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RESEARCH ARTICLE

Association Between Self-Efficacy, Subjective Norms, and Smoking Cessation Behavior Among Adolescent Smokers in East Java: A Reproductive Health Perspective

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Abstract. Smoking behavior among adolescents remains an important public health concern because tobacco exposure during adolescence may contribute to long-term health risks, including potential reproductive health implications. This study aimed to examine the associations between smoking refusal self-efficacy, subjective norms, and smoking cessation behavior among adolescents in East Java, Indonesia. A quantitative cross-sectional study was conducted in 2024 among 200 adolescents recruited from four secondary schools using proportional stratified random sampling. Data were collected using a structured questionnaire developed based on the Theory of Planned Behavior framework. Smoking cessation behavior was defined as complete abstinence from conventional cigarettes and electronic cigarettes/vaping during the previous 30 days. Data were analyzed using chi-square tests and binary logistic regression with a significance level of $p < 0.05$. Most respondents were male (70.0%) and aged 12–18 years. Bivariate analysis showed significant associations between smoking refusal self-efficacy category and smoking cessation behavior ($p < 0.001$) and between subjective norms category and smoking cessation behavior ($p = 0.002$). In the adjusted logistic regression model, adolescents with lower self-efficacy had lower odds of achieving smoking cessation compared with those with higher self-efficacy (adjusted OR = 0.39; 95% CI: 0.19–0.78; $p = 0.008$). The association between stronger supportive subjective norms and smoking cessation was not statistically significant after adjustment (adjusted OR = 1.68; 95% CI: 0.80–3.52; $p = 0.168$). Smoking refusal self-efficacy was associated with adolescent smoking cessation behavior, while subjective norms showed an association in bivariate analysis but not after adjustment. Interventions may consider strengthening adolescents' refusal skills and supportive social environments to promote tobacco abstinence.

Keywords: adolescent smoking cessation; smoking refusal self-efficacy; subjective norms; Theory of Planned Behavior; reproductive health; Indonesia

INTRODUCTION

Smoking behavior among adolescents remains a challenging public health issue in Indonesia. Tobacco use that begins during adolescence is associated with a higher likelihood of continued smoking into adulthood and increased exposure to long-term health risks (Fithria et al., 2021). Adolescence represents a critical developmental period because smoking initiation during this stage is often influenced by social interaction, identity formation, and environmental acceptance of tobacco use. Therefore, adolescent smoking should not only be considered an individual lifestyle behavior but also a broader public health concern requiring preventive and cessation-oriented approaches.

The consequences of adolescent smoking extend beyond chronic diseases and may include potential implications for reproductive health. Previous studies have indicated that nicotine and tobacco exposure may be associated with impaired reproductive function, including alterations in hormonal regulation, reduced sperm quality, fertility-related problems, and adverse reproductive outcomes among both males and females (Engel et al., 2021; Oladipupo et al., 2022; Osadchuk et al., 2023; Ramon et al., 2024). In this context, achieving smoking cessation behavior during adolescence can be viewed as an important preventive behavior within a broader reproductive health framework. However, reproductive health outcomes and reproductive health motivation were not directly measured in the present study; therefore, reproductive health is positioned as a long-term preventive perspective rather than an explanatory variable of smoking cessation behavior.

The persistence of adolescent smoking remains a significant challenge in Indonesia. Data from the Indonesian

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Basic Health Research survey (Riskesdas) showed that smoking prevalence among adolescents aged 10–18 years increased from 7.2% in 2013 to 9.1% in 2018 (Faisal et al., 2022). This trend highlights the continuing difficulty of tobacco control efforts among young populations. Adolescents' smoking-related decisions are often shaped by their surrounding social environment, including peers, family members, schools, and broader social influences (Artanti et al., 2024; Bigwanto et al., 2025). Smoking may become normalized when adolescents perceive tobacco use as socially accepted, associated with peer belonging, or supported by their immediate environment.

East Java represents an important setting for examining adolescent smoking behavior because tobacco use remains present among younger populations within the province. According to the Statistics of East Java Province, daily smoking was reported among 9.21% of individuals aged 15–19 years and 0.29% of those aged 10–14 years based on the 2024 provincial survey (Badan Pusat Statistik Provinsi Jawa Timur, 2025). Although these indicators describe daily smoking prevalence rather than cessation behavior, they demonstrate the continued relevance of tobacco use among adolescents in East Java and support the need for context-specific prevention and smoking cessation efforts. Furthermore, sociocultural factors, including peer relationships, family influence, and community norms, may shape adolescents' perceptions of smoking and their attempts to discontinue tobacco use.

