**Advances in Bioresearch**

## ORIGINAL ARTICLE

# Predicting Factors of Smoking Cessation in Acute Coronary Syndrome Patients after Hospital Discharge

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**ABSTRACT**

*Smoking is one of the leading causes of acute coronary syndrome (ACS). Despite of being aware of the harmful impact of smoking on ACS, these patients still indulged in smoking even after being admitted in the hospital. This study aimed to examine the predictors of smoking cessation in ACS patients following hospital discharge. A descriptive correlational design was used, and 162 ACS patient smokers participated in this research. The study was conducted in seven hospitals in Thailand during January 2014 to August 2015. Instruments consisted of demographic data questionnaire, the smoking self-efficacy questionnaire (SEQ), the Fagerstrom test for nicotine dependence (FTND), the partner interaction questionnaire (PIQ), the center of epidemiology scale of depression (CES-D), the reasons for quitting questionnaire (RFQ), intensity of smoking cessation intervention questionnaires, and smoking cessation question. Descriptive statistics were used to assess the demographic data and regression analysis was used to examine the relationship between variables. Of the total sample, 71% (n=115) reported they had not smoked for three months following discharge. The significant predictors were previous CAD (OR = .229; 95%CI = .076-.693, p<.01), nicotine dependence (OR = .769; 95%CI = .611-.968, p<.05), self-efficacy in smoking cessation (OR = 1.127; 95%CI = 1.081-1.175, p<.05). The results demonstrated that having previous CAD, self- efficacy in smoking cessation and nicotine dependence were the important factors influencing smoking cessation in ACS patients after discharge. In order to encourage ACS patients to quit smoking, self-efficacy in smoking cessation and nicotine dependence should be incorporated in smoking cessation intervention.*
*Keywords: smoking cessation, acute coronary syndrome, hospital discharge, predictors*

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## INTRODUCTION

Smoking is one of the leading causes of acute coronary syndrome (ACS) [1]. Despite of being aware of the harmful impact of smoking on ACS, these patients still indulged in smoking even after being admitted in the hospital [2]. Previous studies showed that 30 - 60% of these patients were smokers at the time of hospitalization [1, 3-5]. In Thailand, National Statistical Office documented that 42,000-52,000 Thai people died from smoking. Out of these total deaths, more than 7,900 smokers died because of coronary artery disease (CAD) caused due to smoking [6]. A recent studies have also found that more than half of Thai ACS patients who were admitted in the hospital were smokers [7, 8] and despite hospitalization, their smoking habits further increased [9, 10].

It has been observed that patients' motivation to stop smoking increases during hospitalization and many attempt to quit smoking during this period [11]. However, these patients are unable to discontinue smoking after being discharged from the hospital [12-14]. Recent studies found that over half of the patients suffering from cardiac diseases who smoked prior to the cardiac event, continued to smoke after being discharged [15, 16]. Previous study has found that about half of the patients who were hospitalized for ACS had resumed smoking within seven days following their discharge [17]. Furthermore, one fifth of ACS patients reported that though they had stopped smoking shortly after their hospitalization, but they resumed to smoking within three months of their discharge [14]. Literature reviews revealed that patients who continue to smoke after being diagnosed with ACS are at a higher risk of another cardiac

event, cardiac related rehospitalization and sudden death [4, 18-24]. Therefore, to avoid the aforementioned problems, smoking cessation after ACS is needed.

Smoking cessation refers to the smoker changes their behaviors from smoking to stop smoking after the quit date [25, 26]. It is an important intense and forced behavioral change in patients addicted to smoking that occurs because of hospitalization [15]. The review of the literature showed that smoking cessationhad been associated with significant reduction in morbidity and mortality after the onset of ACS and prevented future cardiovascular incidents [22, 27-29]. Therefore, cardiac nurses should provide smoking cessation intervention that can significantly improve a patient's health and quality of life. The guidelines of article 14 of the World Health Organization Framework Convention on Tobacco Control (WHO-FCTC) state that to design and implement effective smoking cessation intervention, health care professionals need to understand the factors that influence smoking cessation such as age, sex, education level, etc. [30]. Thus, to develop an effective smoking cessation intervention for Thai ACS patients, cardiac nurses need to understand the predictors that can help these patients practice smoking cessation following their hospital discharge. However, some western country findings about factors of smoking cessation in these patient groups still unclear and could not be generalized for developing countries due to different socioeconomic conditions and cultural contexts as well as disparities in tobacco control policies and social acceptability of smoking [31, 32]. In Thailand, little is known about predictors associated with smoking cessation in ACS patients after their hospital discharge. Some studies identified predictors of smoking cessation in general population or in general patients [33, 34]. Therefore, this study aimed to examine predictors of smoking cessation in ACS patients following their hospital discharge.

