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Smoking Cessation Behavior Among Madurese Adolescents: The Role of Social Capital and the Theory of Planned Behavior

Sujono Riyadi[1]*, Marmi Marmi[2], Shalahuddin Al Madury[3], Muhammad Farid[4]

[1]Faculty of Health, Universitas Jenderal Achmad Yani Yogyakarta, Yogyakarta, Indonesia
[2]Faculty of Health Sciences, YPIB University Majalengka, Majalengka, West Java, Indonesia
[3]Faculty of Health, Universitas Jenderal Achmad Yani Yogyakarta, Yogyakarta, Indonesia
[4]Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

*Corresponding Author: E-mail: sujono_kmpk2005@yahoo.com

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ABSTRACT

Introduction: The high prevalence of smoking among Madurese adolescents reflects a complex public health challenge. This study aims to analyze the influence of social capital and elements of the Theory of Planned Behavior on smoking cessation intentions among Madurese adolescents within their local cultural context.

Methods: A cross-sectional path analysis was conducted with 200 adolescents aged 15–19 years in Sumenep, Madura, using a structured questionnaire to measure attitudes, subjective norms, perceived behavioral control, and smoking cessation intention. Social capital was assessed through three dimensions: trust, social networks, and reciprocity norms, within the context of adolescents' relationships with family, peers, and the broader community.

Results: The findings reveal that strong social support from family and peers significantly influences adolescents' intentions to quit smoking, strengthening the effectiveness of Theory of Planned Behavior (TPB) factors in driving positive behavioral change. Path analysis showed that the intention to quit smoking had a direct and significant effect on actual smoking cessation behavior ($\beta = 1.56$; $p < 0.001$). Attitudes, subjective norms, and perceived behavioral control demonstrated indirect effects through intention. Adolescents with high perceived behavioral control and positive attitudes toward quitting were more likely to succeed in cessation efforts.

Conclusion: These results emphasize the importance of social capital in anti-smoking interventions, especially in culturally cohesive societies such as Madura. Future interventions should leverage community and family-based support systems to enhance smoking cessation efforts among adolescents.

INTRODUCTION

Smoking among adolescents is a serious health issue with long-term impacts on public health worldwide, including in Indonesia (1). In Indonesia, the high prevalence of smoking among adolescents is a primary concern; in 2023, approximately 7.4% of the country's total smokers were adolescents who began smoking at a young age (2). This problem is exacerbated by various factors influencing adolescent smoking behavior, including social, environmental, and individual attitudes (3). However, many studies have shown that social factors, such as family, peers, and community, also play a significant role in shaping smoking behavior in this population (4–6). Additionally, in Indonesia, adolescent smoking exhibits unique characteristics in different cultural regions. For example, in Madura, smoking practices are historically shaped by strong social norms and cultural values, which have a distinct influence on adolescent smoking behavior. This study explores the influence of social capital on smoking cessation intentions among Madurese adolescents, aligning with the broader goal of understanding sociocultural determinants of health behavior.

Several previous studies have identified factors that influence adolescent smoking habits and cessation behavior, but most of this research has focused primarily on individual cognitive and psychological factors (7,8). For example, studies using the Theory of Planned Behavior (TPB) have shown that attitudes, subjective norms, and perceived behavioral control are factors influencing smoking intentions among adolescents (9,10). However, studies integrating social capital elements such as peer and family social support into the TPB model remain limited, especially in communities with strong cultural norms like Madura (11). Social capital plays an important role in shaping health behaviors, including smoking, as social support can facilitate the cessation process (12,13). Based on this research gap, the study focuses on the need to explore the interaction between social capital and smoking cessation intentions in a local cultural context, specifically through the TPB framework as the theoretical foundation (1,14). Previous studies have shown that support from peers and family can increase adolescents' likelihood of quitting smoking and that social norms supporting healthy behaviors can reduce smoking prevalence among adolescents (15,16). Therefore, it is essential to understand how social capital interacts with cognitive factors in influencing smoking cessation intentions among adolescents, especially within a specific cultural context such as Madura.

