Determinants of Successful Smoking Cessation in Surakarta, Central Java

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ABSTRACT

Background: Smoking cessation is a difficult effort since the smoker has to fight against tobacco addiction. Tobacco addiction is a behavioral, cognitive, and physiological phenomenon that causes the affected individual psychologically and physiologically dependent. This study aimed to analyze the determinants of successful smoking cessation using health belief model (HBM), PRECEDE-PROCEED model, and theory of planned behavior (TPB).

Subjects and Methods: This was an analytic observational study with a cross-sectional design. It was conducted in Surakarta, in December 2017, with a sample of 165 study subjects consisting of 68 ex-smokers who were successful and 97 smokers who were unsuccessful in smoking cessation. The sample was selected by snowball sampling. The dependent variable was smoking cessation. The independent variables were intention to quit smoking, attitude toward smoking cessation, outcome expectation, addiction, stress, perceived behavioral control (PBC), subjective norm, social support, family income, purchasing power, smoking duration, and access to a cigarette. The data were collected using questionnaire and analyzed using path analysis.

Results: Successful smoking cessation was positively affected by strong intention (b= 2.39, SE= 0.51, p <0.001). Successful smoking cessation was negatively affected by duration of smoking (≥10 years) (b= -3.46; SE= 0.57; p <0.001) and easy access to cigarettes (b= -1.28; SE= 0.52; p= 0.008). Intention to quit smoking was increased by positive attitude (b = 0.79, SE= 0.39, p= 0.046), positive subjective norm (b= 1.38; SE= 0.40; p= 0.001), and strong PBC (b= 1.89, SE= 0.40; p<0.001). The intention to quit smoking was decreased by high purchasing power (b= -1.23; SE= 0.39; p= 0.002). PBC was decreased by duration of smoking (≥10 years) (b= -2.32; SE= 0.47; p<0.001) and addiction (b= -2.96; SE= 0.49; p<0.001). PBC was increased by positive outcome expectation (b= 1.04; SE= 0.49; p= 0.035). Positive attitude was increased by positive expectation outcome (b= 1.09; SE= 0.34; p= 0.001). Both positive subjective norm (b= 0.77; SE = 0.33; p= 0.020) and positive outcome expectation (b= 0.77; SE= 0.33; p= 0.020) were increased by social support. Smoking duration was increased by stress (b= 0.09; SE= 0.04; p= 0.018). Cigarette purchasing power was increased by high income (b=2.78; SE= 1.43; p= 0.053).

Conclusion: Intention to quit smoking increases the likelihood of successful of smoking cessation. Smoking duration, stress, and access to a cigarette decrease the likelihood of successful smoking cessation. Successful smoking cessation is indirectly affected by attitude, addiction, PBC, subjective norm, social support, outcome expectation, family income, and purchasing power.

Keyword: smoking cessation, HBM, PRECEDE-PROCEED, TPB

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BACKGROUND

Smoking is the second most important risk factor for cardiovascular disease around the world (Murray and Lopez, 2013). It causes premature death around 5.4 million annually. It is estimated that in the year

2030, there will be 7.4 to 9.7 million smoking attributable deaths (WHO, 2008).

The cigarette smoke exposure effect negatively to the lifelong health. The previous study revealed that smoking can increase the risk of stillbirth, congenital defects in fetus, sudden infant death syndrome (SIDS), respiratory illness in children, adolescents, and adults. This will be even worse when the smokers are over 30 years old. It will raise the risk of death due to cardiovascular disease (heart disease and stroke). While, when the smokers are younger, it will enhance the risk of cancer, especially lung cancer, and in a long-term is at risk of death from a respiratory illness (Cook et al. 2016).

Based on WHO data, Indonesia is the world's third-largest smoking country after China and India. The increased of cigarette consumption impacts on a higher number of smoking-caused illness and death (Indonesian Health Ministry, 2016). The smokers' prevalence in Indonesia by 2015 was 76.2% (WHO, 2016).

Smoking cessation is not an easy endeavor as tobacco addiction is behavioral, cognitive and physiological phenomena. Very few of the addicts successfully quit on the first attempt, but it is not impossible (WHO, 2017).

Smoking cessation is a complex behavior. This is affected by internal and external factors. The previous study using Health Belief Model (HBM) theory tended to focus only on the external factors and did not cover all smoking cessation behavior components. Therefore, it is necessary to employ other theories suspected relate to this behavior, like PRECEDE-PROCEED Theory, Health Determinant Theory, and Theory of Planned Behavior (TPB).