## MATERIALS AND METHODS

*Design and sample*

This descriptive correlational design study assessed the relationship among predictors of smoking cessation behavior. Eligible participants were a) diagnosed with ACS (STEMI, NSTEMI, UA) who had been admitted in hospital; b) age 18 years or older; c) having smoking cigarettes at least one cigarette per day within 1 months before admission; d) having spouse or partner in the household; e) has been admitted in hospital 24 hours or greater; f) able to understand and communicate in Thai; and g) willing to participate in this study. Patients were excluded from the study if they had unstable condition or have a life threatening conditions. Multi-stage random sampling was used to recruited sample for this study. The sample size determination was based on a desired ratio of 20 respondents for seven independents variables(35). A sample size maintained the predetermination on statistical criteria of .05 and medium effect size (r = .30), which had the ability to detect an effect at the desired power around .90 [36]. Therefore, participants in this study were 162 ACS patient smokers from seven participating hospitals in Northern, Central, Northeastern, and Southern regions of Thailand.

*Instruments*

*Demographic data questionnaire* was developed and used to assess personal data such as age, gender, history disease, and smoking history.

*Smoking self-efficacy questionnaires (SEQ)* was developed by Etter, Bergman, Humair, & Perneger (2000) and was translated into Thai by experts for this study. This scale consists of 12 items that indicated the respondent perceived confidence in resisting smoking in the context. The total score was obtained by summing up all items, with possible scores ranging from 12-60 points. A greater value indicated that the respondent perceived greater confidence in resisting smoking in the context. For the present study, internal consistency Cronbach's alpha; internal stimuli was .89 and external stimuli was .87.

*Fagerstrom Test for Nicotine Dependence (FTND)* was developed by Heatherton, Kozlowski, Frecker, & Fagerstrom (1991) was used to measure the degree of nicotine dependence. It is a 6 items self- report questionnaire. Scores range from 0 to 10 with higher scores reflecting greater nicotine dependence. Scores of 4 or less are classified as 'low dependence' whilst scores of 8 to 10 equate to 'very high dependence'. Internal consistency Cronbach's alpha was .77 for the present study.

*The partner interaction questionnaire (PIQ)* was developed by Cohen & Lichtenstein (1990) and translated into Thai for this study. This scale consists of 20 items and used to measure the frequency of their received support from spouses or partner to stop smoking. Separate scores were calculated for positive and negative behaviors by summing responses to the 10-items within each subscale. In creating the positive/negative ratio score, participants who reported zero negative behaviors were assigned one negative behavior so that proportions could be calculated. In the present study, internal consistency Cronbach's alpha was .75.

*The Center of epidemiology scale of depression (CES-D)* was developed by Radloff, (1977). This scale was translated to Thai by Worapongsathorn, Pandee, and Triamchaisri (1990), and was used to assess the level of depressive symptoms of the participants. This scale consists of 20 items. Total scores can range from 0 to 60. Higher scores reflect higher levels of depressive symptom. A score of 16 or higher has been used extensively as the cut-off point for high depressive symptoms on this scale. For the present study, internal consistency Cronbach's alpha was .89.

*The intensity of smoking cessation intervention questionnaire* was developed by the researcher. This questionnaire consisted of eight items and was used to indicate the degree of smoking cessation intervention that ACS patients receive from their health care providers during hospitalization or after hospital discharge. The total score was obtained by summing up all items. A greater value indicated that the respondent received more intensive smoking cessation intervention. For the present study, internal consistency Cronbach's alpha was .69.

*The Reasons for Quitting Questionnaire (RFQ)* was developed by Curry, Wagner, &Grothaus (1990) and translated into Thai for the current study. It consists of 20 items that measure the level motivation to quit smoking. Motivation to quit smoking scores are the total sum of responses to the 10 intrinsic items minus the total sum of responses to the 10 extrinsic items, whereby higher scores mean quitting smoking for more intrinsic reasons. For the present study, internal consistency Cronbach's alpha was .83 for the overall intrinsic and extrinsic scales.

*Smoking cessation question* was developed by the researcher. Smoking cessation refer to ACS patients self-report change their behavior from smoking to stop smoking for three months since discharge as continuous smoking abstinence. The participants were asked by question: Do you continue to stop smoking since hospital discharge? Response categories were (0) =No, (1) = Yes.

*Ethical consideration*
This study was approved by the Ethical Review Committee from seven participating hospitals including: Naresuan university hospital (COA No. 034/2014), Sunpasitthiprasong hospital (COA No.-), Prince of Songkla university hospital (COA No.-), Bhumipholadulayadej hospital (COA No.-), King Chulalongkorn memorial hospital (IRB No. 528/56), Pramongkutklao hospital (COA No.-), Siriraj hospital (COA No. Si057/2014).

