validity and reliability. Family environment, peers, and cigarette accessibility had significant associations with smoking behaviour of school adolescents. A negative family environment increased the risk of smoking by 10.5 times (ρ = 0.000; OR = 10.500; 95% CI = 3.078-35.824), while a negative peer environment increased the risk by 7.7 times (ρ = 0.002; OR = 7.742; 95% CI = 2.078-28.844). Easy accessibility of cigarettes was the largest risk factor, increasing the odds of smoking by 14.57 times (ρ = 0.003; OR = 14.57; 95% CI = 1.850-114.764), and had the most dominant influence with the highest OR (45.711). In contrast, school environment and exposure to cigarette advertisements did not show a significant relationship to adolescent smoking behaviour. Family, peers, and cigarette accessibility play important roles in preventing adolescent smoking behaviour. Interventions that focus on these factors are needed to reduce the prevalence of smoking among adolescents.

INTRODUCTION

Smoking behaviour is a public health concern due to its wide-ranging health and economic impacts. According to WHO (2023), cigarettes kill 8 million people every year, with more than 6 million being active smokers. Indonesia ranks first in Southeast Asia with 65.7 million active smokers (SEATCA, 2021). Smoking prevalence continues to increase, reaching 69.1 million adult smokers in 2021 (WHO, 2022). Tobacco consumption in Indonesia has a significant impact on stunting, health costs, and poverty, with economic losses due to smoking reaching IDR 184.36-Rp 410.76 trillion in 2019 (Pajarianto et al., 2022).

Adolescents are a vulnerable group with a high prevalence of smoking. The 2018 Basic Health Research (Riskesdas) recorded an increase in smoking prevalence among 10-18 year olds by 1.9%, from 7.2% in 2013 to 9.1% in 2018 (Ministry of Health, 2018). More than 30% of adolescents tried

smoking before the age of 13 (Directorate General of Public Health, 2018). This behaviour increases the risk of nicotine addiction and smoking-related diseases (Trimuryani & Eryando, 2022). The Global Youth Tobacco Survey (GYTS) also reported that 19.2% of students in Indonesia currently use tobacco, with the highest prevalence among adolescent boys (WHO, 2021).

Risk factors for adolescent smoking behaviour include intrapersonal and environmental aspects. Psychosocially, adolescents are in a phase of self-discovery, making them vulnerable to peer group pressure (Mirnawati et al., 2018). Friends who smoke increase the risk to 5.28 times to smoke (Harsanti & Wicaksono, 2017). The family environment also has a big influence. Children with smoking parents have a 1.24 times higher risk of smoking (Jamal et al., 2020). In addition, easy access to cigarettes, both through friends and sellers, is a significant factor. Adolescents who can access cigarettes have a 4.017 times greater risk of smoking compared to those who do not have access (Muslim et al., 2023).

In addition to risk factors, there are also protective factors that play a role in preventing smoking behaviour. The role of parents who apply firm rules and show affection is an important protector. Positive parenting styles reduce the likelihood of smoking in adolescents (Suharyanta et al., 2018). Peer support that does not smoke also increases the chances of adolescents to stay away from this behaviour (Agustin et al., 2019). In addition, a policy of refusing to sell cigarettes to adolescents can encourage them to quit or not start smoking (Wulandari et al., 2023).

Exposure to cigarette advertising plays an important role in increasing smoking prevalence, especially among adolescents. Attractive advertisements that promote positive images of cigarettes often influence adolescents' perceptions of smoking as normal or even beneficial (Marita & Yansyah, 2023). However, advertising restrictions and the implementation of Smokefree Areas (KTR) have proven effective in reducing smoking prevalence. Campaigns on the dangers of smoking and information conveyed through the media also increase public awareness, including adolescents, about the risks of smoking, and are able to prevent thousands of adolescents from starting the habit (Riyadi, 2021; Duke et al., 2019 In Agustin et al., 2019).

The effectiveness of this policy is important in areas with high smoking prevalence, such as Polewali Mandar District, West Sulawesi. Based on the 2018 Basic Health Research (Riskesdas), the proportion of smokers in the region reached 24.87% for the population aged ≥10 years (MOH RI, 2019). Despite the existence of Regional Regulation No. 4/2015 on KTR, survey data from the Healthy Indonesia Programme with a Family Approach (PISPK) 2023 showed that 44.35% of families in Polewali Mandar still have members who smoke, even in Tapango District the figure reached 52.46% (UPTD Puskesmas Pelitakan, 2023). This high prevalence is partly due to the increasing number of novice smokers, where 75.66% of smokers in West Sulawesi started smoking at the age of 10-19 years (Riskesdas, 2018).