Those explanations underline that the success of smoking cessation will improve the individual as well as social health quality. Hence, the researcher conducted a research dealing with determinants of successful smoking cessation in Surakarta employing Health Belief Model (HBM) theory, PRECEDE-PROCEED Theory, Health Determinant Theory, and Theory of Planned Behavior (TPB).

SUBJECTS AND METHOD

1. Study Design
This was an analytic observational study with a cross-sectional design conducted in Surakarta, Central Java, in December 2017.

2. Population and Sample
The study population was men, smokers, and ex-smokers, in the range of 40 to 60 years old in Surakarta. A sample of 165 study subjects consisting of 68 ex-smokers who were successful and 97 smokers who were unsuccessful in smoking cessation, was selected for this study by snowball sampling.

3. Study Variables
The dependent variable was smoking cessation. The independent variables were social support, outcome expectation, perceived behavioral control (PBC), subjective norm, family income, purchasing power, smoking duration, intention to quit smoking, addiction, access to a cigarette, and stress.

4. Operational Definition of Variable
Successful smoking cessation was defined as the state of the study subjects who have stopped smoking measured by the condition of the smoking cessation study subject.

Social support was defined as the support from people around research subjects (family, colleagues, and society) considered to influence the success of smoking cessation.

Outcome expectation was defined as the expectation that illustrates the ability of the subjects to anticipate and consider the benefits gained after smoking cessation.

Perceived Behavioral Control was defined as the belief of the subjects about the ease and difficulties in successful smoking cessation.

Subjective norm was defined as the confidence of the subjects towards others' expectation influencing the decision of the subject in smoking cessation.

Family income was defined as the subjects' average monthly income compared to regional minimal wages in Surakarta in 2017.

Purchasing power was defined as the subjects' ability to buy a cigarette.

Smoking duration was defined as the length of time spent by the subjects to smoke, from the first time smoking up to the time of data collection.

The intention was defined as the subjects' tendency to quit smoking or not.

Addiction was defined as the physical and psychological addiction level of the subjects towards cigarette measured using questionnaire.

Access to cigarette was defined as the subjects' ease of buying cigarette assessed through the interview.

Stress was defined as the subjects' response level to the conditions considered disruptive.

5. Study Instruments
Data collection was carried out using reliability tested questionnaire. The reliability test was conducted using Alpha Cronbach test to 20 study subjects. The result is shown in Table 1.

Table 1. The Research Questionnaire's Reliability Test Results

No.	Variable	Item total correlation	Cronbach's Alpha
1.	Social Support	≥0.22	0.71
2.	Intention	≥0.39	0.72
3.	Perceived Behavioral Control	≥0.24	0.72
4.	Subjective norm	≥0.48	0.86
5.	Attitude	≥0.36	0.76
6.	Access to cigarette	≥0.24	0.77
7.	Purchasing power	≥0.35	0.85
8.	Outcome expectation	≥0.31	0.77
9.	Attitude toward smoking cessation	≥0.49	0.77
10.	Stress	≥0.29	0.76

6. Data Analysis
The results of characteristic analysis of the research subjects and univariate analysis in form of categorical or dichotomy data were described in frequency (n) and percentage (%). Bivariate analysis was conducted using Chi-Square test. Multivariate analysis using path analysis was done by SPSS Stata program. The stages were as follows:
a. Model Specification.
b. Model Identification.
c. Model Fit.
d. Estimation.
e. Model Re-specification.

7. Research Ethics
The research ethics clereance for this study was obtained from the Research Committee at Dr. Moewardi Hospital. Research ethics included informed consent, anonimity, and confidentiality.

RESULTS
1. Study Subjects' Characteristics
Most of the research subjects accomplished undergraduate program (32.1%), while there were also a big number of subjects worked as an entrepreneur (23.6%) (Table 2).

