

Associations Between Social Support, Health Belief Model Constructs, and Smoking Cessation Among Patients Attending a Smoking Cessation Clinic in Surakarta, Central Java, Indonesia

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Received: 20 May 2026; Accepted: 24 June 2026; Available online: 16 July 2026

ABSTRACT

Background: Smoking behaviour is a major health problem in Indonesia, with a high prevalence rate. The decision to quit smoking is influenced by various factors, including social support and components of the Health Belief Model (HBM). However, the direct and indirect mechanisms through which social support and HBM components influence smoking behaviour remain incompletely understood, particularly among patients attending smoking cessation clinics. Understanding these factors is crucial for improving the success of smoking cessation programmes.

Subjects and Method: This analytical observational study employed a case-control design involving patients at the Surakarta Smoking Cessation Clinic from September 2025 to November 2025. Data were collected using structured questionnaires and analysed using logistic regression and generalized structural equation modeling (GSEM) to evaluate the direct and indirect effects between variables.

Results: Self-efficacy had a positive effect on smoking cessation ($b = 1.23$; 95% CI = 0.60 to 1.85; $p < 0.001$). Perceived susceptibility ($b = 0.66$; 95% CI = 0.05 to 1.27; $p = 0.034$) and perceived benefit ($b = 0.63$; 95% CI = 0.001 to 1.26; $p = 0.050$) have a positive effect on smoking cessation, whilst perceived barriers have a negative effect on smoking cessation ($b = -0.70$; 95% CI = -1.30 to -0.09; $p = 0.025$). Cues to action had a positive effect on self-efficacy ($b = 0.73$; 95% CI = 0.16 to 1.31; $p = 0.013$). Social support positively influenced cues to action ($b = 1.85$; 95% CI = 1.21 to 2.49; $p < 0.001$) and perceived benefits ($b = 1.00$; 95% CI = 0.42 to 1.59; $p = 0.001$). Social support influences smoking cessation indirectly through cues to action, perceived benefits, and self-efficacy.

Conclusion: Smoking cessation is influenced by the interaction between social support and the components of the Health Belief Model, with self-efficacy being the most dominant factor. Social support plays an indirect role by increasing cues to action, perceived benefits, and self-efficacy; therefore, strengthening these factors is important in improving the success of smoking cessation.

Keywords: smoking cessation, social support, Health Belief Model, Generalized Structural Equation Model

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Cite this as:

Timoer SAK, Apriningsih H, Murti B, Aphridasari J, Setijadi AR (2026). Associations Between Social Support, Health Belief Model Constructs, and Smoking Cessation Among Patients Attending a Smoking Cessation Clinic in Surakarta, Central Java, Indonesia. *J Health Promot Behav.* 11(03): 307-317. <https://doi.org/10.26911/thejhp.2026.11.03.01>.



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BACKGROUND

Smoking is the act of inhaling smoke produced by the combustion of tobacco via cigarettes or pipes (Rohadatul & Surjaningum, 2021). The World Health Organization (WHO) states that tobacco use causes more than 8 million deaths each year, including approximately 1.2 million deaths due to exposure to second-hand smoke (World Health Organization, 2023). Indonesia has one of the highest smoking prevalences globally and ranks third in the number of active smokers after China and India (Global Smoking and Tobacco Harm Reduction Database, 2025).

Data from the Central Statistics Agency in 2023 showed a smoking prevalence of 28.62% among the population aged 15 years and over, whilst around 20% of adolescents aged 13–15 years are active smokers. The high prevalence of smoking contributes to an increased burden of non-communicable diseases, a decline in quality of life, and rising healthcare costs due to tobacco-related illnesses (World Health Organization, 2023). Consequently, smoking cessation efforts are a key strategy in the prevention and control of non-communicable diseases.