This study contributes new insights by incorporating the concept of social capital into the TPB to understand smoking cessation behavior among Madurese adolescents. This contribution offers an unexplored perspective on how peer and family social capital can influence subjective norms and perceived behavioral control in adolescents' efforts to quit smoking (12,17). Previous studies indicate that peer and family social support can serve as a significant driving factor in the cessation process, where strong social connections can increase individuals' motivation to change their smoking behavior (18). Thus, this study not only enhances theoretical understanding of TPB in the context of social capital but also provides practical insights for developing more effective intervention strategies. The study results are expected to help reduce youth smoking rates in Indonesia through interventions that consider social and cultural contexts. In this context, it is essential to design intervention programs that focus not only on individual aspects but also on the influence of social environments, such as prevailing norms within the community (19,20). This study has the potential to contribute to public health policy by emphasizing the importance of social support in smoking prevention and cessation efforts among adolescents (12,21).

The main issue addressed in this study is the low success rate of smoking cessation among Madurese adolescents, despite various efforts by the government and health agencies to raise awareness about the dangers of smoking. This low success rate is likely related to an approach that focuses more on individual factors, without considering the influence of social capital and strong cultural norms in the Madurese community (22). Therefore, this study focuses on the influence of social capital and TPB elements on smoking cessation behavior in this adolescent group, with the expectation that the results may provide a basis for more relevant intervention approaches. This study aims to analyze how social capital measured through family and peer support and TPB constructs such as attitudes, subjective norms, and perceived behavioral control, can influence smoking cessation intentions and behaviors among Madurese adolescents. Drawing on established literature on adolescent behavioral health, this research explores whether the integration of social capital enhances the predictive power of TPB within the cultural context of Madura. The scope of this study includes Madurese adolescents aged 15 to 19 with a smoking history. The research was conducted in Sumenep, East Java, where the prevalence of smoking among adolescents is high and cultural values

support smoking behavior. The study's limitations include a focus on school-going adolescents and limited examination of social capital from peers and family, without considering other factors such as advertising and media influence, which may also play a role in influencing adolescent smoking behavior.

METHOD

Research Type

This study employed a quantitative cross-sectional approach using a path analysis design to explore the influence of social capital and constructs from the Theory of Planned Behavior (TPB) on smoking cessation behavior among Madurese adolescents. While a longitudinal design would offer stronger insights into the temporal sequence of behavior change, especially in understanding the transition from intention to actual cessation behavior, this study adopted a cross-sectional approach due to time constraints and the exploratory nature of the research. Nonetheless, path analysis allowed for modeling the hypothesized relationships among variables and identifying potential mediators within the theoretical framework. Future studies are encouraged to adopt longitudinal designs to capture the dynamic process of behavioral change over time and to validate the directionality of the observed associations. The use of path analysis enabled the examination of both direct and indirect effects among variables, facilitating a deeper understanding of the behavioral dynamics associated with smoking cessation in a culturally specific context (9). The analysis was conducted using STATA version 13, which supports structural modeling based on theoretical frameworks (23).

Population and Sample/Informants

The study population consisted of Madurese adolescents aged 15 to 19 years residing in Sumenep, East Java, who had a history of smoking. A purposive sampling method was employed to recruit 200 participants, ensuring that all respondents met the inclusion criteria: age 15–19 years, current or former smokers, and residence in the designated study area. While this sampling approach was appropriate for targeting the study's specific population, it may introduce sampling bias. As a result, the findings may not fully represent all Madurese adolescents, particularly those living outside the area or with different smoking behaviors. This limitation should be taken into account when considering the generalizability of the results. Adolescents were excluded if they did not meet the age criteria, had no smoking history, or declined to provide written informed consent.

Research Location

The research was conducted in Sumenep, East Java, an area known for its high prevalence of adolescent smoking and a local culture that supports smoking behavior, particularly among males in Madurese society. This location was purposefully chosen to capture the socio-cultural influences relevant to smoking cessation among youth in the region.