Table 2. Study Subjects Characteristics

Characteristics	N	%
Education		
Failing Primary School	2	1.2
Primary School	23	13.9
Middle School	42	25.5
High School	24	14.5
Vocational School	4	2.4
Diploma	14	8.5
Undergraduate	53	32.1
Postgraduate	3	1.8
Occupation		
Blue-collar	20	12.1
Teacher	8	4.8
Trader	23	13.9
Civil Servants	30	18.2
Police	6	3.6
Private	25	15.2
Farmer	12	7.3
Army	2	1.2
Entrepreneur	39	23.6

2. Univariate Analysis

The percentage of the research subjects succeed smoking cessation was 58.8%. Those who earned ≥minimum regional wage was 59.4%. About 52.7% subjects had been smoking ≥10 years. In addition, there were 55.2% subjects possessing high purchasing powers (Table 3).

3. Bivariate Analysis

The relationship of each independent variable toward successful smoking cessation behavior using Chi-Square test is shown in Table 4. Table 4 showed the relationship of each independent variable toward successful smoking cessation behavior using Chi-Square test.

It was learned that if outcome expectation and perceived behavioral control were positive, smoking cessation would likely to succeed. Meanwhile, if family income and purchasing power were high, plus it was easy to get a cigarette, the smoking cessation would likely to fail (Table 4).

Table 3. Univariate Analysis

Characteristics	N	%
Income		
< Minimum Regional Wage	67	40.6
≥ Minimum Regional Wage	98	59.4
Smoking duration		
<10 years	78	47.3
≥10 years	87	52.7
Purchasing power		
Low (score<3)	74	44.8
High (score ≥3)	91	55.2
Outcome expectation		
Low (score<3)	55	33.3
High (score ≥3)	110	66.7
Perceived Behavioral Control		
Low (score<4)	87	52.7
High (score ≥4)	78	47.3
Access to cigarette		
Difficult (score<4)	79	47.9
Easy (score ≥4)	86	52.1
Successful Smoking Cessation		
Fail (score<4)	68	41.2
Succeed (score ≥4)	97	58.8
Stress		
Severe (score<19)	81	49.1
Light (score ≥19)	84	50.9
Intention		
Low (score<4)	83	50.3
High (score ≥4)	82	49.7
Attitude		
Negative (score<4)	70	42.4
Positive (score ≥4)	95	57.6
Addiction		
Light (score<6)	71	43.0
Severe (score ≥6)	94	57.0
Subjective norm		
Negative (score<5)	87	52.7
Positive (score ≥5)	78	47.3
Social support		
Weak (score <6)	62	37.6
Strong (score ≥6)	103	62.4

4. Path Analysis

The relationship among variables is shown by model specification on Figure 1. Model specification on figure 1 shows the relationship among variables. Model identification was conducted by measuring the degree of freedom (df) score. The first model score was 24, therefore the path analysis could be done.

Table 4. Bivariate analysis of successful smoking cessation determinants

Variable	Fail n	Fail %	Succeed N	Succeed %	Total n	Total %	OR	p
Income (Rp)								
<Regional Minimum Wages	25	37.3	42	62.7	67	100	0.76	0.425
≥ Regional Minimum Wages	43	43.9	55	56.1	98	100		
Smoking duration								
<10 year	20	27.0	54	73.0	74	100	0.33	0.001
≥10 year	48	52.7	43	47.3	91	100		
Purchasing power								
Low (score<3)	32	58.2	23	41.8	55	100	2.86	0.002
High (score ≥3)	36	32.7	74	67.3	110	100		
Outcome expectation								
Low (score<3)	62	71.3	25	28.7	87	100	29.76	<0.001
High (score ≥3)	6	7.7	72	92.3	78	100		
Perceived Behavioral Control								
Low (score<4)	22	27.8	57	72.2	79	100	0.34	0.001
High (score ≥4)	46	53.5	40	46.5	86	100		
Access to cigarette								
Difficult (score<4)	25	30.9	56	69.1	81	100	0.43	0.011
Easy (score ≥4)	43	51.2	41	48.8	84	100		
Successful Smoking Cessation								
Fail (score<4)	56	67.5	27	32.5	83	100	12.01	<0.001
Succeed (score ≥4)	12	14.6	70	85.4	82	100		
Stress								
Severe (score<19)	37	52.9	33	47.1	70	100	2.31	0.011
Light (score ≥19)	31	32.6	64	67.4	95	100		
Intention								
Low (score<4)	13	18.3	58	81.7	71	100	0.16	<0.001
High (score ≥4)	55	58.5	39	41.5	94	100		
Attitude								
Negative (score<4)	6	7.7	72	92.3	78	100	0.03	<0.001
Positive (score ≥4)	62	71.3	25	28.7	87	100		
Addiction								
Light (score<6)	47	54.0	40	46.0	87	100	3.19	<0.001
Severe(score ≥6)	21	26.9	57	73.1	78	100		
Subjective norm								
Negative (score<5)	27	43.5	35	56.5	62	100	1.17	0.744
Positive (score ≥5)	41	39.8	62	60.2	103	100		

Successful smoking cessation was influenced by intention, smoking duration, stress, and access to a cigarette.

