

ANALYSIS OF FACTORS ASSOCIATED WITH SMOKING BEHAVIOR IN HEALTH STUDENTS AT THE UNIVERSITY OF MUHAMMADIYAH JAKARTA

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Abstract

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Smoking behavior among health sciences students remains a public health concern influenced by various internal and external factors, and this study aimed to analyze the factors associated with smoking behavior among health sciences students at Universitas Muhammadiyah Jakarta through a quantitative cross-sectional study among 130 male health sciences students at UMJ selected using accidental sampling, with data collected using a validated and reliable online questionnaire (Google Form) and analyzed using the Chi-Square and Fisher's Exact tests. The results showed that a total of 79.2% of respondents were active smokers, with no significant association found between knowledge ($p=0.374$), attitude ($p=0.074$), availability of facilities and infrastructure ($p=0.708$), or the role of social media ($p=0.942$) and smoking behavior, while peer interaction ($p=0.003$) and family factors ($p=0.031$) showed significant associations, leading to the conclusion that peer interaction and family factors were significantly associated with smoking behavior among health sciences students, while knowledge, attitude, availability of facilities and infrastructure, and the role of social media were not

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INTRODUCTION

Global tobacco use has declined from 1.38 billion users in 2000 to 1.2 billion in 2024; however, approximately one in five adults still uses tobacco, accompanied by challenges from new nicotine products such as electronic cigarettes, with more than 100 million users worldwide (WHO, 2025a). In Indonesia, the 2023 Indonesian Health Survey recorded approximately 70 million active smokers, with 7.4% aged 10–18 years (Kemenkes RI, 2024), indicating that smoking behavior begins during adolescence and



that the age of initiation is becoming increasingly younger (Aulya et al., 2022), thereby increasing the risk of non-communicable diseases and the economic burden on the healthcare system (Muizzah & Effendi, 2025).

University students are in a developmental transition characterized by increasing social, academic, and emotional demands. Some may use cigarettes as a means of coping with stress or enhancing self-confidence, reinforced by peer pressure and permissive environments (Wardani et al., 2025). Smoking behavior can be explained through predisposing factors, such as knowledge and attitudes; enabling factors, such as facilities and infrastructure; and reinforcing factors, such as peers, family, and social media. Although health students generally have good knowledge, some continue to smoke (Saleh, 2024), and previous studies have reported inconsistent findings regarding these factors (Aini et al., 2024; Lake et al., 2017; Nuraeni et al., 2021; Nursadiyah et al., 2021; Oktaviani et al., 2019; Oxa et al., 2022; Prautami & Rahayu, 2018; Putri, 2021; Rohman et al., 2024; Sawitri et al., 2020). Therefore, this study is important to investigate smoking behavior among health students at UMJ as a basis for developing educational programs and campus smoking-control policies. This study aims to analyze the relationships between knowledge level, attitudes, peer interaction, family factors, facilities and infrastructure, and the role of social media and smoking behavior among health students at UMJ.

Conceptually, smoking behavior can be explained through three interrelated groups of factors: predisposing factors, such as individual knowledge and attitudes toward smoking; enabling factors, such as the availability of facilities and infrastructure and ease of access to cigarettes; and reinforcing factors, such as the influence of peers, family, and exposure to social media. Theoretically, individuals with good knowledge and unfavorable attitudes toward smoking tend to have a lower likelihood of smoking. In practice, however, many health students continue to smoke despite understanding its harmful effects, indicating that smoking behavior is not determined solely by knowledge but is also influenced by interactions with the surrounding social environment. Health students at UMJ, as a group expected to serve as role models for healthy living in the community, therefore represent a relevant population for examining the extent to which these factors are associated with their smoking behavior

LITERATURE REVIEW

Smoking Behavior

Smoking behavior refers to the use of tobacco products and represents an important public health concern because it can contribute to various non-communicable diseases and increase the economic burden on health systems. The reviewed study explains that tobacco use remains prevalent globally, while Indonesia continues to face a substantial number of active smokers. Smoking initiation increasingly occurs during adolescence, making young people an important population for prevention. University students experience social, academic, and emotional transitions that may contribute to smoking through stress coping, self-confidence, social acceptance, and exposure to permissive environments. Health students are particularly relevant because they are expected to become health professionals and role models for healthy lifestyles. Nevertheless, knowledge of health risks does not always prevent smoking.