This study aims to analyse the risk and protective factors that influence the smoking behaviour of school adolescents in the Pelitakan Puskesmas working area. By understanding these factors, more effective primary prevention strategies can be designed, including through increasing the role of family and peers, limiting access to cigarettes, and strengthening the implementation of KTR policies. Family, school and government policy-based interventions are expected to protect young people from the dangers of smoking more comprehensively.

METHODOLOGY

This research methodology uses a mixed methods research approach with an explanatory sequential design. The study began with quantitative data collection through a case control design to determine risk and protective factors for adolescent smoking behaviour. Furthermore, qualitative data collection was conducted to explore in-depth information related to significant factors based on the results of quantitative analysis. The study was conducted from August to September 2024 at the junior high school (SMP) in the working area of UPTD Puskesmas Pelitakan, Tapango District, Polewali Mandar Regency.

The study population included all junior high school adolescents in the area. The sample was determined using purposive sampling with a total of 95 respondents, consisting of 19 cases (smoking adolescents) and 76 controls (non-smoking adolescents), with a ratio of 1:4. Inclusion criteria included active student status, willingness to participate, and completion of the questionnaire, while exclusion criteria included students who dropped out of school or refused to participate. Qualitative data were collected from 8 informants, consisting of 4 smoking and 4 non-smoking adolescents who were randomly selected.

The quantitative research instruments were questionnaires based on the *Community That Care - Youth Survey* (CTC-YS) and *the Global Youth Tobacco Survey* (GYTS), which were adapted according to the needs of the study. The qualitative research instrument was an interview guide based on risk and protective factors. The validity and reliability of the questionnaire were tested using SPSS. The validity test involved 30 respondents outside the main population, while the reliability test showed a Cronbach Alpha value of 0.862, indicating high reliability.

Primary data were collected through questionnaires and in-depth interviews. Secondary data were obtained from relevant agencies, including the local health office and education office. Quantitative data analysis included univariate, bivariate and multivariate analyses using SPSS. Qualitative analysis was conducted by coding interview results and compiling in-depth narratives. Data presentation was done in the form of tables for quantitative data and narratives for qualitative data. This study received ethical approval from the Ethics Committee of the Faculty of Public Health, Hasanuddin University.

RESULTS AND DISCUSSION

RESULTS

This study was conducted in four public junior high schools in the Pelitakan Health Centre working area, with 292 school adolescents who participated in smoking screening. The screening results showed that 21.6% of school adolescents had tried smoking, and 8.6% had smoked in the past month. Most of the school adolescents were from SMP Negeri 4 Wonomulyo (33.2%) and the highest age was 14 years old (30.8%). The number of males and females involved in the screening was equal at 50%. The majority of adolescents were in grade 9 (43.8%). These data provided an important insight into the prevalence of smoking and associated factors, which formed the basis of sample selection for further research. The sample consisted of 19 cases and 76 controls, who were then administered questionnaires for further data collection (Table 1).

Table 1 Frequency Distribution of Respondent Characteristics Based on Smoking Screening Results in School Adolescents in the Pelitakan Health Centre Working Area, Tapango District

No.	Respondent Characteristics	N	%
1	**Ever Smoked**		
	Yes	63	21.6
	No	229	78.4
	Total	**292**	**100**
2	**Smoking Status**		
	Yes	25	8.6
	No	267	91.4
	Total	**292**	**100**
3	**Age at First Smoking Attempt**		
	Never been	229	78.4
	< 10 years	16	5.5
	10 Years	7	2.4
	11 Years	9	3.1

	12 Years	6	2.1
	13 Years	13	4.5
	14 Years	12	4.1
	Total	**292**	**100**
4	**School origin**		
	SMPN 3 Tapango	76	26.0
	SMPN 4 Wonomulyo	97	33.2
	Batu Junior High School	39	13.4
	SMPN Rappang	80	27.4
	Total	**292**	**100**
5	**Gender**		
	Male	146	50
	Women	146	50
	Total	**292**	**100**
6	**Age**		
	11	1	0.3
	12	65	22.3
	13	70	24.0
	14	90	30.8
	15	61	20.9
	16	7	1.7
	Total	**292**	**100**
7	**Class**		
	7	95	32.5
	8	69	23.6
	9	128	43.8
	Total	**292**	**100**