1) Strong intention had logodd around 2.39 to succeed in smoking cessation (b= 2.39; SE= 0.51; p<0.001).
2) The longer smoking duration (≥10 years) could decrease log odd in successful smoking cessation up to 3.46 (b= -3.46; SE= 0.57; p<0.001).
3) The easier of access to cigarette decreased the successful of smoking cessation with log odd in 1.28 (b= -1.28; SE= 0.52; p= 0.0008)

The intention was influenced by attitude, perceived behavioral control, smoking duration, and purchasing power.

1) Positive attitude had logodd of 0.79 to have a positive intention (b= 0.79; SE= 0.39; p= 0.046)
2) Positive perceived behavioral control possessed logodd of 1.89 to have positive intention (b= 1.89; SE= 0.40; p<0.001).
3) Strong purchasing power had 1.23 logodd to have positive intention (b= -1.23; SE= 0.39; p= 0.002).
4) Positive subjective norm improved positive intention logodd of 1.38 (b= 1.38; SE= 0.40; p= 0.001).

Perception control was influenced by smoking duration, outcome expectation, and addiction.

1) The longer someone owned smoking history (≥10 years) could reduce positive perceived behavioral control (b= -2.32; SE= 0.47; p<0.001).
2) Someone who had positive outcome expectation improved positive perception control to quit smoking (b= 1.04; SE= 0.49; p= 0.035).
3) Someone who had severe addiction to cigarette dropped positive perceived behavioral control (b= -2.96; SE= 0.49; p<0.001).

Attitude was affected by outcome expectation. Positive outcome expectation enhanced positive attitudes toward smoking cessation (b= 1.09; SE= 0.34; p= 0.001).

Social support influenced subjective norm. Strong social support improved positive subjective norm (b= 0.77; SE= 0.33; p= 0.020).

Social support also influenced outcome expectation. Strong social support increased positive outcome expectation (b= 0.77; SE= 0.33; p= 0.020).

Smoking duration was influenced by stress. Severe stress could increase smoking duration (≥10 years) (b= 0.09; SE= 0.04; p= 0.018).

Cigarette purchasing power was affected by income. Income ≥Minimum Regional Wage increased strong cigarette purchasing power (b= 2.78; SE= 1.43; p= 0.053).
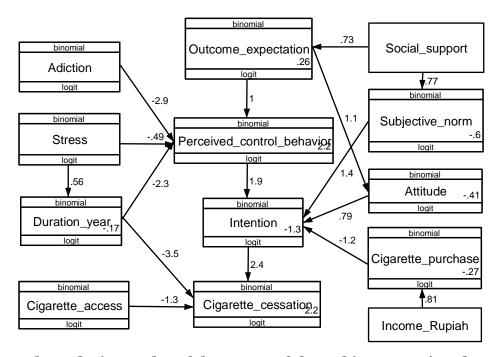

Figure 1. Path analysis results of the successful smoking cessation determinants

Table 5. Path Analysis Results of Determinants of Smoking

Dependent variable		Independent variable	B	SE	CI 95%		p
					Lower limit	Upper limit	
Direct effect							
Successful Smoking Cessation	←	Strong intention	2.39	0.51	1.39	3.39	<0.001
	←	Smoking duration ≥10 years	-3.46	0.57	-4.59	-2.33	<0.001
	←	An ease of access to cigarette	-1.28	0.51	-2.27	-0.29	0.011
Indirect effect							
Strong intention	←	Positive subjective norms	1.38	0.40	0.59	2.17	0.001
	←	Positive attitude	0.79	0.39	0.16	1.67	0.046
	←	Strong purchasing power	-1.23	0.39	-2.01	-0.46	0.002
	←	Positive perceived behavioral control	1.89	0.40	1.11	2.69	<0.001
Positive attitude	←	*Positive outcome expectation*	1.09	0.34	0.42	1.75	0.001
Positive perceived behavioral control	←	Smoking duration ≥10 years	-2.32	0.47	-3.24	-1.39	<0.001
	←	Severe addiction	-2.96	0.49	-3.93	-2.01	<0.001
	←	*Positive outcome expectation*	1.04	0.49	0.07	2.01	0.035
	←	Smoking duration ≥10 years	-2.21	0.48	-3.14	-1.26	<0.001
		Severe stress	-0.12	0.05	-0.23	-.002	0.020
Positive subjective norms	←	Strong social support	0.77	0.33	0.12	1.42	0.020
Positive outcome expectation	←	Strong social support	0.73	0.34	0.06	1.39	0.032
Strong purchasing power	←	Income ≥Minimum Regional Wages	2.78	1.43	-3.29	5.59	0.053
smoking duration ≥10 years	←	Severe stress	0.09	0.04	0.02	0.16	0.018