Smoking cessation is an effort to help individuals stop smoking and overcome nicotine dependence (Fitriani, Harlivasari and Susanto, 2024). However, the success of smoking cessation still faces various challenges, including high levels of nicotine dependence, low social support, high perceived barriers, a strong smoking culture, and limited access to smoking cessation services (King et al., 2018). Effective smoking cessation programmes generally use the 5A and 4T approaches to improve patients' readiness, motivation,

and success in quitting smoking (Fitriani, Harlivasari and Susanto, 2024). In addition to clinical interventions, social support from family, friends, and the surrounding community also plays a crucial role in improving the success of smoking cessation (Saudi et al., 2024; Ayuningtyas et al., 2021)

One widely used approach to explain health behaviour change is the Health Belief Model (HBM) (Rosenstock, 1974; Becker, 1978). This model explains that an individual's decision to undertake a health-related action is influenced by their perception of disease susceptibility, their perception of the severity of the disease, perceived benefits of the health behavior, perceived barriers to the behavior, cues to action, and an individual's belief in their ability to change behavior (self-efficacy) (Rosenstock, 1974; Becker, 1978). In the context of smoking cessation, individuals who have a high perception of the health risks associated with smoking, understand the benefit of quitting, and possess strong self-efficacy tend to be more successful in maintaining abstinence (Pribadi & Devy, 2020; Aderita et al., 2023; Lepore et al., 2019). Conversely, a high perception of barrier can reduce motivation and decrease the likelihood of successful smoking cessation (Nisriina et al., 2024.).

Although various studies have reported the relationship between the constructs of the Health Belief Model and smoking behaviour, as well as the role of social support in health behaviour change, most studies still evaluate these factors separately. Furthermore, study analyzing the direct and indirect relationships between social support and all constructs of the Health Belief Model within a single

integrated analytical model remains limited, particularly among patients participating in Smoking Cessation Clinic programmes in Indonesia.

This study offers added value by simultaneously evaluating the relationships between social support, perceived susceptibility, perceived severity, perceived benefit, perceived barrier, cues to action, and self-efficacy using the Generalised Structural Equation Modelling (GSEM) approach. This approach allows for the identification of both direct and indirect pathways of influence between variables, thereby providing a more comprehensive understanding of the factors influencing smoking behaviour among patients at the Surakarta Smoking Cessation Clinic. Based on this background, this study aims to analyse the influence of social support and the Health Belief Model on smoking behaviour among patients at the Surakarta Smoking Cessation Clinic.

SUBJECTS AND METHOD

1. Study Design

This analytical observational study employed a case-control design to examine the influence of social support and Health Belief Model constructs on smoking behavior among patients attending the Surakarta Smoking Cessation Clinic

2. Population and Sample

The study population comprised all patients participating in the smoking cessation programme at the Surakarta City Smoking Cessation Clinic. The sample was selected using consecutive sampling in accordance with the study's inclusion and exclusion criteria. A total of 200 respondents were involved in this study, comprising 100 active smokers and 100 former smokers. The group of former smokers was categorised as the case group, whilst the

group of active smokers was categorised as the control group.

3. Study Variables

The dependent variable in this study was smoking behaviour. The independent variables included social support, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

4. Operational Definition of Variables

Social support is an individual's perception of the availability and adequacy of support received from family members, friends, and significant others.

Perceived susceptibility refers to an individual's belief regarding their likelihood of experiencing health problems or diseases related to smoking

Perceived severity is defined as an individual's belief regarding the seriousness and potential consequences of smoking-related diseases and their impact on physical and social functioning

Perceived benefit refer to an individual's belief that smoking cessation provides positive outcomes, including health improvement and reduced risk of smoking-related diseases.

Perceived barrier are an individual's perceptions of obstacles or difficulties encountered in attempting to quit smoking, including physical, psychological, and social challenges

Cues to action refer to internal or external stimuli that trigger an individual to initiate or maintain smoking cessation behavior, such as advice from health professionals, encouragement from family members, and exposure to health information

Self-efficacy is defined as an individual's confidence in their ability to quit smoking and maintain smoking abstinence despite challenges and temptations.

Smoking behaviour refers to an individual's pattern of tobacco use, including the continuation or cessation of smoking.