In the reviewed study, 79.2% of 130 male health students were active smokers,

and most smokers had consumed cigarettes for two to five years and smoked one to twelve cigarettes per day. These findings demonstrate that smoking may persist even among individuals with health-related education. Smoking behavior can therefore be understood as a complex outcome shaped by individual characteristics and social surroundings. Preventive efforts should not focus exclusively on delivering information about tobacco hazards but should also address behavioral patterns and environmental influences. The high proportion of smokers among health students further indicates the importance of strengthening campus-based tobacco control, health promotion, and supportive environments. Understanding the factors associated with smoking behavior provides a basis for developing interventions that are more responsive to the social context of university students and the challenges of tobacco use. Such interventions should consider both personal characteristics and the surrounding social environment.

Predisposing Factors

Predisposing factors are individual characteristics that may influence the formation of health-related behavior before behavior occurs. In the reviewed study, knowledge and attitude toward smoking are conceptualized as predisposing factors. Knowledge concerns an individual's understanding of the dangers of smoking, including the harmful and addictive effects of nicotine. The study found that almost all respondents, 98.5%, had good knowledge regarding smoking hazards. However, knowledge was not significantly associated with smoking behavior, with a p-value of 0.374. This finding indicates that awareness of health risks alone may be insufficient to produce behavioral change. Limited variation in knowledge among respondents may also reduce the ability to identify a statistical association.

Attitude represents an individual's tendency to respond favorably or unfavorably toward smoking. Although 69.2% of respondents had positive attitudes toward smoking prevention, attitude was also not significantly associated with smoking behavior, with a p-value of 0.074. Nevertheless, smoking prevalence was higher among respondents with negative attitudes than among those with positive attitudes. This pattern suggests that attitude may still have behavioral relevance even when statistical significance is not achieved. The literature presented in the study indicates that smoking can become a habit, a relaxation strategy, or a means of appearing mature and socially accepted. Therefore, predisposing factors should be considered together with enabling and reinforcing factors. The findings support a broader behavioral perspective in which knowledge and attitudes provide an important foundation, but actual smoking behavior may be more strongly shaped by interpersonal relationships, family environments, accessibility, and other contextual influences. Health education should consequently be combined with behavioral and environmental approaches rather than relying solely on increasing knowledge.

Reinforcing and Enabling Factors

Reinforcing and enabling factors represent important components in understanding smoking behavior among university students. Reinforcing factors include social influences from peers and family, whereas enabling factors include facilities, infrastructure, and access to cigarettes. The reviewed study found that peer interaction was significantly associated with smoking behavior, with a p-value of 0.003. All respondents who reported peer influence were smokers, indicating a strong relationship between the social environment and smoking. Peer influence may operate through

imitation, identification, social suggestion, and the desire for acceptance within a group. Family factors were also significantly associated with smoking behavior, with a p-value of 0.031 and an odds ratio of 3.176. Respondents exposed to risky family factors had greater odds of smoking, suggesting that family members may function as behavioral models and contribute to the normalization of tobacco use.

In contrast, facilities and infrastructure were not significantly associated with smoking behavior, with a p-value of 0.708. Although 97.7% of respondents reported cigarette vendors near campus, accessibility alone did not demonstrate a significant statistical relationship in this study. The role of social media was likewise not significantly associated with smoking behavior, with a p-value of 0.942. These findings suggest that direct interpersonal relationships may have greater relevance than general exposure to information or accessibility in this population. Therefore, smoking prevention among health students should involve peer-based approaches, family support, and consistent implementation of smoke-free campus policies while continuing to address cigarette availability and social media exposure. Strengthening supportive peer environments and family supervision may help reduce the normalization of smoking. Meanwhile, campus policies can complement interpersonal interventions by creating environments that discourage tobacco use and support healthier behavioral choices among students.

RESEARCH METHOD

This observational analytic study employed a cross-sectional design and was conducted at three health-related faculties at UMJ, namely the Faculty of Medicine and Health, Faculty of Public Health, and Faculty of Nursing, from April to June 2026. The sample was selected using accidental sampling among active male students who met the inclusion criteria. The minimum sample size was calculated using the Lemeshow (1997) formula, resulting in 118 respondents, with an additional 10% added to anticipate dropouts, resulting in a total of 130 respondents.

