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Depression is a predictor for both smoking and quitting intentions among male coronary artery disease patients

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ABSTRACT

Coronary artery disease (CAD) is the third most prominent cause of death globally, and smoking is the most common risk factors for CAD. However, few studies have examined both smoking and smoking cessation intentions in patients with CAD. The study aims to explore the predictors for smoking and quitting intentions among male CAD patients. This was a cross-sectional study. A total of 368 male CAD patients were recruited and classified into never smoked, quit smoking, and continuing to smoke three groups. Demographic information, level of nicotine dependence, carbon monoxide concentration, depression, and resilience were analyzed by using t-test, one-way analysis of variance (ANOVA), and least significant difference (LSD) post-hoc test and the multiple logistic regression analysis. The results revealed that among participants, 23.1% had never smoked, 40.5% had quit smoking, and 36.4% continued to smoke. Multiple logistic regression analysis revealed that age (OR=0.95, 95% CI=0.90–0.99), carbon monoxide (OR=1.74, 95% CI=1.51–2.01), and depression (OR=1.13, 95% CI=1.04–1.23) predicted participants who continued to smoke. Among the 134 participants who continued to smoke, 35.8% exhibited no intention to quit, and 64.2% planned to quit. Nicotine dependence (OR=0.79, 95% CI=0.66–0.94) and depression (OR=1.10, 95% CI=1.02–1.20) were significant predictors in participants who intended to quit smoking. The study demonstrates that depression is a significant predictor for both smoking and quitting intentions among male CAD patients.

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1. INTRODUCTION

Coronary artery disease (CAD) is the third most prominent cause of death globally, resulting in 17.8 million deaths worldwide each year. In the United States, as many as 610,000 people die of CAD annually, accounting for one-quarter of all deaths [1]. The American Heart Association reports that the prevalence of non-hypertensive heart disease is 9.3% [2], and in Asia, 3.68 of every 1,000 people contract fatal cardiovascular diseases (CVDs) [3]. Statistical data indicate that 1,022,016 people aged 20 years or older in Taiwan have been hospitalized with a form of ischemic heart disease, such as angina pectoris and acute myocardial infarction (AMI) [4]. CVDs are the second most prevalent cause of death in Taiwan, claiming 20,457 lives in 2020 [5]. Smoking is the most common risk factor for CAD. Among patients diagnosed with CAD, 60.8% smoke or had smoked in the past [6]. According to the 1999 to 2016 National Health and Nutrition Examination Survey in

the United States, 36% of people diagnosed with CAD at a young age had smoked [7]. Results from a meta-analysis revealed that smoking is a critical risk factor for fatal CVDs in Asia [3]. Nevertheless, the percentage of patients with CAD who continue to smoke remains high. A previous study revealed that 48.6% of patients diagnosed with an AMI continued to smoke [8].

Many factors affect smoking behaviors, with depression playing a key role in smoking habits [9]. Studies reported that 11–40% of patients with CAD exhibit depression [10], [11]. Patients with continual symptoms of depression exhibit higher risks of a CAD diagnosis (odds ratio [OR]=1.77, 95% confidence interval [CI]=1.38–2.26) and consequent death (OR=1.63, 95% CI=1.01–2.64) than individuals with no symptoms of depression [12]. Most studies indicated that patients with more-severe depression are more likely to smoke [13], [14] and experience greater difficultly quitting smoking [15]–[17]. Patients with depression exhibit a smoking rate twice as high as that of people without depression and higher nicotine dependence. They are more likely to experience negative emotional shifts following nicotine withdrawal and are thus less likely to succeed in quitting smoking than individuals without depression [18]. Statistical analyses support the claim that patients with CAD who experience depression are less willing to quit smoking than those who do not experience depression [19]. In addition, resilience, which interacts with stress and negative emotions, is another key factor influencing smoking and nicotine dependence [20]. High levels of resilience lead to more-favorable self-rated health, lower levels of stress, anxiety, and depression, and less-frequent smoking [21].

However, previous studies have controversy results, such as no significant association between depression and smoking was observed [22]. Although highly resilient women frequently participate in healthy behaviors, resilience was not significantly correlated with abstinence from smoking [23]. Plus, few studies have simultaneously explored the effects of depression on the smoking status of patients with CAD and their intentions to quit smoking. Therefore, we aimed to examine relationships of the smoking status of men diagnosed with CAD with their depression and resilience. Furthermore, the effect of depression on the intention to quit smoking among male smokers with CAD was analyzed.

2. RESEARCH METHOD

2.1. Study design and population

In this cross-sectional survey, patients with CAD aged over 20 years, with the ability to communicate in Mandarin and Taiwanese, with the capacity to understand and participate in the study, and with no mental disorders were recruited from a medical center in northern Taiwan through convenience sampling (main diagnostic codes: I20–I25.1). Those who had been diagnosed with a terminal disease, arrhythmia, or class IV heart failure according to the New York Heart Association classification or were equipped with a pacemaker were excluded from the survey. The number of samples was calculated as Z^2*p*q/(sampling error)^2 [24]. With reference to the 28.6% average smoking rate of patients with CAD [25], 0.05 sampling error, and a Z^2 value of 3.84, a minimum of 310 valid samples were required for the survey. To account for an estimated 15% sample loss, such as from incomplete survey responses, 365 total patients were required for this study. Predictors were determined through a multiple regression analysis; G power software was used to calculate the sample size in accordance with a moderate effect size. The type I error was set to 0.05, and the power was 0.8, with nine predictors. The sample size needed to be at least 114 subjects.