N obseration = 165
df= 24
AIC= 1538.32
BIC= 1612.86

DISCUSSION
1. Successful smoking cessation was directly influenced by intention

Smoking cessation has a lot of benefits and results in lengthen smoker life expectancy. Smoking cessation behavior is not a single act. It requires process through several stages (Jha and Peto, 2014).

Some theoretical models provide explanations towards changing smoking cessation behavior. It is assumed to be related to someone's belief and perception in adopting and quitting a behavior. The previous study about smoking behavior using TPB theory had focused on whether or not that model could predict smoking intention. The result revealed that the success of this behavior was directly influenced by intention. The stronger someone's intention to quit smoking the higher his/her chance of being successful in smoking cessation (Bogart and Delahanty, 2004).

Theory of Planned Behavior (TPB) is one of the best behavioral theories in predicting someone's behavior, especially in

social and health behavior. Ajzen (1991) stated that TPB can be employed to predict someone's behavior. The main factor in TPB is the intention. The intention will become behavior under the will control. The will control is someone's ability in deciding to or not to do the behavior.

The intention is the cognitive and conative representative from individual maturity to perform the behavior. It is the behavior determinant and disposition until the individual has the right opportunity and time to perform it in a real way. TPB shows that intention is a direct factor of behavior and a tendency or individual plan to perform it. This intention is measured by three main predictors, i.e. attitude, subjective norm, and perceived behavioral control. The stronger the intention of engaging behavior, the bigger chance someone will do it. If he or she has that intention, she would tend do it anyway and vice versa (Fishbein and Ajzen, 1975).

a. Smoking cessation intention was influenced by attitude

The three main predictors in TPB are the attitude towards behavior, subjective norm, and perceived behavioral control. This theory is best implemented to find out psychosocial consequences of behavior change (Hamilton, et al., 2011).

Attitude is commonly employed by the society to determine someone's behavior. It is someone's belief in consequences of the committed behavior. Such judgment can positive or negative. It is also used widely to describe one's behavior (Fishbein and Ajzen, 1975; Ajzen, 1991).

Generally, the more one has positive judgment upon a certain behavior; it results in a positive attitude towards that behavior and vice versa (Ajzen, 2005).

Smokers' intention to quit smoking was clearly influenced by their attitude towards smoking. Many people considered

that smoking or exchanging cigarette was normal. Thus, it requires a critical effort to change social perspective towards smoking in order to change smokers' perspective towards smoking (WHO, 2008).

The attitude was influenced by outcome expectation. Someone tends to smoke continuously if he or she assumes that smoking is beneficial and this benefit is portrayed positively. Change requires negative perspective enhancement and the real negative effect (e.g. disease risk) (WHO, 2010).

b. Attitude was influenced by perceived behavioral control

The construct in TPB theory reveals that the conduct or non-conduct behavior is not only determined by attitude and subjective norm but also individual perception towards control that can be performed based on control beliefs (Ajzen, 1991; Ajzen, 2005; WHO, 2010).

Perceived behavioral control is one's belief towards supporting or inhibiting factors to conduct behavior. This belief is affected by individual's prior experience about a certain behavior, one's information about behavior gained by observing themselves or acquaintances, and by other factors enhancing or lessening the individual sense of the degree of difficulty in performing a behavior (Ajzen, 1991; Hamilton et al., 2011).

1) Perceived behavioral control was influenced by smoking duration

The more individual perceive supporting factors and less inhibiting factors to perform a behavior, he or she will tend to self-adjust to perform it and vice versa (Ajzen, 2006). The longer smoking duration results in an individual burden to reduce smoking.