The dependent variable was smoking behavior, while the independent variables included knowledge level, attitude, peer interaction, family factors, facilities and infrastructure, and the role of social media. These variables were measured using questionnaires that had been tested for validity (r table = 0.361) and reliability among 30 respondents. The study received ethical approval from the Research Ethics Committee of the Faculty of Public Health, UMJ (No.10.051.B/KEPK-FKMUMJ/VI/2026). Data were processed through editing, coding, data entry, and cleaning, followed by univariate and bivariate analyses using the Chi-Square test or Fisher's Exact Test when the expected cell frequency was <5 in SPSS. A relationship was considered statistically significant when $p \leq 0.05$, while the strength of the association was assessed using the Odds Ratio (95% CI).

Knowledge level was assessed based on correct or incorrect responses to 12 questions concerning the dangers of smoking and was categorized as good (score $\geq 75\%$) or poor (score $<75\%$). Attitudes were measured using a Likert scale consisting of seven statements and categorized as positive (score $\geq$ mean) or negative (score $<$ mean). Peer interaction, family factors, facilities and infrastructure, and the role of social media were assessed using dichotomous (yes/no) questions and categorized based on the mean value as influential/not influential, risky/not risky, and supportive/not supportive,



respectively. Smoking behavior was assessed based on smoking status, the number of cigarettes consumed per day, and duration of smoking.

RESULTS

Research Setting

The study was conducted at Universitas Muhammadiyah Jakarta (UMJ) across three health-related faculties located at two campus sites. The Faculty of Nursing is located at Campus A (Cempaka Putih, Central Jakarta), while the Faculty of Public Health and the Faculty of Medicine and Health are located at Campus B (Cirendeui, South Tangerang). All study programs within the three faculties have been accredited as Excellent. Based on field observations, all campus areas have implemented a Smoke-Free Area (Kawasan Tanpa Rokok/KTR) policy, indicated by no-smoking signs. However, many food stalls and minimarkets selling cigarettes are still found around both campuses and are easily accessible to students. Therefore, the availability and accessibility of cigarettes outside the campus areas remain relatively high

Respondent Characteristics

The study involved 130 male students from three health-related faculties at UMJ. The characteristics of the respondents are presented in Table 1.

Table 1. Distribution of Respondent Characteristics

Characteristics	n	%
Smoking Status		
No Smoking	27	20,8
Smoking	103	79,2
Armed forces		
2022	24	18,5
2023	60	46,2
2024	19	14,6
2025	27	20,8
Age (Years)		
19-20	52	40,0
21-22	68	52,3
≥23	10	7,7
Faculty		
Faculty of Nursing Sciences	16	12,3
Faculty of Medicine and health	47	36,2
Faculty of Public Health	67	51,5
Length of smoking (among smokers, n=103)		
≤1 years	24	23,3
2-3 years	37	35,9
4-5 years	32	31,1
≥ 6 years	8	7,8
Number of cigarettes per day (among smokers, n=103)		
1-5 sticks	40	38,8
6-12 sticks	39	37,9
≥13 sticks	24	23,3

Most respondents (79.2%) were active smokers, with the largest proportion coming from the 2023 cohort (46.2%) and the Faculty of Public Health (51.5%). Among smokers, the majority had been smoking for 2–5 years and consumed 1–12 cigarettes per day.

Univariate Analysis

Almost all respondents (98.5%) had good knowledge of the dangers of smoking, although understanding of the addictive nature of nicotine remained low (22.3%). Most respondents (69.2%) had positive attitudes toward smoking prevention. Regarding social environmental factors, 76.2% reported that their peers did not influence their smoking behavior, although 100% had friends who smoked. A total of 57.7% were categorized as having a non-risky family environment, although 70.8% had family members who smoked. Furthermore, 73.1% were categorized as being in a non-supportive facilities and infrastructure environment, although 97.7% reported the presence of cigarette vendors near campus. Meanwhile, 53.1% reported that social media did not support smoking behavior. The distribution of the independent and dependent variables is presented in Table 2.