Instrumentation or Tools

The primary instrument used was a structured questionnaire developed based on the Theory of Planned Behavior (TPB) framework. It measured three core TPB components: (1) Attitudes toward smoking cessation, (2) Subjective norms, and (3) Perceived behavioral control. All items were scored using a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." Additionally, the questionnaire included a module on social capital, assessing social support from peers and family in the context of quitting smoking. The instrument had previously demonstrated strong reliability and validity in studies involving Indonesian adolescents, with Cronbach's Alpha values > 0.70, indicating good internal consistency. Confirmatory Factor Analysis (CFA) was used to assess construct validity, confirming that each item reliably represented its intended construct.

Data Collection Procedures

Data were collected through direct interviews using the structured questionnaire. Interviews were conducted by a trained team of interviewers to ensure that participants understood the questions and responded accurately. Prior to participation, all adolescents received a clear explanation of the study's objectives and were asked to provide

written informed consent. The interviews were conducted in person and followed standardized procedures to ensure consistency across all data collectors.

Data Analysis

Data analysis was performed using path analysis techniques in STATA 13 to evaluate the direct and indirect relationships between variables within a modified TPB model, which incorporated social capital as an additional influencing factor (23). The model was tested for goodness of fit using key indices, including Chi-Square, Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). A significance level of 0.05 was applied to determine the statistical validity of the relationships among variables.

Ethical Approval

The Research Ethics Committee of Jenderal Achmad Yani Yogyakarta University conducted an ethical review based on a literature study to ensure the protection of human subjects in health research. The research proposal was approved and deemed ethically appropriate with the approval number: SKep/98/KEP/V/2024.
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RESULTS

This study involved 200 Madurese adolescents aged 15 to 19 years with a history of smoking. Based on demographic data, the majority of participants were male (85%), reflecting higher smoking rates among male adolescents compared to females in Sumenep, East Java. In terms of education, most participants were at the high school level. Social factors such as family environment and peer influence played an important role, as adolescents with friends or family members who smoke reported more difficulty quitting. This data underscores the importance of social and cultural factors in influencing smoking cessation behavior within this population. Table 1 is shows that most participants were male (85%) with an age range dominated by adolescents aged 17-18 years (45%). The majority were high school students (60%), and over half had family members or friends who smoke, which may influence their smoking behavior.

Table 1. Distribution of demographic and social characteristics of the Madurese adolescent sample.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	170	85%
	Female	30	15%
Age	15 - 16 years	80	40%
	17 - 18 years	90	45%
	19 years	30	15%
Education Level	Junior High School (SMP)	60	30%
	Senior High School (SMA)	120	60%
	Not Enrolled	20	10%
Family Smoking Status	Family Member Smokes	130	65%
	No Family Member Smokes	70	35%
Peer Influence	Friends Smoke	150	75%
	No Friends Smoke	50	25%

The path analysis results indicate that the intention to quit smoking has a direct and significant impact on smoking cessation behavior among Madurese adolescents (b = 1.56, 95% CI [0.95, 2.17], $p < 0.001$), as shown in Table 2. Adolescents with stronger intention to quit are more likely to succeed compared to those with weaker intentions. There are also significant indirect effects: attitudes (b = 1.05, p = 0.016), perceived behavioral control (b = 1.45, p = 0.001), and subjective norms (b = –1.57, $p < 0.001$) influence cessation behavior through intention. Additional indirect effects stem from awareness of smoking dangers (b = 1.86, $p < 0.001$) and media exposure (b = –0.86, p = 0.008).

The model demonstrated acceptable fit, with a log likelihood of –579.7423, AIC of 1185.485, and BIC of 1228.363. Although traditional SEM fit indices such as RMSEA or CFI were not calculated, these values provide a

basis for evaluating model parsimony and information loss. Future studies are encouraged to complement such analysis with full SEM-based fit indices and report R² values to further enhance interpretability and predictive power.

Table 2. Path analysis results of direct and indirect effects of psychosocial factors on smoking cessation behavior among Madurese adolescents.