Table 2 Frequency Distribution and Relationship between Environment and Smoking Behaviour of School Adolescents in the Pelitakan Health Centre Working Area

Family Environment	**Case**		**Control**		**P-Value**	**OR**	**95% CI**
	N	**%**	**N**	**%**			
Negative	9	47.4	6	7.9	0	10.5	3.078 - 35.824
Positive	10	52.6	70	92.1			
Total	**19**	**100**	**76**	**100**			
School Environment	**Case**		**Control**		**P-Value**	**OR**	**95% CI**
	N	**%**	**N**	**%**			
Negative	4	21.1	5	6.6	0,075	3.787	0.908 - 15.790
Positive	15	78.9	71	93.4			
Total	**19**	**100**	**76**	**100**			
Peer Environment	**Case**		**Control**		**P-Value**	**OR**	**95% CI**
	N	**%**	**N**	**%**			
Negative	16	84.2	31	40.8	0.002	7.742	2.078 - 28.844
Positive	3	15.8	45	59.2			
Total	**19**	**100**	**76**	**100**			
Cigarette Accessibility	**Case**		**Control**		**P-Value**	**OR**	**95% CI**
	N	**%**	**N**	**%**			
Easy	18	94,7	42	55.3	0.003	14.57	1.850 - 114.764
Difficult	1	5.3	34	44.7			
Total	**19**	**100**	**76**	**100**			
Cigarette Advertising Exposure	**Case**		**Control**		**P-Value**	**OR**	**95% CI**
	N	**%**	**N**	**%**			
High	7	36.8	23	30.3			
Low	12	63.2	53	69.7	0.783	1.344	0.469 - 3.852

Total	**19**	**100**	**76**	**100**			

Based on Table 2, several environmental factors influence the smoking behaviour of school adolescents. In the family environment, a higher proportion of cases came from families with a negative environment (47.4%) than the control group (7.9%) with a p-value of 0.0105 indicating that a negative family environment was a significant risk for smoking behaviour. In the school environment, although more cases were in schools with a positive environment (78.9%), the p-value was 0.075 indicating that this relationship was not significant.

Peer environment had a significant influence, with 84.2% of cases being in a negative peer environment, compared to 40.8% in the control group with a p-value of 0.002 indicating that peers with smoking behaviour increase the risk of adolescent smoking. Cigarette accessibility also plays an important role, where 94.7% of cases had easy access to cigarettes, compared to 55.3% in the control group, with a p-value of 0.003 indicating that easy access to cigarettes is a high risk factor. Lastly, although exposure to cigarette advertising was higher in the case group, the p-value was 0.783 (p 0.05), meaning there was no significant association between exposure to cigarette advertising and smoking behaviour.

Table 31 Results of Multivariate Analysis Environmental Relationship with Smoking Behaviour of School Adolescents in the Pelitakan Puskesmas Working Area

Independent Variable	**β**	**ρ value**	**Exp(β)**	**Confidence Interval (CI) 95%**	
				Lower	**Upper**
Family Environment	2.966	0.002	19.416	2.903	129.858
Peer Environment	2.012	0.014	7.476	1.515	36.896
Cigarette Accessibility	3.822	0.004	45.711	3.289	635.260
School Environment	-0.809	0.468	0.445	0.050	3.965
Constant	-9.555				
Hosmer and Lameshow Test:				ρ value = 0.981	
Nagelkerke R Square:				0.507	

Table 3 shows that the factors that significantly influence adolescent smoking behaviour are family environment, peers, and cigarette accessibility, with school environment as a confounding variable. The Hosmer and Lemeshow test results show a value of ρ = 0.981 (ρ > 0.05), which indicates that this logistic regression model can explain the data well. Nagelkerke R Square of 0.507 indicates that 50.7% of adolescent smoking behaviour can be explained by factors of family environment, peers, and cigarette accessibility, while the rest is influenced by other factors. Cigarette accessibility was the most dominant risk factor with OR = 45.711 (95% CI: 3,289-635,260), meaning that adolescents with easy access to cigarettes were 45.7 times more likely to smoke than those with difficult access to cigarettes. In addition, family and peer environment also had a significant effect, with OR values of 19.416 (95% CI: 2.903-129.858) and 7.476 (95% CI: 1.515-36.896) respectively, indicating that both contributed to adolescent smoking behaviour.