Understanding smoking cessation behavior requires clear conceptual distinctions. Smoking behavior refers to patterns of tobacco consumption, whereas smoking cessation intention refers to an individual's willingness or plan to quit smoking. Smoking cessation attempts describe efforts made to stop smoking, while smoking reduction refers to decreased cigarette consumption without necessarily achieving abstinence. In contrast, smoking cessation behavior refers to the achievement of complete smoking abstinence for a defined period. In the present study, smoking cessation behavior was operationalized as adolescents' reported achievement of complete smoking abstinence during the previous 30 days rather than merely reducing cigarette consumption or expressing an intention to quit.

Psychological and social factors play an important role in adolescent smoking cessation behavior. One psychological factor that has received considerable attention is self-efficacy, defined as an individual's confidence in their ability to perform and maintain a desired behavior despite challenges (Bandura, 1997). In the context of smoking cessation behavior, self-efficacy reflects adolescents' confidence in resisting cigarette offers, managing smoking urges, coping with stressful situations, and maintaining smoking abstinence (Hagerman et al., 2021; Rasmussen & Pisinger, 2024). Adolescents with stronger self-efficacy may be better prepared to overcome smoking-related challenges and maintain abstinence from smoking (Durkin et al., 2021; Nyman, Pinto, et al., 2024).

In addition to individual psychological factors, social influences may shape adolescent smoking cessation behavior. Subjective norms refer to individuals' perceptions regarding social expectations, approval, or pressure from important referents, including peers, family members, and social environments (Ajzen, 1991; Loan et al., 2021; Montes et al., 2023). During adolescence, peer acceptance and family attitudes may strongly influence health-related decisions because adolescents are developing autonomy while remaining highly connected to their social environment. Supportive social norms may facilitate smoking cessation behavior, whereas environments that normalize smoking may create barriers to achieving smoking abstinence.

This study was guided by the Theory of Planned Behavior (TPB), which explains that behavioral performance is influenced by attitudes, subjective norms, and perceived behavioral control, with intention serving as an important determinant of behavior (Ajzen, 1991). Previous studies have applied TPB to understand smoking-related behaviors, including smoking cessation intentions and smoking cessation-related behaviors (Liu et al., 2021; Koulierakis et al., 2022). However, the present study does not aim to examine the complete TPB pathway. Instead, it selectively focuses on two theoretically relevant constructs: subjective norms and self-efficacy. Subjective norms represent perceived social expectations, whereas self-efficacy reflects adolescents' confidence in managing smoking-related challenges. Although self-efficacy is conceptually related to perceived behavioral control, it represents only one dimension of this broader TPB construct. Therefore, attitude, intention, and the complete perceived behavioral control construct were not included as primary variables in this study.

Previous studies have examined psychosocial factors related to adolescent smoking; however, much of the existing evidence has focused on smoking initiation, smoking susceptibility, or general smoking behavior rather than smoking cessation behavior among adolescent smokers. Furthermore, limited evidence is available regarding how self-efficacy and subjective norms are associated with adolescent smoking cessation within the Indonesian sociocultural context, particularly in relation to broader adolescent health and reproductive health prevention perspectives. Exploring these associations may provide valuable insight into the development of culturally appropriate interventions that strengthen individual capability and supportive social environments for adolescent smoking cessation.

Based on this theoretical framework and research gap, this study aimed to examine the associations between self-efficacy, subjective norms, and smoking cessation behavior among adolescents in East Java, Indonesia. The hypotheses tested were: (H1) higher self-efficacy is associated with higher likelihood of achieving smoking cessation behavior among adolescents; and (H2) stronger supportive subjective norms are associated with higher likelihood of achieving smoking cessation behavior among adolescents. Given the cross-sectional design, these hypotheses refer to statistical associations and do not imply causal relationships.

METHODS

Study Design and Research Framework

This study employed a quantitative cross-sectional design to examine the associations between smoking refusal self-efficacy, subjective norms, and smoking cessation behavior among adolescents. The study was conducted in 2024 among junior and senior high school students in East Java, Indonesia. The cross-sectional design was selected because the study aimed to identify statistical associations between psychosocial factors and smoking cessation status at a single point in time; therefore, the findings were interpreted as associations rather than causal relationships.

The study was guided by the Theory of Planned Behavior (TPB) as the conceptual framework. TPB proposes

that behavioral performance is influenced by attitudes, subjective norms, and perceived behavioral control, which contribute to behavioral intention and subsequent behavior (Ajzen, 1991). In this study, subjective norms represented adolescents' perceptions of social expectations, approval, and support from important referents regarding smoking cessation, while smoking refusal self-efficacy represented adolescents' perceived capability to resist smoking-related situations and maintain abstinence.