Table 2. Distribution of Independent and Dependent Variables

Variable	n	%
Level of knowledge about the dangers of smoking		
Less	2	1,5
Good	128	98,5
Attitude to smoking behavior		
Negative	40	30,8
Positive	90	69,2
Peer Interaction		
Influential	31	23,8
No Effect	99	76,2
Family Factors		
Risky	55	42,3
No risk	75	57,7
Availability of facilities and infrastructure		
Support	35	26,9
Not Support	95	73,1
The Role Of Social Media		
Support	61	46,9
Not Support	69	53,1
Smoking Behavior		
Support	103	79,2
Not Support	27	20,8

Bivariate Analysis

The results of the analysis of the relationships between each independent variable and smoking behavior are presented in Table 3.

Table 3. Bivariate Analysis of Independent and Dependent Variables

Variable	Category	Smoking		Not smoking		Total	p	OR (95% CI)
		n	%	n	%			
Level Knowledge	Less	1	50,0	1	50,0	2	0,374	0,255 (0,015 – 4,213)
	Good	26	20,3	102	79,7	128		
Attitude	Negative	36	90,0	4	10,0	40	0,074	3,090 (0,992 – 9,627)
	Positive	67	74,4	23	25,6	90		
Peer interaction	Influential	31	100	0	0,00	31	0,003	TD
	No Influential	72	72,7	27	27,3	99		
Family factors	Risky	49	89,1	6	10,9	55	0,031	3,176 (1,185 – 8,515)
	No risk	54	72,0	21	28,0	75		
Means and Infrastructure	Support	29	82,9	6	17,1	35	0,708	1,372 (0,503 – 3,743)
	No support	74	77,9	21	22,1	95		
The Role Of Social Media	Support	49	80,3	12	19,7	61	0,942	1,134 (0,484 – 2,659)
	No support	54	78,3	25	21,7	69		

Fisher's Exact Test showed no significant relationship between knowledge and smoking behavior ($p=0.374$). Similarly, attitude was not significantly associated with smoking behavior ($p=0.074$), although the proportion of smokers was higher among respondents with negative attitudes (90.0%). In contrast, peer interaction was significantly associated with smoking behavior ($p=0.003$), with all respondents who reported that their peers influenced them being smokers. Family factors were also significantly associated with smoking behavior ($p=0.031$; $OR=3.176$; 95% CI: 1.185–8.515), indicating that respondents with risky family factors had 3.176 times greater odds of smoking. Facilities and infrastructure ($p=0.708$) and the role of social media ($p=0.942$) were not significantly associated with smoking behavior.

*Note: * significant ($p<0.05$); NS = not significant; S = significant; NA = not applicable/cannot be calculated (cell frequency = 0).*

DISCUSSION

Relationship Between Knowledge Level and Smoking Behavior

The results showed no significant relationship between knowledge level and smoking behavior ($p=0.374$). Knowledge is one of the predisposing factors that may influence the formation of individual behavior (Notoatmodjo, 2014, in Afifah, 2021).

However, good knowledge is not always followed by behavioral change because other factors may have a stronger influence, such as attitudes, social environment, family, and peers. This finding is consistent with Rohman et al. (2024), who found among students at the UNSIQ Islamic boarding school that good knowledge regarding the dangers of smoking was not sufficient to change smoking behavior. It is also consistent with Saleh (2024), who reported that students continued to smoke despite being aware of its risks because smoking had become a habit, served as a form of relaxation, or was influenced by their social environment. The absence of a significant relationship may also be explained by the fact that almost all respondents (98.5%) had good knowledge, resulting in limited variation in the data and making it difficult to statistically detect an association.

Relationship Between Attitude and Smoking Behavior

The analysis showed no significant relationship between attitude and smoking behavior ($p=0.074$), although the proportion of smokers was higher among respondents with negative attitudes (90.0%) than among those with positive attitudes (74.4%). According to Notoatmodjo (2018), attitude is an individual's covert response to an object that may influence behavioral tendencies but does not necessarily translate directly into actual behavior. This finding is consistent with Gulo and Widani (2025), who also found no significant relationship between attitude and smoking behavior ($p=0.205$), which was attributed to the instability of adolescents' attitudes and the perception that smoking can make a person appear more mature, confident, and socially accepted. Within the behavioral factor framework, attitude is classified as a predisposing factor, whereas smoking behavior is also influenced by enabling and reinforcing factors, such as peers and family (Meriyadi, 2022; Asmidar et al., 2024), which were found to be more dominant in this study.