*Data collection procedure*
The data collection procedures were started by asks permission from each hospital. The researcher trained the research assistants about objective and data collection procedure. Participants who agreed to participate in the study were asked to sign consented form and were responded to the questionnaires during hospitalization. At three months after hospital discharge, participants were asked about smoking cessation by telephone call.

*Statistical analysis*
Descriptive statistics was used to describe the baseline characteristics including frequency, percentages, range, mean, and standard deviation. Binary logistic regression analysis was used to examine the relationship among independent variables and smoking cessation. Assumptions underlying the analysis were tested to ensure no violation of underlying assumptions. The level of any statistical tests was established at $\alpha = .05$.

**RESULTS**
*Characteristic of participants*
A total of 162 participants who were Thai ACS patient smokers were include in this study. The findings showed that the majority of the participants were male (95.1%). The mean age of the samples was 54.8 years (SD = 10.26, range = 27 - 78). They were diagnosed with NSTEMI (54.3%), married (81.5 %), and completed primary education (44.4%). Moreover, one-thirds of the participants (30.9%) worked as employee and closed to half of the participants (46.3%) had a monthly income less than 10,000 baht. In addition, approximately about three quarters of the participants (72.2%) stayed with husband or wife.

Medical history found that more than one-third the participants (39.5%) had reported of co-morbidities such as diabetes, hypertension, dyslipidemia, and allergic rhinitis. Moreover, almost one-fourths of the participants (21.6%) had been diagnosed with coronary artery disease (CAD) and had experienced of post cardiac event.

Regarding smoking history, an average duration of smoking before admission was27.06 years and the average number of cigarettes smoked per day was 15.93. One hundred percent of sample had quit attempt at least one time (range 1-14).The self-reported continuous smoking abstinence rate at 3 months after discharge was 71 %.

*Predicting factors of smoking cessation*

The results showed that previous CAD had a significant negative correlation to smoking cessation (r = -.258; P<.01). Nicotine dependence had a significant negative correlation to smoking cessation (r = -.259; P<.01). Depressive symptom had a significant negative correlation to smoking cessation (r = -.192; P<.05). Self-efficacy in smoking cessation had a significant positive correlation to smoking cessation (r = .638; P<.01). Social support had a significant positive correlation to smoking cessation (r = .228; P<.01). Motivation to quit smoking had a significant positive correlation to smoking cessation (r = .182; P<.05) (Table 1). The overall regression analysis is shown in Table 2. The finding showed that self-efficacy in smoking cessation, social support, motivation to quit smoking, nicotine dependence, depressive symptom, previous CAD, an intensity of smoking cessation intervention could predict smoking cessation among ACS patients after discharge with the $R^2$ being .603.

Table 1; Correlations between independent variables and smoking cessation (N=162)

| Variables | SC | CADH | IV | NIC | DEP | SE | SS | MOV |
|---|---|---|---|---|---|---|---|---|
| **Smoking cessation(SC)** | 1.000 | | | | | | | |
| **Previous CAD (CADH)** | -.258** | 1.000 | | | | | | |
| **Intensity of Intervention (IV)** | .010 | .133 | 1.000 | | | | | |
| **Nicotine dependence (NIC)** | -.259** | .047 | .164* | 1.000 | | | | |
| **Depressive symptom (DEP)** | -.192* | .006 | .177* | .148 | 1.000 | | | |
| **Self-efficacy (SE)** | .638** | -.164* | -.079 | -.192* | -.282** | 1.000 | | |
| **Social support (SS)** | .228** | -.040 | -.062 | -.167* | -.178* | .195* | 1.000 | |
| **Motivation (MOV)** | .182* | -.143 | .167* | -.128 | -.167* | .243** | .117 | 1.000 |

* Correlation is significant at the 0.05 level (2-tailed);
** Correlation is significant at the 0.01 level (2-tailed)

Table 2; Regression analysis of smoking cessation in ACS patients after hospital discharge

| Variables | B | S.E. | Wald | OR | 95.0% C.I. Lower | Upper | p-value |
|---|---|---|---|---|---|---|---|
| **Previous CAD** | -1.475** | .566 | 6.799 | .229 | .076 | .693 | .009 |
| **Intensity of Intervention** | .245 | .176 | 1.940 | 1.277 | .905 | 1.802 | .164 |
| **Nicotine dependence** | -.262* | .117 | 4.994 | .769 | .611 | .968 | .025 |
| **Depressive symptom** | -.015 | .030 | .234 | .986 | .929 | 1.045 | .628 |
| **Self-efficacy** | .120** | .021 | 31.389 | 1.127 | 1.081 | 1.175 | .000 |
| **Social support** | .907 | .532 | 2.909 | 2.477 | .874 | 7.022 | .088 |
| **Motivation** | .083 | .163 | .261 | 1.087 | .790 | 1.496 | .610 |
| **Constant** | -3.894 | 1.379 | 7.979 | .020 | | | .005 |
| Dependent variable= Smoking cessation   $R^2$ = .603,  p < .05 | | | | | | | |