Table 4 Informant Characteristics

No.	**Informant code**	**Age (Thn)**		**Gender**	**SS**	**FE**	**SE**	**PE**	**CA**	**AE**
1	R.1	15		Male	Yes	Positive	Positive	Negative	Easy	High
2	R.2	15		Male	Yes	Negative	Negative	Negative	Easy	High
3	R.3	15		Male	Yes	Negative	Negative	Negative	Easy	High
4	R.4	13		Male	Yes	Negative	Positive	Negative	Easy	High

No.	Informant code	Age (Thn)		Gender	SS	FE	SE	PE	CA	AE
5	R.5	15		Male	No	Positive	Positive	Negative	Easy	Low
6	R.6	15		Male	No	Positive	Positive	Negative	Difficult	Low
7	R.7	14		Male	No	Positive	Positive	Negative	Easy	Low
8	R.8	12		Male	No	Positive	Negative	Negative	Easy	Low

SS= Smoking status, FE= Family environment, SE= School environment, PE = Peer environment
CA = Cigarette accessibility, AE = Advertising exposure.

Based on interviews with the eight informants, it was found that adolescent smoking behaviour is influenced by family environment, peers, and cigarette accessibility, while school environment and exposure to cigarette advertisements did not show a significant relationship.

School Adolescent Smoking Behaviour where the majority of informants tried smoking for the first time at the age of 12-13 years. They were influenced by the behaviour of family, relatives or friends. Informants who smoked revealed:

> *"...Nothing (taught), my own desire. At first I tried it . I was alone at home. I used cigarettes that I bought myself. I wanted to try it because I saw many friends smoking. There are friends, fathers, and my brother (smoking)..."* ***(R.1, 15 years).***

Meanwhile, informants who do not smoke refrain from smoking because of parental rules or health reasons, for example in preparation for entering an official school.

Family environment, it is known that parents tend to prohibit smoking in adolescence but allow it as an adult. This affects children's perceptions, as explained by the informant:

> *"... I was prohibited from smoking, my parents just said don't smoke first, you can smoke later when you know how to earn money, because you can steal if you don't have money (to buy cigarettes). No (parents don't know). Ouch, I'll get scolded. If my parents know that I smoke, they might just scold me, because I have money from the pocket money that I collect..."* ***(R.2, 15 years old)***.

Good relationships and effective communication between parents and children can prevent smoking behaviour.

The school environment provides positive activities, although not all students are interested in joining. Informants stated that there is a no-smoking rule at school, but teacher smoking behaviour still occurs:

> *"...Yes ma'am (I go to school regularly). I plan to go to SMK, majoring in computers. There are people who smoke at school, I usually see the teacher. For students, only that one time when someone was caught smoking at school. There is (a ban on smoking in school). During the ceremony, the rule of not smoking in the school environment is conveyed. Maybe parents are called...".* ***(R.6, 15 years old).***

Peer environment, where friends who smoke tend to invite or teach smoking, while friends who do not smoke provide a neutral influence. One informant explained:

> *"...my friend taught me to smoke. He told me to just smoke. I usually hang out, chat, and smoke with friends around the house in front of the stall. I have five friends who smoke. There are also friends who don't smoke. They hang out and chat together too. Never (shunned by friends who don't smoke) ...."* ***(R.3, 15 years old).***

Conversely, friends who oppose smoking are perceived as providing alternative views. **Accessibility Cigarettes** are easily available at stalls without age restrictions, at affordable prices. One informant said:

> *"... I usually buy (cigarettes), or my friends and my brother give them to me. I buy per pack, for me and my brother. I also sometimes ask my brother. Sometimes I buy with my own money. Yes, I usually go to work if someone invites me, and I usually get paid Rp100,000. I use the money to buy cheap cigarettes that cost Rp13,000. There are no sellers who refuse"* ***(R.1, 15 years old).***

This availability shows the weak enforcement of age restrictions on cigarette buyers. **Exposure** to **Cigarette Advertisements** where the majority of informants rarely see cigarette advertisements, but are often exposed to smoking behaviour on social media. One informant said:

> *"...I never see cigarette adverts. I also rarely see people smoking on TV and on the internet. I have seen the words children under 18 years old are prohibited from smoking on cigarette packets. The danger of smoking can take lives, I've seen it on cigarette packets. I also saw a person with a hole here (pointing to the neck), I was immediately afraid..."* ***(R.8, 12 years old).***