The present study applied a selective TPB approach by focusing on two theoretically relevant constructs: subjective norms and smoking refusal self-efficacy. Subjective norms were selected because adolescent smoking behavior is strongly influenced by social environments, including family, peers, and schools. Smoking refusal self-efficacy was examined because perceived capability to refuse smoking offers and manage smoking-related challenges represents an important aspect of perceived behavioral control. However, self-efficacy does not represent the entire TPB construct; therefore, attitudes, behavioral intention, and other dimensions of perceived behavioral control were not included as primary variables in this study.

Sampling Technique and Participants

The study population consisted of adolescents aged 12–18 years enrolled in junior and senior high schools in East Java, Indonesia. The minimum sample size was determined using the Lemeshow formula for a two-proportion hypothesis test with a significance level of 5%, resulting in a required sample of 200 participants. Proportional stratified random sampling was employed, with stratification based on educational level and school ownership. Four schools participated in the study, comprising two junior high schools (one public and one private) and two senior high schools (one public and one private). Within each school, eligible students were identified according to the inclusion criteria, assigned identification numbers, and selected using a computerized random selection procedure.

Eligible participants were adolescents aged 12–18 years who were enrolled in the participating schools, had experimented with conventional cigarettes or electronic cigarettes (vapes) at least once during their lifetime, and were willing to participate with the required informed consent or assent. Both current smokers and adolescents with previous tobacco exposure who were no longer using tobacco products were eligible. Smoking status was recorded as current smoker, ever smoker, or former smoker based on questionnaire responses. For the primary outcome, participants were classified according to their self-reported use of conventional cigarettes or electronic cigarettes during the preceding 30 days. Those reporting no use of either product during this period were categorized as having achieved 30-day tobacco abstinence, whereas those reporting any use were categorized as not having achieved abstinence. Questionnaires with incomplete responses were excluded from the final analysis. Of the 240 students invited, 222 agreed to participate, while 18 declined or withdrew during recruitment. Subsequently, 22 students were excluded because of incomplete responses or failure to meet the eligibility criteria, resulting in a final analytical sample of 200 adolescents.

Data Collection Instrument

Data were collected using a structured, self-administered questionnaire developed by the researchers based on the Theory of Planned Behavior (TPB) framework and previous literature on adolescent smoking cessation. The instrument incorporated relevant theoretical constructs, particularly subjective norms and smoking refusal self-efficacy, to assess psychological and social factors associated with tobacco abstinence. Questionnaire items were designed to address smoking-related situations experienced by adolescents, including refusal of cigarette offers, resistance to peer pressure, management of smoking-related triggers, perceived family support, and social expectations regarding smoking cessation. The questionnaire comprised four sections: respondent characteristics and smoking history, smoking refusal self-efficacy, subjective norms related to smoking cessation, and reproductive health knowledge concerning tobacco exposure.

Smoking cessation behavior, the dependent variable, was assessed using self-reported information on conventional cigarette and electronic cigarette use during the preceding 30 days, obtained from the smoking history section. Participants reporting complete abstinence from both products during this period were coded as having achieved 30-day tobacco abstinence (1), whereas those reporting any use were coded as not having achieved abstinence (0). Smoking reduction, cessation intention, or unsuccessful quit attempts were not considered equivalent to achieving abstinence. The reproductive health knowledge score was summarized descriptively and was not included as an explanatory variable in the primary logistic regression model.

Smoking Refusal Self-Efficacy Measurement

Smoking refusal self-efficacy was defined as adolescents' confidence in their ability to refuse cigarette offers, resist peer pressure, manage smoking-related triggers, and maintain abstinence from tobacco use. This construct was assessed using a researcher-developed questionnaire consisting of 10 items, including the statement, "I am able to firmly refuse when my close friends offer me cigarettes." Each item was rated on a five-point Likert scale ranging from 1 (very unsure) to 5 (very confident), with intermediate categories of unsure (2), uncertain (3), and confident (4). The theoretical total score ranged from 10 to 50, with higher scores indicating greater smoking refusal self-efficacy.

In the study sample (N = 200), the mean self-efficacy score was 40.12 (SD = 8.21), with a median of 41 (IQR = 34–47) and observed scores ranging from 21 to 50. For categorical analysis, 92 respondents (46.0%) were reported in the higher self-efficacy category, while 108 respondents (54.0%) were classified in the lower self-efficacy category. The higher self-efficacy group was used as the reference category in the binary logistic regression analysis. These categories represented relative self-efficacy levels within the study population and should not be interpreted as established clinical classifications.