5. Study Instruments

Data were collected using a structured questionnaire covering respondent characteristics, social support, and the constructs of the Health Belief Model. Social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS), which has been widely used to measure perceptions of social support from family, friends, and significant others (Saudi et al., 2024). The constructs of the Health Belief Model—comprising perceived susceptibility, perceived severity, perceived benefit, perceived barrier, cues to action, and self-efficacy—were measured using an instrument developed based on the Health Belief Model (Rosenstock, 1974; Becker, 1978).

6. Data analysis

Data analysis was conducted in stages. Descriptive analysis was used to describe the characteristics of the respondents. Numerical data were presented as means and standard deviations (mean ± SD), whilst categorical data were presented as

frequencies and percentages. Multivariate analysis was conducted using generalized structural equation modeling (GSEM).

RESULTS

1.Characteristics of the Study Participants

As presented in Table 1, the proportions of current smokers and former smokers were equal, with each group comprising 100 respondents (50.0%). The most common educational attainment was senior high school, accounting for 74 respondents (37.0%). Regarding occupation, private employees constituted the largest group, with 54 respondents (27.0%), followed by entrepreneurs with 46 respondents (23.0%) and laborers with 38 respondents (19.0%). Based on the distribution of primary healthcare centres, the largest proportion of respondents was recruited from Gilingan Primary Healthcare Centre with 48 respondents (24.0%), followed by Sibela with 44 respondents (22.0%), Pajang 42 with respondents (21.0%), Penumping with 36 respondents (18.0%), and Sangkrah with respondents (15.0%).

Table 1. Respondent Characteristics (Categorical Variables)

Characteristic	Category	n	Percentage (%)
Smoking Status	Current Smoker	100	50.0
	Former Smoker	100	50.0
Education Level	Elementary School	32	16.0
	Junior High School	38	19.0
	Senior High School	74	37.0
	Diploma	24	12.0
	Bachelor's Degree	26	13.0
	Master's Degree	6	3.0
Occupation	Civil Servant	22	11.0
	Private Employee	54	27.0
	Entrepreneur	46	23.0
	Laborer	38	19.0
	Student	12	6.0
	Unemployed	28	14.0
Primary Healthcare Centre	Gilingan	48	24.0
	Sibela	44	22.0
	Pajang	42	21.0

Characteristic	Category	n	Percentage (%)
	Penumping	36	18.0
	Sangkrah	30	15.0

Table 2 presents the descriptive statistics of the continuous study variables. The respondents' age ranged from 30 to 70 years. Social support scores ranged from 28 to 72. The scores for perceived susceptibility, per-

ceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy ranged from 20 to 35, 21 to 35, 20 to 35, 5 to 20, 22 to 35, and 20 to 35, respectively.

Table 2. Descriptive Statistics of Study Variables (Continuous Variables)

Variable	Mean	SD	Min.	Max.
Age (years)	52.10	14.92	30	70
Social Support	51.75	9.16	28	72
Perceived Susceptibility	27.68	3.35	20	35
Perceived Severity	29.10	3.41	21	35
Perceived Benefits	29.18	3.38	20	35
Perceived Barriers	8.14	2.52	5	20
Cues to Action	30.36	3.08	22	35
Self-Efficacy	29.78	3.49	20	35

2. Multivariate Analysis

Structural relationships among social support, Health Belief Model constructs, and smoking cessation

The structural model showed that smoking cessation behaviour was directly influenced by self-efficacy, perceived susceptibility, perceived benefits, and perceived barriers. Self-efficacy was influenced by cues to action, whereas cues to action was influenced by social support. Social support also influenced perceived benefits.

Figure 1 presents the path diagram of the structural relationships among social support, Health Belief Model constructs, and smoking cessation behaviour among adult patients with respiratory diseases. The model demonstrated that social support indirectly influenced smoking cessation behaviour through cues to action, perceived benefits, and self-efficacy.