2) Perceived behavior control was influenced by addiction

This study showed when someone experienced severe cigarette addiction, it decreased positive perceived behavioral control (b= -2.96; SE= 0.49; p< 0.001)

The prior study uncovered that nicotine addiction was a significant obstacle to smoking cessation. There was a negative relationship, i.e. the higher nicotine addiction, the lower one's ability to quit smoking. It indicated that smoking cessation strategy should consider the level of nicotine addiction (Hyland, et al., 2004; Hyland et al. 2006; Fagan et al., 2007).

Vidal's et al. study (2011) discovered that 9 out of 10 smokers stated that they experienced difficulty in smoking cessation; while around 72% smokers intended to quit smoking. This difficulty was caused by nicotine dependence (Parreti-Water et al. 2007; Chaiton et al. 2007).

Hence, smokers with low dependence should be supported to quit smoking. Smokers with higher addiction should be treated using medical intervention to lessen the cigarette consumption on purpose to increase their chance of smoking cessation (Hyland et al., 2005).

3) Perceived behavioral control was influenced by stress

Someone's with severe stress level decreased positive perceived behavioral control log odd to 0.12 (b= -0.12; SE= 0.33; p= 0.020).

Tsourtos and O'Dwayer study (2008) revealed that someone's perception towards his or her stress was a barrier for him or her to quit smoking.

4) Perceived behavioral control was influenced by outcome expectation

Someone who had positive outcome expectation possessing log odd of 1.04 to increase positive control perception (b= 1.04; SE= 0.49; p= 0.035).

This study revealed that someone with positive outcome expectation from smoking cessation benefit more likely influenced his or her perception in controlling smoking behavior to reduce, or even to quit smoking.

c. Intention was influenced by subjective norm

Subjective norm is one's perception of social pressure in the society. It will affect his or her decision to or not to engage a behavior (Ajzen, 1991).

Subjective norm was influenced by social support. Strong social support raised positive subjective norm (b= 0.77; SE= 0.33; p= 0.020).

Subjective norm influence someone under social pressure to or not to engage a behavior. The more he or she perceive that society reinforce him or her to engage in a behavior, he or she will tend to feel the social pressure him or her to perform it, and vice versa (Hamilton et al., 2011; Ajzen, 2005; Fishbein and Ajzen, 1975).

d. Intention was influenced by purchasing power

Prior studies in several countries identified some factors relating to intention to quit smoking; including social economical factors (Tucker et al. 2005; Vidal et al. 2011; Driezen et al. 2016).

Purchasing power in this study was measured through some questions describing subjects' purchasing power.

Cigarette purchasing power was influenced by income. This research showed that the higher one's income increased his or her cigarette purchasing power.

Ross et al. (2009) stated that individual income affected purchasing power over a cigarette. When one's income was low, while cigarette tax in his area was high, he tended to keep buying a cigarette at a low price rather than quitting.

2. Successful smoking cessation was directly influenced by smoking duration

The longer someone smoking duration (≥10 years) decreased log odd to successful smoking cessation around 3.46 (b= -3.46; SE= 0.57; p< 0.001)

Zang et al. (2015) claimed that the longer someone smoked the more he or she addicted to cigarette and decreased the success of smoking cessation.

Marti's study (2010) identified that smokers who had ever quitted smoking had bigger chance to be successful in smoking cessation in the following attempt.

Smoking duration is influenced by stress. Severe stress increased smoking duration (≥10 years) with log odd of 0.09 (b= 0.09; SE= 0.04; p= 0.018).

Ayyagari and Sindelar (2010) showed that stress due to working load might influence smoking behavior. It was because smoking reduced stress and enhanced someone's focus. This discovering highlighted that the more severe someone's stress, the more intense he or she smoked, the less chance of him or her becomes successful in smoking cessation.

3. Successful smoking cessation was directly influenced by access to a cigarette.

The easier access to cigarette reduced the success of smoking cessation with log odd of 1.28 (b= -1.28; SE= 0.52; p= 0.008)

HBM theory focused more on the internal factor and did not cover all smoking cessation behavior components. The essential factors affecting smoking cessation are nicotine addiction, economic and environmental factor, social norm, and peer role (WHO, 2010).

This study illustrated the ease of the access to a cigarette from friends, neighborhood vendors, and smokers will always keep one in their pocket.

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