DISCUSSION

The results showed that the family environment is a very significant factor in influencing the smoking behaviour of school adolescents. A negative family environment, such as parents who smoke and lack of supervision and communication between parents and children, increases the risk of smoking behaviour by 10.5 times (Zubaidillah, 2018; Harsanti & Wicaksono, 2017). In-depth interviews revealed that adolescents who smoke are often exposed to smoking behaviour in the home environment. In fact, some informants mentioned that they first tried smoking because they saw their parents smoking. Parents' permissive attitude towards smoking behaviour, especially after adolescents reach a certain age or have their own income, contributes to the perception that smoking is normal (Lia & Putri, 2019). This shows the importance of the family's role in creating an environment that supports healthy behaviour.

The school environment showed no significant association with adolescent smoking behaviour despite exposure to smoking behaviour from teachers and school staff. The no-smoking rule in schools with strict sanctions seems to be effective in controlling students' behaviour, although it does not completely eliminate the exposure. This study found that some teachers and staff still smoked in the school area, but this factor was not enough to significantly influence students' behaviour. Instead, students' involvement in prosocial activities and high commitment to school were important protective factors, as confirmed by previous research (Alamsyah et al., 2017).

Peer environment is another significant risk factor, where adolescents with smoking peers have up to 7.7 times greater risk of smoking compared to those with non-smoking friends (Agustin et al., 2019). Interviews showed that adolescents are often offered cigarettes by peers or influenced by friends who smoke. Moral support from peers who smoke creates social pressure to try cigarettes. However, adolescents who have peers who do not smoke or who actively reject smoking behaviour tend to be protected from the habit (Nurlela & Pranoto, 2024).

Accessibility of cigarettes is also a significant risk factor. Adolescents with easy access to cigarettes have a 14.57 times greater risk of smoking. The availability of cigarettes in stalls around the house or school, affordable prices, and lack of supervision of cigarette sales to minors are the main causes (Nadzifah et al., 2023). Interviews showed that adolescents often buy cigarettes at retail, and some even get cigarettes from family members or friends. This factor is reinforced by the lack of implementation of regulations prohibiting the sale of cigarettes to children under a certain age.

Exposure to cigarette advertisements, both pro-smoking and anti-smoking, did not show a significant association with adolescent smoking behaviour in this study. Although most respondents were exposed to pro-smoking advertisements, the high exposure to anti-smoking advertisements that educate about the dangers of smoking appears to be a protective factor. Informants reported that

health warnings on cigarette packs had a stronger impact than pro-smoking adverts in the media (Fadhila et al., 2022). However, the need for stricter enforcement of cigarette advertising restrictions remains a challenge to ensure these positive effects are maximised.

This study confirms the importance of a holistic approach in addressing adolescent smoking behaviour. Family environment, peers, schools, and accessibility of cigarettes need to be addressed comprehensively. Family-based interventions that encourage communication and supervision, strengthening the No Smoking Area (KTR) policy in schools, as well as strict enforcement of regulations related to the accessibility and advertising of cigarettes can be a strategic step. In addition, efforts to educate adolescents about the dangers of smoking through mass media and prosocial programmes in schools need to be developed. These interventions are not only effective in reducing smoking rates among adolescents but also in building a healthier generation that is free from the negative influence of smoking.

CONCLUSIONS

Based on the results of the study, it was found that negative family environment was significantly associated with smoking behaviour of school adolescents, increasing the risk of smoking compared to positive family environment. There was no significant relationship between school environment and smoking behaviour. Negative peer environment was also significantly associated, where adolescents with negative peers were more at risk of smoking. Easy accessibility of cigarettes also increased the risk of smoking behaviour of school adolescents. However, exposure to cigarette advertisements did not show a significant association with smoking behaviour. Of all the variables, cigarette accessibility was the most influential factor on school adolescents' smoking behaviour.

LIMITATIONS OF THE STUDY

The use of a case control design has limitations in establishing the temporal relationship between risk/protective factors and adolescent school smoking behaviour, making it difficult to infer a causal relationship between the two. The relatively small sample size resulted in instability of parameter estimates, characterised by wider confidence intervals. Although this study has identified several risk factors associated with smoking behaviour, there are still other possible factors that may influence the smoking behaviour of school adolescents. These include variables from the individual domain such as the social skills of school adolescents, and social environment variables that are more specific to the social environment examined in this study.

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