The results of the Generalised Structural Equation Modelling (GSEM)

analysis indicate that self-efficacy has a positive and significant effect on smoking behavior. Furthermore, perceived susceptibility also has a positive effect on smoking behavior. Perceived benefits had a positive effect on smoking behaviour.

Conversely, perceived barriers had a negative effect on smoking behavior. These findings indicate that higher perceived barriers reduce the likelihood of successful smoking cessation.

In the mediation pathway, cues to action had a positive effect on self-efficacy. Social support had a positive effect on cues to action and perceived benefits and perceived benefits.

The GSEM model indicates that social support does not have a direct effect on smoking behaviour but exerts an indirect effect via increased cues to action, perceived benefits, and self-efficacy.

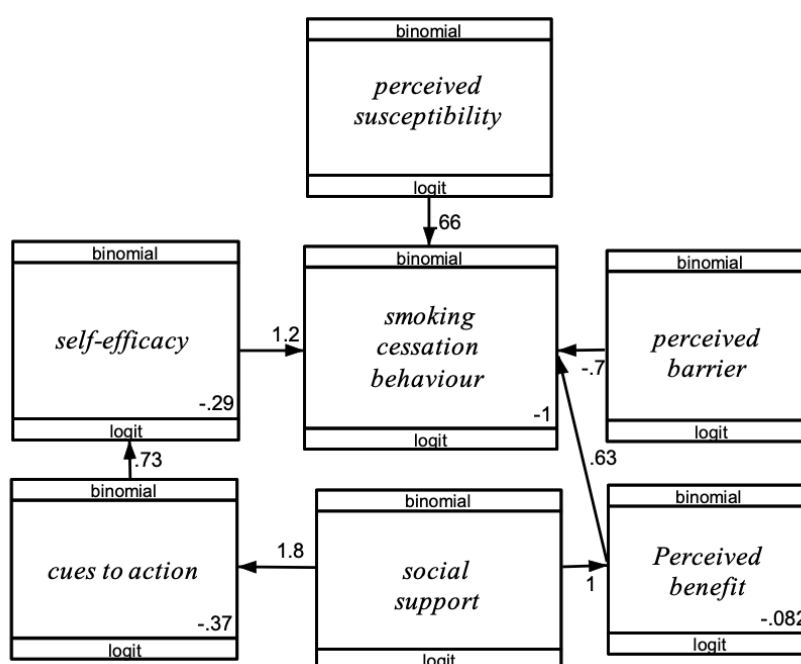


Figure 1. Path diagram of factors associated with smoking cessation using the Health Belief Model

Table 3 presents the results of the generalized structural equation modelling (GSEM) analysis of factors associated with smoking cessation behaviour among adult patients with respiratory diseases. Smoking cessation behaviour was directly associated with self-efficacy ($b=1.23$; 95% CI=0.60 to 1.85; $p<0.001$), perceived susceptibility ($b=0.66$; 95% CI=0.05 to 1.27; $p=0.034$), perceived benefits ($b=0.63$; 95% CI=0.001 to 1.26; $p=0.050$), and perceived barriers ($b=-0.70$; 95% CI=-1.30 to -0.09; $p=0.025$). Self-efficacy was positively influenced by cues to action ($b=0.73$; 95% CI=0.16 to 1.31; $p=0.013$). In addition, social support had significant positive effects on cues to action ($b=1.85$; 95% CI=1.21 to 2.49; $p<0.001$)

These findings indicate that self-efficacy was the strongest determinant of

smoking cessation behaviour, as evidenced by the largest regression coefficient among the direct predictors. Individuals with higher perceived susceptibility and perceived benefits were more likely to engage in smoking cessation behaviour, whereas greater perceived barriers reduced the likelihood of smoking cessation. Furthermore, social support contributed indirectly to smoking cessation behaviour by enhancing cues to action and perceived benefits, which subsequently strengthened self-efficacy. Overall, the findings support the Health Belief Model by demonstrating that both individual cognitive perceptions and social support influence smoking cessation behaviour through interconnected pathway.