Relationship Between Peer Interaction and Smoking Behavior

The results showed a significant relationship between peer interaction and smoking behavior ($p=0.003$). All respondents who reported that their peers influenced them were smokers. Interaction with peers can shape behavior through processes of imitation, identification, and suggestion within the social environment (Sukaryawan & Sari, 2023). As a reinforcing factor, peers become particularly influential during adolescence and the university period, as individuals tend to imitate the behavior of their social groups in order to gain social acceptance (Meriyadi, 2022; Asmidar et al., 2024). This finding is consistent with Aini et al. (2024), who found a significant relationship between the role of peers and smoking behavior among students at Campus X, South Aceh. The greater the influence of peers, the greater the tendency of students to smoke because the norms and habits of social groups can more easily influence individual behavior.

Relationship Between Family Factors and Smoking Behavior

The results showed a significant relationship between family factors and smoking behavior ($p=0.031$; $OR=3.176$; 95% CI: 1.185–8.515). The family is the first environment to provide education, supervision, and behavioral models for individuals and is therefore classified as a reinforcing factor that can strengthen or weaken a particular behavior (Meriyadi, 2022; Asmidar et al., 2024). Parents or family members who smoke may serve as role models that influence students' behavior, whereas families that provide supervision and promote healthy lifestyles may function as protective

factors. This finding is consistent with Aini et al. (2024), who found a significant relationship between the role of parents and students' smoking behavior. Students with smoking parents had a higher risk of becoming smokers due to direct exposure and the normalization of smoking habits within the home environment.

Relationship Between Facilities and Infrastructure and the Role of Social Media with Smoking Behavior

The availability of facilities and infrastructure was not significantly associated with smoking behavior ($p=0.708$). Theoretically, facilities and infrastructure are classified as enabling factors related to the ease of accessing cigarettes (Meriyadi, 2022; Asmidar et al., 2024). However, this finding is inconsistent with Nurfadhilah et al. (2022), who found a relationship between ease of cigarette access and smoking behavior. This difference may be attributed to the characteristics of the respondents as health students, meaning that easy access to cigarettes does not necessarily encourage smoking behavior. Nevertheless, 97.7% of respondents reported that cigarette vendors were located near the campus, indicating that strengthening the implementation of Smoke-Free Areas (KTR) remains necessary as part of environmental smoking control.

The role of social media was also not significantly associated with smoking behavior ($p=0.942$). Social media can function as an environmental factor that influences perceptions through information dissemination and exposure to cigarette promotions; however, such exposure does not necessarily result in behavioral changes because its effects are also influenced by individual characteristics and the ability to filter information (Meriyadi, 2022; Asmidar et al., 2024). This finding is inconsistent with Oktaviani et al. (2019), who found a relationship between exposure to cigarette advertising and smoking behavior, but is consistent with Nursadiyah et al. (2021), who also found no significant relationship between social media exposure and electronic smoking behavior among university students. Overall, these findings indicate that smoking behavior among health students is more strongly influenced by factors that directly interact with their daily lives, particularly peers and family, than by knowledge, attitudes, facilities and infrastructure, or exposure to social media.

Study Limitations

This study has several limitations. First, the cross-sectional design means that the independent and dependent variables were measured at the same time; therefore, the study can only describe relationships between variables and cannot establish causal relationships or changes in behavior over time. Second, data collection was conducted using an online self-report questionnaire, which may have resulted in information bias, including social desirability bias, because all information depended on the respondents' honesty, understanding, and memory. Third, the use of accidental sampling limits the generalizability of the findings because the sample obtained may not fully represent the characteristics of the overall population. These limitations should be considered by future researchers when designing studies using stronger research designs.

CONCLUSION

Most of the UMJ health students who participated as respondents were active smokers (79.2%). The majority had good knowledge (98.5%) and positive attitudes (69.2%) toward smoking prevention; however, neither was significantly associated with smoking behavior ($p=0.374$ and $p=0.074$, respectively). In contrast, peer interaction

($p=0.003$) and family factors ($p=0.031$) were significantly associated with smoking behavior, whereas facilities and infrastructure ($p=0.708$) and the role of social media ($p=0.942$) were not. These findings emphasize that smoking behavior among health students is more strongly influenced by their immediate social environment—particularly peers and family—than by knowledge, attitudes, cigarette access, or social media

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