Subjective Norms Measurement

Subjective norms were defined as adolescents' perceptions of social expectations, approval, and support from significant individuals, including parents, family members, peers, and the school environment, regarding smoking cessation. This construct was assessed using a researcher-developed questionnaire consisting of eight items based on the Theory of Planned Behavior (TPB) framework. One example item was, "My parents or extended family would be very proud of and fully support me if I stopped smoking." Each item was rated on a five-

point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with intermediate response options of disagree (2), uncertain (3), and agree (4). The theoretical total score ranged from 8 to 40, with higher scores indicating stronger perceived social support and more favorable subjective norms toward smoking cessation.

In the study sample (N = 200), the mean subjective norms score was 18.04 (SD = 5.24), with a median of 17 (IQR = 14–22) and observed scores ranging from 8 to 33. For categorical analysis, respondents were classified into less supportive and stronger supportive subjective norms categories. Based on the reported classification, 125 respondents (62.5%) were included in the less supportive subjective norms category, while 75 respondents (37.5%) were classified as having stronger supportive subjective norms. The less supportive subjective norms category was used as the reference group in the binary logistic regression analysis. These categories represented differences in perceived social expectations and support within the study population rather than established clinical classifications.

Smoking Cessation Behavior

Smoking cessation behavior was operationally defined as self-reported complete abstinence from conventional cigarettes and electronic cigarettes (vaping) during the 30 days preceding data collection. The outcome was assessed using structured questions regarding the use of conventional cigarettes and electronic cigarettes within this period. Respondents who reported no use of either product during the preceding 30 days were classified as having achieved 30-day tobacco abstinence, whereas those reporting any cigarette or electronic cigarette use during the same period were classified as not having achieved abstinence. Accordingly, reductions in smoking frequency or cigarette consumption, intentions to quit, and unsuccessful cessation attempts were not considered equivalent to complete abstinence when tobacco use continued during the assessment period. The dependent variable was coded dichotomously, with 1 indicating achieved 30-day tobacco abstinence and 0 indicating continued tobacco use during the preceding 30 days.

The study included adolescents with previous tobacco exposure, encompassing current smokers and those who had previously experimented with conventional cigarettes or electronic cigarettes. Smoking status was recorded as current smoker, ever smoker, or former smoker and was analyzed descriptively rather than used as a substitute for the primary cessation outcome. Among the 200 respondents, 120 adolescents (60.0%) reported complete abstinence during the preceding 30 days, while 80 adolescents (40.0%) reported continued cigarette or electronic cigarette use. Because smoking cessation behavior was determined through self-reported tobacco use within a defined 30-day period, the outcome represented recent abstinence rather than independently verified long-term cessation.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize respondents' sociodemographic characteristics, smoking history, and the distributions of the study variables. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means, standard deviations (SD), medians, interquartile ranges (IQR), and observed minimum and maximum values, as appropriate. Bivariate associations between smoking refusal self-efficacy, subjective norms, and smoking cessation behavior were examined using chi-square tests. The results were presented as frequencies, percentages, crude odds ratios (ORs), 95% confidence intervals (CIs), and p-values.

Variables demonstrating statistically significant associations in the bivariate analysis were subsequently entered into a binary logistic regression model to examine their simultaneous associations with smoking cessation behavior. The dependent variable was coded as 1 for achieved 30-day tobacco abstinence and 0 for continued tobacco use during the preceding 30 days. The model included smoking refusal self-efficacy and subjective norms as independent variables, with higher self-efficacy and less supportive subjective norms serving as their respective reference categories. The regression results were expressed as regression coefficients (B), standard errors (SE), adjusted odds ratios (aORs), 95% confidence intervals, and p-values. The adjusted odds ratios represented associations after mutual adjustment for the two predictors included in the model rather than adjustment for additional demographic or smoking-related characteristics.

Model adequacy was assessed using McFadden's pseudo-R^2, the likelihood-ratio test, and overall classification accuracy at a predicted probability threshold of 0.50. Statistical significance was determined at a two-sided p-value of less than 0.05. Given the cross-sectional study design, all observed relationships were interpreted as statistical associations rather than evidence of causal effects.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Health Sciences, Universitas Jenderal Achmad Yani Yogyakarta (Reference No. SKep/98/KEP/V/2024). Participation was voluntary. Before participation, respondents received information regarding study objectives, confidentiality, potential benefits, and their right to withdraw without consequences. For participants younger than 18 years, written informed consent was obtained from parents or legal guardians, followed by adolescent assent before questionnaire administration. Participants aged 18 years provided informed consent independently.