Table 3. Results of generalized structural equation modeling of factors associated with smoking cessation

Dependent Variable	Independent Variable	b	95% CI		p
			Lower Limit	Upper Limit	
Direct effect					
Smoking cessation	← High self-efficacy	1.23	0.60	1.85	<0.001
	← High perceived susceptibility	0.66	0.05	1.27	0.034
	← High perceived benefits	0.63	0.00	1.26	0.050
	← High perceived barriers	-0.70	-1.30	-0.09	0.025
Indirect effect					
High self-efficacy	← High Cues to Action	0.73	0.16	1.31	0.013
High Cues to Action	← High social support	1.85	1.21	2.49	<0.001
High perceived benefits	← High social support	1.00	0.42	1.59	0.001
N observation = 200					

DISCUSSION

Association between social support and smoking cessation

This study indicates that social support does not have a direct effect on smoking cessation. However, social support has a positive effect on cues to action and perceived benefits, which in turn influence self-efficacy and smoking cessation. These findings suggest that the role of social support in the smoking cessation process does not operate directly, but rather through cognitive mechanisms that encourage individuals to make behavioral changes.

Social support may enhance awareness of the benefits of quitting smoking and strengthen motivation to initiate cessation efforts. The results of this study support the concept that social factors are external factors that can influence the health decision-making process by enhancing positive perceptions of the behaviour to be undertaken (Ayuningtyas et al., 2021; Saudi et al., 2024). These findings indicate that social support acts as a reinforcing factor that helps individuals maintain motivation and commitment throughout the smoking cessation process.

Association between Health Belief Model constructs and smoking cessation

This study indicates that perceived susceptibility has a positive influence on smoking cessation. Individuals who feel more vulnerable to smoking-related illnesses tend to have greater motivation to quit smoking. This finding is consistent with the study by Pribadi & Devy (2020), which reported that perceptions of vulnerability to the health impacts of smoking are associated with the intention to quit smoking. Similar findings were also reported by Rohadatul & Surjaningum, (2021) who demonstrated that perceptions of health risks play a role in encouraging individuals to make changes to their health behavior. These findings are consistent with the Health Belief Model, which states that perceived vulnerability is one of the main factors driving an individual to take preventive action against health problems (Rosenstock, 1974; Becker, 1978).

Perceived benefits also have a positive influence on smoking cessation behaviour. Individuals who believe that quitting smoking will provide health, social, or economic benefits tend to be more motivated to maintain their smoking

cessation behaviour. Conversely, perceived barriers have a negative influence on smoking cessation behavior. Barriers experienced during the process of quitting smoking can reduce motivation and decrease the likelihood of successfully stopping the habit. These findings support the core concept of the Health Belief Model, which states that an individual's decision to undertake a health-related action is influenced by the balance between perceived benefits and perceived barrier (Rosenstock, 1974; Becker, 1978). Although perceived severity does not show a direct relationship with smoking cessation behaviour in the final model, this construct still plays a role in the behavioural change process through its relationship with cues to action, as described within the Health Belief Model framework. According to Rosenstock, (1974) and Becker, (1978), perceptions regarding the severity of a disease can increase an individual's readiness to receive health information and respond to various action cues that support behavioural change.

Association between self-efficacy and smoking cessation

Self-efficacy emerged as the factor most strongly associated with smoking cessation behaviour, highlighting the importance of individuals' confidence in their ability to quit smoking for achieving successful behavioral change. Individuals with high self-efficacy are more likely to resist relapse, maintain abstinence, and overcome challenges encountered during the cessation process. Recent evidence from ecological momentary assessment research suggests that maintaining high and stable levels of self-efficacy during a quit attempt is associated with increased smoking cessation outcomes, highlighting the dynamic role of self-efficacy throughout the cessation process (Hopkins et al., 2022). These

finding are also consistent with Aderita, Ningsih and Yuliyanti (2023), who reported that self-efficacy is associated with the intention to quit smoking. Similarly, Lepore et al. (2019) identified self-efficacy as a major predictor of successful smoking cessation and sustained long-term abstinence, while a meta-analysis by Gwaltney et al. (2009) confirmed the robustness of this association across diverse populations and study settings.