Variable	Path Coefficient (b)	Coefficient Interval (CI 95%)		p
		Lower Bound	Upper Bound	
Direct Influence				
Smoking Cessation Behavior ←				
Intention Not to Smoke	1.56	0.95	2.17	<0.001
Indirect Influence				
Intention Not to Smoke ←				
Non-Smoking Attitude Subjective Norm of Non-Smoking	1.05 -1.57	0.19 -2.36	1.91 -0.77	0.016 <0.001
Perceived Behavioral Control of Non-Smoking	1.45	0.58	2.31	0.001
Intention Not to Smoke ←				
Awareness of Smoking Dangers	1.86	1.23	2.49	<0.001
Media Exposure on Smoking	-0.86	-1.49	-0.22	0.008
Perceived Behavioral Control of Non-Smoking ←				
Awareness of Smoking Dangers	1.67	1.06	2.28	<0.001
Subjective Norm of Non-Smoking ←				
Social Capital (Peer Influence)	-0.62	-1.21	-0.04	0.038
Information:				
N observasi = 200	AIC = 1185.485			
Log likelihood = -579.7423	BIC = 1228.363			
←——— : Exposure				

This diagram illustrates the direct and indirect influences between variables in the path analysis model, including the relationships between social capital, attitudes, subjective norms, perceived behavioral control, and smoking cessation behavior as shown in Figure 1. Social capital influences subjective norms, which subsequently impact the intention to quit smoking, while attitudes and perceived behavioral control have indirect effects on intention through their influence on adolescents' confidence and views on quitting smoking.
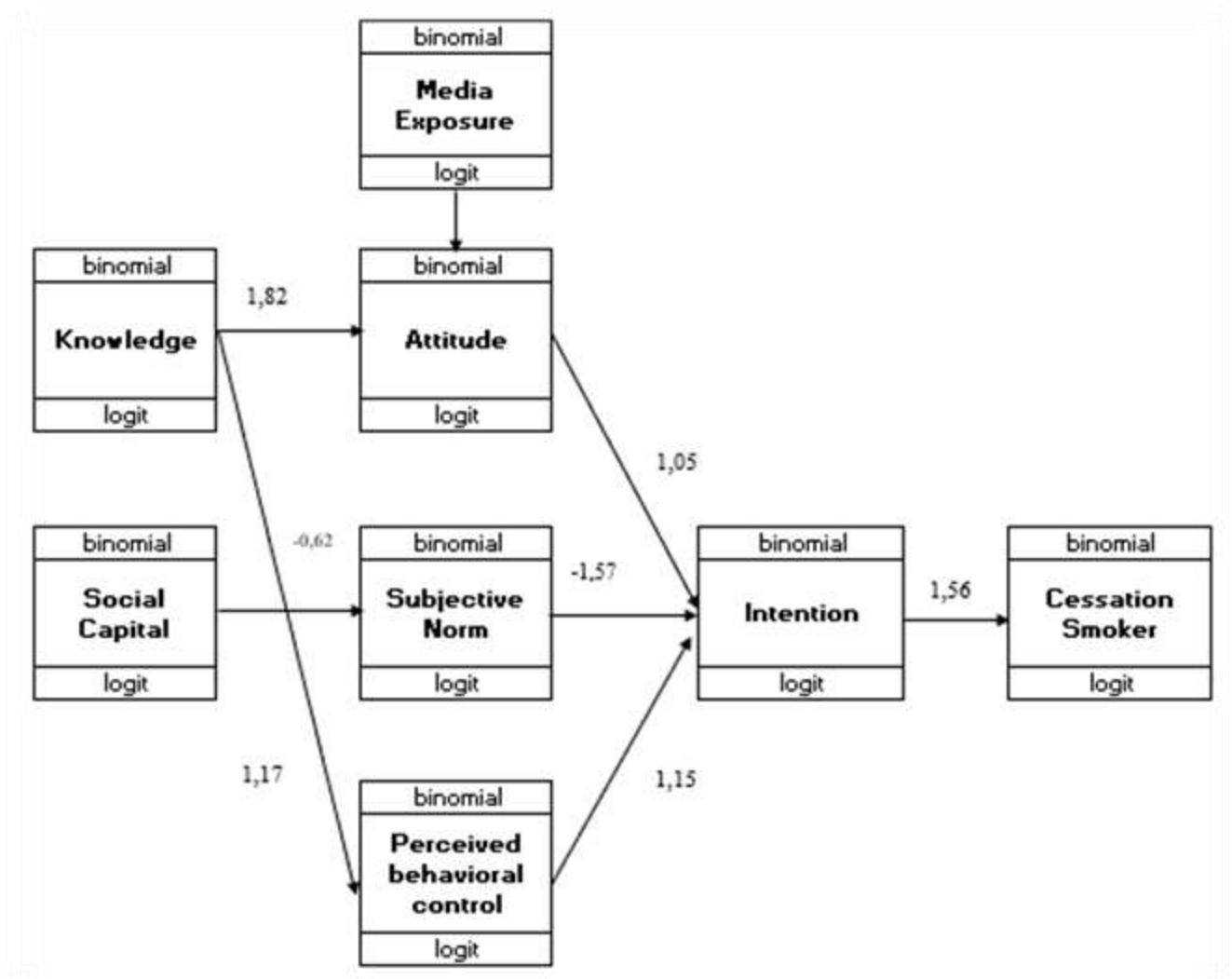
Figure 1. Path analysis model illustrating the direct and indirect influences among variables: social capital, attitudes, subjective norms, perceived behavioral control, and smoking cessation behavior.