RESULTS OF STUDY

The recruitment process was conducted across four selected schools in East Java, Indonesia, comprising two junior high schools (one public and one private school) and two senior high schools (one public and one private school). Of the 240 students invited to participate, 222 agreed to participate. During the recruitment process, 18 students declined or withdrew during the briefing session. Subsequently, 22 students were excluded because of incomplete questionnaire responses or because they did not meet the eligibility criteria, including students who had never experienced conventional cigarette use or electronic cigarette/vaping. A total of 200 adolescents were included in the final analysis.

Respondent Characteristics

Table 1 presents the sociodemographic and smoking-related characteristics of the 200 adolescents included in the study. Most respondents were male (n = 140, 70.0%), while

60 (30.0%) were female. Regarding smoking status, 84 respondents (42.0%) were classified as former smokers, 80 (40.0%) as current smokers, and 36 (18.0%) as ever smokers. A history of previous smoking cessation attempts was reported by 33 respondents (16.5%), whereas the majority (n = 167, 83.5%) reported no previous quit attempts. Regarding the type of tobacco product recorded, conventional cigarettes accounted for 169 respondents (84.5%), while electronic cigarettes or vapes were reported for 31 respondents (15.5%). These findings provide an overview of respondents' smoking histories and tobacco exposure patterns, which are relevant to interpreting the associations between psychosocial factors and smoking cessation behavior.

Table 1. Sociodemographic and Smoking-Related Characteristics of Respondents (N = 200)

Characteristic	n	%
Sex		
Female	60	30.0
Male	140	70.0
Smoking status		
Current smokers	80	40.0
Ever smokers	36	18.0
Former smokers	84	42.0
History of quit attempt		
Previous quit attempt	33	16.5
No previous quit attempt	167	83.5
Recorded tobacco product		
Conventional cigarettes	169	84.5
Electronic cigarettes/vapes	31	15.5

Source: Primary data, 2024.

Descriptive Statistics of Continuous Variables

Table 2 summarizes the descriptive statistics of respondents' age, reproductive health knowledge, subjective norms, and smoking refusal self-efficacy. The respondents' mean age was 16.08 years (SD = 1.45), with a median of 16 years (IQR = 15–17) and an age range of 12–18 years. The reproductive health knowledge score had a mean of 15.74 (SD = 2.52) and a median of 16 (IQR = 15–18), with observed scores ranging from 6 to 19. Subjective norms scores ranged from 8 to 33, with a mean of 18.04 (SD = 5.24) and a median of 17 (IQR = 14–22). Meanwhile, smoking refusal self-efficacy scores ranged from 21 to 50, with a mean of 40.12 (SD = 8.21) and a median of 41 (IQR = 34–47). These descriptive findings illustrate the distribution and variability of the measured characteristics and psychosocial constructs within the study population.

Relationship Between Smoking Refusal Self-Efficacy and Smoking Cessation Behavior

Table 3 presents the association between smoking refusal self-efficacy categories and smoking cessation behavior among adolescents. The bivariate analysis revealed a statistically significant association between smoking refusal self-efficacy and self-reported smoking cessation behavior (Pearson's chi-square test, $p < 0.001$). Among respondents with higher self-efficacy (n = 92), 69 adolescents (75.0%) reported achieving smoking cessation during the preceding 30 days, while 23 (25.0%) did not achieve cessation. In contrast, among those with lower self-efficacy (n = 108), 51 respondents (47.2%) reported achieving cessation, whereas 57 (52.8%) did not. Overall, 120 respondents (60.0%) reported achieving 30-day tobacco abstinence, while 80 (40.0%) reported continued tobacco use. Using the higher self-efficacy category as the reference group, adolescents with lower self-efficacy had significantly lower odds of reporting smoking cessation (crude OR = 0.30; 95% CI: 0.16–0.55; $p < 0.001$). These findings indicate that higher smoking refusal self-efficacy was associated with a greater likelihood of self-reported 30-day tobacco abstinence among the adolescents studied.

Relationship Between Subjective Norms and Smoking Cessation Behavior

Table 4 presents the association between subjective norms and smoking cessation behavior among the 200 adolescents included in the study. The bivariate analysis showed a statistically significant association between subjective norms and self-reported smoking cessation behavior (reported $p = 0.002$). Among adolescents with stronger supportive subjective norms (n = 75), 56 respondents (74.7%) reported achieving smoking cessation during the preceding 30 days, while 19 respondents (25.3%) did not achieve cessation. In comparison, among adolescents with less supportive subjective norms (n = 125), 64 respondents (51.2%) reported achieving cessation, whereas 61 respondents (48.8%) did not. As shown in Table 4, adolescents with stronger supportive subjective norms had significantly higher odds of reporting 30-day tobacco abstinence than those with less supportive subjective norms (crude OR = 2.81; 95% CI: 1.50–5.26; reported $p = 0.002$). These findings indicate a positive association between perceived social support for smoking cessation and self-reported tobacco abstinence at the bivariate level, without establishing a causal relationship.