* p<.05, ** p<.01          *B*= Regression coefficient, S.E. = Standard error

## DISCUSSION

This current finding demonstrated that self-reported smoking cessation rate at three months after discharge was 71 % which was favorable when compared with the range of 31- 60 % shown in earlier studies of cardiac population(37).Our findings showed that previously CAD had a significant negative correlation to smoking cessation in ACS patients after hospital discharge. In addition, patients with a history of a previous cardiac event were significantly more likely to continue smoking when compared with those who were recently diagnosed with this disease. This finding is consistent with the study of ACS patients [37]. A previous study supported that ACS patients who had no past record of previous CAD and had been admitted in the hospital were statistically significant positive predictors of smoking cessation [38]. Furthermore, the study  also supported that if ACS smokers did not stop smoking after first myocardial infarction (MI), it was less likely that they would do so after another cardiac event [17]. This is contrary to the common belief that having suffered a cardiac event, patients would show increased motivation to stop smoking.
Nicotine dependence had a significant negative correlation to smoking cessation among ACS patients after hospital discharge. Various studies suggested that patients with high nicotine dependence were more likely to continue smoking after hospitalization for a cardiac event [14, 39]. In addition, these studies supported that cardiac disease patients who were high-risk smokers with greater nicotine dependence were more likely to relapse in to smoking [14, 37, 39, 40].

Self-efficacy in smoking cessation had a significant positive correlation to smoking cessation in ACS patients after hospital discharge. This result is consistent with previous studies that indicated that self-efficacy was significantly associated with smoking cessation [15, 41]. Further, self-efficacy in smoking cessation was stronger in cardiac disease patients who could give up smoking, which meant that they were fairly certain that they would not smoke in any difficult situation. Previous studies also supported that cardiac disease patients with a high confidence in their ability to quit smoking were more often successful in smoking cessation [41, 42].

Depressive symptom had a significant negative correlation to smoking cessation among this patient group. These symptoms were significant mood disturbances in patients recovering for ACS [43] and were significantly associated with a strong nicotine dependency and a need for continuing smoking [44]. This finding is consistent with previous studies that reported patients with depressive symptoms during ACS hospitalizations were less likely to practice smoking cessation [45]. These findings also suggest that ACS patients' smokers needed more support to stop smoking than what was usually provided during hospitalization and follow ups in the outpatients' department.

Social support had a significant positive correlation to smoking cessation in ACS patients following hospital discharge. It is consistent with a previous study that indicated patients with cardiac disease who were able to stop smoking had been reported to have experienced more support from their partner, cardiologist, family, and colleagues than those who could not stop smoking [46].Support from others can encourage smoking cessation by providing an environment where healthy lifestyle practices are accepted as normal and desirable [14, 47].

Motivation to quit smoking had a significant positive correlation with smoking cessation in these patient groups. Our findings indicated that motivation to quit smoking is important prerequisite for smoking cessation in ACS patients following hospital discharge. This finding is congruent with previous studies [37]. The participants who had high level of motivation to quit smoking were more likely to perform smoking cessation.

Importantly, we found that the intensity of smoking cessation intervention had a non-significant positive correlation with smoking cessation in these patients group. This finding is inconsistent with the previous studies [44, 45, 48]. It is possible that patients did not effectively note or understand the advice provide during smoking counseling, and that smoking cessation interventions were ineffective due to inadequate follow-ups after the patients was discharged.

## CONCLUSION

Our study has shown that having previous coronary heart disease and having a high level of nicotine dependence are important negative predictors of smoking cessation in ACS patients after hospital discharge. In addition, we found that having a high level of self-efficacy in smoking cessation is a significant positive predictor of smoking cessation in these patient groups. Therefore, a smoking cessation intervention with emphasis on self- efficacy in smoking cessation and nicotine dependence can help ACS patient smokers to quit smoking, which could result in lower morbidity and mortality, hospital readmissions as well as improve the quality of life among ACS patients.

The results of this study further demonstrate that if a patient had a history of CAD, self- efficacy in smoking cessation and nicotine dependence are important factors influencing smoking cessation in ACS patients after hospital discharge. In order to promote smoking cessation among ACS patients, health care professionals should provide smoking cessation intervention as soon as possible taking into account the factors that were found to predict smoking cessation. However, this study has some limitations as well. First, we did not biochemically validate self-reported smoking cessation. However, it is generally found that self-reports of cessation are accurate in research studies [49]. Also, our study conducted with a small sample size. Therefore, further research with more participants is needed to confirm these results.

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