DISCUSSION

The results of this study confirm that the intention to quit smoking has a direct and significant influence on the success of smoking cessation among Madurese adolescents. Participants with a strong intention to quit demonstrate a higher likelihood of successfully ceasing smoking compared to those with weaker intentions. This finding aligns with a central premise of the Theory of Planned Behavior (TPB), which posits that intention is a primary predictor of behavioral change (9,10).

In the Madurese cultural context, smoking is more than a personal habit; it is often embedded in social rituals, expressions of masculinity, and peer bonding. Nevertheless, adolescents who internalize the intention to quit driven by family expectations, religious values, or personal health awareness tend to resist peer conformity and sustain cessation efforts. This supports the TPB assertion that intention, when internalized and reinforced by enabling social structures, significantly increases the likelihood of behavior enactment. Moreover, longitudinal evidence from Indonesia indicates that adolescent smoking behavior follows a patterned developmental trajectory, shaped by sociocultural environments. Accordingly, interventions should extend beyond fostering individual intention and be grounded in adolescents' social, cultural, and developmental contexts.

Attitudes toward quitting smoking also show an indirect influence on intention, with adolescents who have a positive outlook on quitting smoking demonstrating stronger intentions. This aligns with TPB, which identifies positive attitudes as a reinforcing factor for individuals to change behavior. These findings are consistent with previous studies demonstrating that a positive attitude can strengthen the intention to quit smoking. However, beyond supporting the traditional TPB framework, the current study highlights how social capital particularly from family and peers acts as a reinforcing mechanism that enhances TPB constructs. For instance, adolescents with strong familial trust and peer encouragement exhibited a more internalized motivation to quit, indicating that social capital not only supports but also contextualizes and expands the explanatory reach of TPB within the sociocultural realities of Madurese youth. Therefore, attitude change may require culturally grounded health education strategies that also leverage these social networks (24).

Subjective norms have a significant impact on the intention to quit smoking. Adolescents who feel social support from family and friends are more likely to have a strong intention to quit (25), indicating that social capital plays a crucial role in supporting the decision to quit smoking. This supports previous views emphasizing that positive subjective norms, supported by strong social capital, can serve as substantial external motivators for behavioral change (26,27). However, without adequate reinforcement from perceived control, social support alone may not be sufficient to drive long-term success.