Multivariable Logistic Regression Analysis

Table 5 presents the results of the binary logistic regression analysis examining the simultaneous associations of smoking refusal self-efficacy and subjective norms with smoking cessation behavior. The dependent variable was coded as 1 for respondents who achieved self-reported 30-day tobacco abstinence and 0 for those who continued using conventional cigarettes or electronic cigarettes during the preceding 30 days. As shown in Table 5, smoking refusal self-efficacy remained significantly associated with smoking cessation after adjustment for subjective norms. Adolescents with lower self-efficacy had significantly lower odds of reporting 30-day tobacco abstinence than those with higher self-efficacy (adjusted OR = 0.39; 95% CI: 0.19–0.78; $p = 0.008$). In contrast, the association between stronger supportive subjective norms and smoking cessation was attenuated after adjustment for self-efficacy and was no longer statistically significant (adjusted OR = 1.68; 95% CI: 0.80–3.52; $p = 0.168$).

The model performance indicators are also summarized in Table 5. The logistic regression model yielded a McFadden pseudo-R^2 of 0.068 and a statistically significant likelihood-ratio test ($p < 0.001$), with an overall classification accuracy of 62.0% at a probability threshold of 0.50. Although the likelihood-ratio test indicated that the model provided a statistically significant improvement over the intercept-only model, the relatively low pseudo-R^2 and modest classification accuracy suggest limited explanatory and classification performance. Overall, the findings presented in Table 5 indicate that smoking refusal self-efficacy was

independently associated with self-reported 30-day tobacco abstinence after accounting for subjective norms, whereas subjective norms did not retain statistical significance in the multivariable model. These associations should be interpreted cautiously because the cross-sectional design does not establish temporal or causal relationships.

Table 2. Descriptive Statistics of Continuous Variables (N = 200)

Variable	Mean	SD	Median	IQR	Min–Max
Age (years)	16.08	1.45	16	15–17	12–18
Reproductive health knowledge score	15.74	2.52	16	15–18	6–19
Subjective norms score	18.04	5.24	17	14–22	8–33
Smoking refusal self-efficacy score	40.12	8.21	41	34–47	21–50

Source: Primary data, 2024.

Table 3. Association Between Smoking Refusal Self-Efficacy Category and Smoking Cessation Behavior

Smoking refusal self-efficacy category	Did not achieve cessation n (%)	Achieved cessation n (%)	Total n (%)	Crude OR for cessation (95% CI)	p-value
Higher self-efficacy (Reference)	23 (25.0)	69 (75.0)	92 (100.0)	1.00	
Lower self-efficacy	57 (52.8)	51 (47.2)	108 (100.0)	0.30 (0.16–0.55)	<0.001
Total	80 (40.0)	120 (60.0)	200 (100.0)		

Source: Primary data, 2024. Percentages are calculated within each category.

Table 4. Association Between Subjective Norms Category and Smoking Cessation Behavior

Subjective norms category	Did not achieve cessation n (%)	Achieved cessation n (%)	Total n (%)	Crude OR for cessation (95% CI)	p-value
Less supportive subjective norms (Reference)	61 (48.8)	64 (51.2)	125 (100.0)	1.00	
Stronger supportive subjective norms	19 (25.3)	56 (74.7)	75 (100.0)	2.81 (1.50–5.26)	0.002
Total	80 (40.0)	120 (60.0)	200 (100.0)		

Source: Primary data, 2024. Percentages are calculated within each category.

Table 5. Binary Logistic Regression of Smoking Cessation Behavior

Predictor	B	SE	Adjusted OR	95% CI	p-value
Lower self-efficacy vs higher self-efficacy	-0.947	0.359	0.39	0.19–0.78	0.008
Stronger supportive subjective norms vs less supportive subjective norms	0.520	0.377	1.68	0.80–3.52	0.168

Model summary: N = 200; McFadden pseudo-R^2 = 0.068; likelihood-ratio test $p < 0.001$; classification accuracy = 62.0%.

DISCUSSION

This study examined the associations between smoking refusal self-efficacy, subjective norms, and smoking cessation behavior among adolescents using the Theory of Planned Behavior (TPB) framework. The findings indicate that both psychological capability and social influences were significantly associated with achieving smoking cessation, defined as complete abstinence from conventional cigarettes and electronic cigarettes during the previous 30 days. These findings support the view that adolescent smoking cessation is a complex behavioral process influenced by both individual and social determinants. However, because this study employed a cross-sectional design, the findings should be interpreted as statistical associations rather than causal relationships.