Within the framework of the Health Belief Model, self-efficacy serves as a key determinant that enables individuals to translate perceptions of risk, benefits, and barriers into concrete action (Becker, 1978; Fitriani et al., 2024).

This theoretical perspective is further reinforced by Strecher et al. (1986), who emphasised that confidence in one's ability to perform a recommended behaviour is essential for initiating and maintaining health behaviour change despite perceived obstacles. The strong association observed in this study suggests that smoking cessation interventions should focus not only on increasing awareness of the health risks associated with smoking but also on strengthening individuals' confidence in their ability to quit. Strategies such as behavioural counselling, skills training, peer support, and continuous encouragement from healthcare providers may enhance self-efficacy and ultimately improve smoking cessation outcomes among patients with respiratory diseases.

Association between social support and the Health Belief Model construct

This study demonstrates that smoking cessation behavior is influenced by the interaction between social and cognitive factors. Social support acts as an external factor that enhances cues to action and perceived benefits, whilst self-efficacy acts

as an internal factor that directly influences smoking cessation behavior.

The findings support the Health Belief Model, which proposes that health-related behaviours are influenced by perceptions of susceptibility, benefits, barriers, cues to action, and self-efficacy (Rosenstock, 1974; Becker, 1978). In the present study, social support strengthened cues to action and perceived benefits, which subsequently enhanced self-efficacy as the strongest predictor of smoking cessation behaviour. These results indicate that social support contributes to smoking cessation not through a direct pathway but through its influence on cognitive and motivational factors that facilitate behavioural change.

These findings are also consistent with the PRECEDE-PROCEED Model, which emphasises that health behaviour is shaped by the interaction of predisposing, enabling, and reinforcing factors (Green and Kreuter, 2005). Furthermore, the World Health Organization, (2023) highlights the importance of supportive environments and behavioural interventions in improving smoking cessation outcomes. The use of Generalised Structural Equation Modelling (GSEM) in this study enabled the simultaneous examination of direct and indirect relationships among social support and Health Belief Model constructs, providing a more comprehensive understanding of the mechanisms underlying smoking cessation behavior among patients attending smoking cessation clinics.

The findings of this study have important implications for the development of smoking cessation programmes, particularly among patients with respiratory diseases. Interventions should not be limited to providing information about the health risks of smoking but should also focus on strengthening self-efficacy, enhancing soci-

al support, increasing perceived benefits of smoking cessation, and promoting cues to action that encourage sustained behavioural change. These strategies are consistent with evidence-based smoking cessation recommendations that emphasise the integration of behavioral counselling, social support, and motivational approaches to improve smoking cessation outcomes (United States Public Health Service Office of the Surgeon General & National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2020; Vanfrank & Presley-Cantrell, 2021; Fitriani et al., 2024).

In addition, recent evidence suggests that interventions targeting cognitive beliefs and motivational processes may further strengthen individuals' intention to quit smoking and support sustained behavior change (Hong et al., 2024).

Healthcare providers, family members, and community support systems may therefore play an important role in reinforcing smoking cessation efforts and maintaining long-term abstinence.

This study utilised data obtained via self-report questionnaires, meaning the possibility of recall bias or social desirability bias cannot be ruled out. Furthermore, the case-control design employed does not allow researchers to draw direct causal conclusions. The research model also only included the variables under investigation, meaning there remains the possibility of other factors outside the model influencing smoking cessation behaviour.

FINANCIAL SUPPORT AND SPONSORSHIP

This research was entirely self-funded by the researcher without any financial support from institutions, sponsors, or other parties.

ACKNOWLEDGEMENT

The author would like to express sincere gratitude to all patients at the Smoking Cessation Clinic of Dr. Moewardi General Hospital, Surakarta, for their willingness to participate in this study.

CONFLICT OF INTEREST

The authors declare that the study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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