In addition, perceived behavioral control significantly influences the intention to quit smoking, indicating that adolescents who feel capable of controlling their smoking habits are more likely to have strong intentions to quit. This supports previous studies that highlight the importance of self-efficacy in facilitating smoking cessation intentions (28,29). However, without environmental support and reinforcement from social capital, this perceived control may diminish over time, especially in a cultural environment where smoking is considered common.

The findings of this study have significant implications for designing culturally sensitive smoking cessation interventions among Madurese adolescents. While the traditional TPB framework emphasizes individual cognitive factors such as attitudes, subjective norms, and perceived behavioral control, this study demonstrates that incorporating social capital especially trust, social cohesion, and reciprocal peer support can significantly strengthen and contextualize these constructs. For instance, peer encouragement and familial emotional investment not only reinforce positive norms but also enhance adolescents' confidence and sense of agency in quitting smoking.

Therefore, intervention programs may be more effective when they are not only individual-focused but also socially embedded. A community-based approach that leverages local social structures, such as peer groups, religious leaders, and family units, can amplify perceived behavioral control and reshape subjective norms toward smoking. This integrated model acknowledges that adolescent health behaviors are deeply influenced by communal values, and thus public health programs should incorporate mechanisms to strengthen social capital as a core component of behavior change strategies in culturally embedded contexts like Madura (30).

This study has several limitations. First, the cross-sectional design limits the study's ability to infer causal relationships between variables. Longitudinal research is recommended to understand how attitudes, subjective norms, and perceived behavioral control may change over time and influence the intention and behavior of smoking cessation. Second, this study employs a self-report method, which may be prone to social desirability bias, where participants might report more positive answers regarding their intentions to quit smoking than the reality. This limitation aligns with similar studies showing that self-report methods among adolescent populations are prone to bias.

Finally, the study is limited to a sample of adolescents in Sumenep, Madura, with specific cultural norms and social environments. This limitation may mean that the study results are not generalizable to other adolescent populations in Indonesia, who may have different values and social norms. To increase generalizability, future research is recommended to involve a broader sample from various regions in Indonesia.

CONCLUSION

This study demonstrates that the intention to quit smoking is the primary factor directly influencing the success of smoking cessation behavior among Madurese adolescents. These findings align with the Theory of Planned Behavior (TPB), which states that intention serves as the main predictor in behavioral change. Positive attitudes toward quitting smoking, social support from close environments (subjective norms), and perceived behavioral

control significantly contribute to strengthening adolescents' intentions to quit. The role of social capital, particularly through peer and family support, reinforces social norms and perceived behavioral control, ultimately supporting the success of the intention to quit smoking. This highlights the importance of social environmental influence in creating motivation and confidence to overcome smoking addiction, especially within the strong cultural context of Madura.

The implications of these findings underscore the importance of designing smoking cessation intervention programs that focus on strengthening social capital, family support, and enhancing perceived control and positive attitudes toward quitting smoking. Community-based approaches involving family and peer support are expected to improve the effectiveness of intervention programs, particularly within the local cultural context. Nevertheless, this study has limitations, namely the cross-sectional design that restricts causal conclusions and the use of self-report methods that may be prone to bias. Future longitudinal studies involving broader samples from various cultural regions in Indonesia are necessary to increase generalizability and explore the dynamics of intention and smoking cessation behavior changes among adolescent populations.

AUTHOR'S CONTRIBUTION STATEMENT
SR contributed to the conceptual framework, research design, data collection, statistical analysis, and led the drafting, editing, and final review of the manuscript. M participated in the development of the study design, provided input on data interpretation, and was actively involved in the writing and revision of the manuscript. SAM assisted with the refinement of the methodology, contributed to the literature review, and supported the manuscript editing and review process. MF was responsible for managing and analyzing data and contributed to the preparation and formatting of the final manuscript.

CONFLICTS OF INTEREST
The authors affirm that there are no competing interests associated with the content of this article.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS
The authors acknowledge the use of ChatGPT, a generative AI tool developed by OpenAI, to assist in translating content from Indonesian to English during the manuscript preparation. All translated material has been thoroughly reviewed and validated by the authors to ensure its accuracy and integrity.

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