The association between smoking refusal self-efficacy and smoking cessation behavior highlights the importance of adolescents' perceived capability in managing smoking-related challenges. Within the TPB framework, perceived behavioral control reflects an individual's perception of their ability to perform or avoid a behavior (Ajzen, 1991). In this study, self-efficacy represented adolescents' confidence in refusing smoking offers, managing smoking triggers, resisting peer pressure, and maintaining abstinence. Previous studies have demonstrated that stronger self-efficacy is consistently associated with greater ability to initiate and maintain smoking cessation efforts (Rajani et al., 2021; Ramos-Carro et al., 2026).

The role of self-efficacy may be particularly important during adolescence because smoking behavior is often embedded within social and emotional contexts. Adolescents may encounter smoking opportunities through peers, experience curiosity, or use smoking as a coping mechanism during stressful situations. Individuals with stronger refusal self-efficacy may be better prepared to

anticipate these situations, apply coping strategies, and avoid relapse-related triggers (Durkin et al., 2021; Hagerman et al., 2021). Therefore, smoking cessation interventions among adolescents should not only provide information about tobacco-related risks but also develop practical behavioral skills, including refusal techniques, stress management, and strategies for handling social pressure.

The strong association observed between self-efficacy and smoking cessation behavior is also consistent with previous research emphasizing self-efficacy as an important psychological determinant of tobacco-related behavior change. Adolescents who believe they can control smoking-related situations may have greater confidence in maintaining cessation decisions despite environmental challenges (Nyman et al., 2024; Vallata et al., 2021). Nevertheless, the magnitude of the odds ratio observed in this study should be interpreted cautiously because the distribution of predictor categories demonstrated strong separation between self-efficacy levels and cessation status. Therefore, the findings indicate a strong statistical association within this sample rather than evidence that self-efficacy alone determines cessation outcomes.

Subjective norms were also significantly associated with smoking cessation behavior, indicating that adolescents' perceptions of social expectations and support may contribute to cessation-related behavior. According to TPB, subjective norms represent perceived social pressure or approval from important individuals regarding whether a behavior should be performed (Ajzen, 1991). Among adolescents, these perceptions are strongly influenced by social environments, including peers, family members, schools, and communities.

Peer influence is particularly relevant because adolescence is a developmental stage characterized by social identity formation and the desire for acceptance. Smoking may become normalized within peer groups when it is perceived as a symbol of maturity, independence, or group belonging. Conversely, supportive peer environments may encourage healthier decisions and reinforce smoking avoidance behaviors (Littlecott et al., 2023; Loan et al., 2021). Therefore, peer-based approaches, such as peer counseling and positive peer role modeling, may represent important components of adolescent smoking cessation programs.

Family environments also play an important role in shaping subjective norms. Parental support, monitoring, and communication regarding tobacco use may influence adolescents' perceptions of whether smoking is acceptable or discouraged within their social environment. Previous research has shown that supportive family relationships and appropriate parental monitoring are associated with lower tobacco-related risk behaviors among adolescents (Mills et al., 2021). Consequently, family involvement should be incorporated into smoking cessation strategies rather than focusing solely on individual adolescents.

Schools and communities provide additional opportunities to strengthen supportive norms toward smoking cessation. Smoke-free school policies, reproductive health education, and adolescent health promotion programs may create environments where non-smoking behavior becomes socially valued. Community-based interventions can further reinforce consistent messages regarding tobacco prevention and healthy adolescent development (Fithria et al., 2021; Tate et al., 2021).

Although social media exposure was not measured in this study, digital environments represent an important implication for future intervention development. Adolescents increasingly obtain health information and social cues through online platforms. Previous studies have suggested that digital environments may contribute either to the normalization of smoking behavior or to the dissemination of cessation messages and health education (Bigwanto et al., 2025; Smith et al., 2021). Therefore, future interventions may consider integrating digital health approaches while recognizing that the present study does not provide direct evidence regarding the influence of social media on smoking cessation behavior. Previous qualitative research has also highlighted the importance of understanding adolescents' experiences and preferences when developing e-cigarette cessation interventions (Kong et al., 2021)

The reproductive health perspective provides additional relevance to adolescent smoking cessation. Adolescence represents a critical period for establishing behaviors that may influence long-term health outcomes. Tobacco exposure during adolescence has been associated with adverse reproductive health indicators, including alterations in reproductive hormones, reduced sperm quality, and potential effects on fertility-related outcomes (Engel et al., 2021; Oladipupo et al., 2022; Osadchuk et al., 2023; Trapphoff et al., 2024). Therefore, supporting smoking cessation during adolescence may represent an important preventive strategy to reduce potential future reproductive health risks. In addition, reproductive health education may represent an important complementary strategy because adolescents' understanding of tobacco-related reproductive consequences may influence their motivation to avoid smoking. A recent Indonesian study found that adolescents with better reproductive health knowledge had stronger intentions to avoid smoking (Marmi & Riyadi, 2025). Although the present study did not measure reproductive health knowledge as an explanatory variable, these findings suggest that educational components may complement psychological and social approaches in adolescent smoking prevention and cessation programs.

The findings have several practical implications for adolescent smoking cessation programs. Interventions should adopt a comprehensive approach that addresses both individual psychological capability and social environments. Self-efficacy may be strengthened through refusal-skill training, coping strategy development, peer education, and reproductive health counseling (Nyman et al., 2024; Orsal & Ergun, 2021). Meanwhile, supportive subjective norms may be promoted through family engagement, smoke-free school policies, community participation, and health communication strategies involving both offline and digital platforms.

Several limitations should be considered when interpreting the findings. First, the cross-sectional design prevents determination of temporal relationships and causal effects between self-efficacy, subjective norms, and smoking cessation behavior. Second, all measurements were based on self-reported questionnaires, which may introduce recall bias and social desirability bias, particularly when assessing smoking-related behaviors. Third, smoking cessation status was not verified using biological markers such as cotinine testing; therefore, possible misclassification of cessation status cannot be excluded. Fourth, nicotine dependence was not measured, although dependence level may influence adolescents' ability to achieve and maintain abstinence. Fifth, the study was conducted among adolescents from selected schools in East Java, Indonesia; therefore, the findings may not be fully generalizable to adolescents from other regions with different cultural, social, and educational contexts.

Despite these limitations, this study contributes to understanding adolescent smoking cessation behavior by

demonstrating the relevance of psychological capability and social expectations within a reproductive health perspective. Future longitudinal studies involving broader populations and additional determinants, including nicotine dependence, family characteristics, psychological factors, and digital media exposure, are recommended to further clarify the pathways underlying adolescent smoking cessation behavior.

CONCLUSION

This study found that smoking refusal self-efficacy and subjective norms were significantly associated with smoking cessation behavior among adolescents. Adolescents with higher self-efficacy and more supportive subjective norms showed higher odds of achieving smoking cessation, defined as complete abstinence from conventional cigarettes and electronic cigarettes during the previous 30 days. However, these findings should be interpreted as statistical associations because the cross-sectional design does not allow causal conclusions. In addition, the observed strength of association should be interpreted cautiously because other potentially relevant factors, including smoking intensity, nicotine dependence, family support, peer smoking exposure, and intention to quit, were not included in the analytical model.

The findings highlight the importance of addressing both individual psychological capability and social environments in adolescent smoking cessation programs. Practical interventions may include refusal-skill training to strengthen adolescents' ability to respond to smoking offers and peer pressure, peer counseling to provide supportive social networks, and reproductive health education to increase awareness of the potential long-term consequences of tobacco exposure. Furthermore, schools, families, and communities may contribute by implementing smoke-free school policies, strengthening family involvement, and promoting supportive anti-smoking social norms.

Future studies should use longitudinal designs and incorporate additional behavioral, psychological, and social factors, including nicotine dependence, smoking patterns, family characteristics, peer influences, and digital media exposure, to better understand the pathways associated with adolescent smoking cessation behavior over time.

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DECLARATIONS

Ethics Approval and Consent to Participate

Ethical approval for this study was granted by the Health Research Ethics Committee of the Faculty of Health Sciences, Universitas Jenderal Achmad Yani Yogyakarta (Reference No. SKep/98/KEP/V/2024). Participation in the study was voluntary. Before data collection, all respondents received an explanation regarding the study objectives, confidentiality of information, and their right to withdraw from the study at any time. Written informed consent was obtained from all participants prior to questionnaire administration.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that there are no competing interests related to this study.

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The authors used Paperpal and Grammarly during manuscript preparation to assist with language editing, grammar correction, and improvement of academic writing clarity. These tools were used only for linguistic support. All scientific content, interpretation of findings, and conclusions remain entirely the responsibility of the authors.

Authors' Contributions

MM contributed to the study conceptualization, data collection, interpretation of findings, and manuscript preparation. SR contributed to the study design, data analysis, critical revision of the manuscript, and supervision of the research process. Both authors reviewed and approved the final version of the manuscript.

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ADDITIONAL INFORMATION

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