2.2. Study variables and measurements

The measurement variables included demographic information (e.g., age, sex, educational level, history of heart disease, and smoking status: never smoked, quit smoking, and continued to smoke), nicotine dependence, carbon monoxide (CO) concentration in the lungs, depression, resilience, and intention to quit smoking.

2.1.1. Nicotine dependence

A Chinese version of the fagerström test for nicotine dependence (FTND) issued by the Health Promotion Administration of Taiwan was used. The scale consists of six items scored from 0 to 10, with a high score indicating more-severe nicotine dependence. Cronbach's α values of the scale were 0.55–0.74, and the test-retest reliability was *r*=0.75. The criterion-related validity was supported by significant correlations of the score of the FTND with the nicotine concentration in saliva and CO concentration in the lungs (*r*=0.59) [26].

2.2.2. CO concentration in the lungs

A CO meter (Bedfont Scientific, Maidstone, Kent, UK) was employed to measure the CO concentration (ppm) in the lungs of each patient. The meter was regularly maintained and calibrated. In the current study, 32 patients underwent two lung CO concentration tests spaced 10 min apart. The correlation coefficient between the two tests was *r*=0.92.

2.2.3. Depression

Depression was measured using the 10-item Center for Epidemiological Studies Depression Scale, which scores the frequency of respondents' depressive symptoms within 1 week from 0 to 3, with a total score of 30. A high score indicates more-severe depression, and a score of ≥10 indicates depressive tendencies [27]. Cronbach's α, sensitivity, and specificity of the scale were 0.80, 92–100%, and 84–87%, respectively [28].

2.2.4. Resilience

The Chinese version of the Brief Resilience Scale was used to measure resilience; it is comprised of six items related to the dimensions of resilience and succumbing. Six items are scored on a five-point Likert scale (1=strongly disagree to 5=strongly agree), and scores are totaled to calculate the average score per item. A high average score indicates high levels of psychological resilience. When the scale was administered to 157 patients with poliomyelitis, it exhibited an overall Cronbach's α of 0.79. The construct validity of the scale was tested through an exploratory factor analysis, that revealed 82% explained variance of the two dimensions and 0.79–0.89 factor loadings of all six items [29].

2.2.5. Intention to quit smoking

According to the transtheoretical model of change, cessation behavior consists of the following five phases: i) precontemplation phase of currently smoking with no intention to quit within the next six months; ii) contemplation phase of currently smoking but intending to quit within the next six months; iii) preparation phase of currently smoking but intending to quit within the next month; iv) action phase of having quit smoking within the last six months; and v) maintenance phase of having quit smoking for longer than six months.

2.3. Statistical analysis

Valid survey responses were coded and filed using Excel and analyzed using SPSS 24.0 (SPSS, Chicago, IL, USA), with the level of statistical significance set to 0.05. The research variable distribution was analyzed in the form of frequencies, percentages, means, and standard deviations (SDs). Significant differences in the dependent and independent variables were examined through an independent-sample *t*-test, one-way analysis of variance (ANOVA), and least significant difference (LSD) post-hoc test. Finally, simple and multiple logistic regression analyses were conducted to examine factors influencing patients' smoking status and intentions to quit smoking.

3. RESULTS AND DISCUSSION

Of the 372 participants, four were women, and only the 368 male participants were subsequently analyzed. Male participants had an average age of 62.05±9.45 years and a body-mass index of 26.18 ± 3.18 kg/m2; 46.5% had graduated from high school, 71.7% had no history of an AMI, and 80.7% had undergone coronary artery stent placement. Average scores of 1.32±2.30, 5.91±5.4, and 3.79 ± 0.67, respectively, for nicotine dependence, depression, and resilience were observed. Participants were grouped according to their smoking status, with 85 having never smoked (23.1%), 149 having quit smoking (40.5%), and 134 who continued to smoke (36.4%).

The average age of participants who continued to smoke was younger than those of the other two groups ($F=5.82$, $p=0.003$). All three groups significantly differed in terms of their educational levels ($p<0.001$). Participants who had quit smoking exhibited the highest percentages of AMI diagnoses (35.6%; $p=0.04$) and stent placement (85.9%). Participants who continued to smoke exhibited the highest nicotine and CO concentrations ($p<0.001$), and the highest scores for depression ($F=33.73$, $p<0.001$) compared with those of the other two groups. The resilience scores of three groups did not significantly differ Table 1.

A simple logistic regression analysis was conducted to compare participants who had quit smoking (n=149) with those who continued to smoke (n=134). Results revealed that participants who were younger, had been diagnosed with an AMI, had received an intravascular stent, and exhibited higher CO concentrations, more-severe depression, and less-favorable resilience were more likely to continue to smoke. A multiple logistic regression analysis was performed to verify these findings, and results indicated that patients' age (OR=0.95, 95% CI=0.90–0.99), CO concentration (OR=1.74, 95% CI=1.51–2.01), and level of depression (OR=1.13, 95% CI= 1.04–1.23) were predictors of continuing to smoke Table 2. The 134 participants who continued to smoke were further grouped according to the five phases of change, with 48(35.8%), 64(47.8%), 13(9.7%), 9(6.7%), and 0 assigned to the precontemplation, contemplation, preparation, action, and maintenance phases, respectively. In total, 86 of these participants (64.2%) intended to quit smoking. As detailed in Table 3, of participants who continued to smoke, those who had no intravascular stent ($X2=4.31$, $p=0.04$) and were highly dependent on nicotine ($t=2.19$, $p=0.03$) exhibited lower intentions to quit

smoking than did the other participants who continued to smoke. The simple logistic regression confirmed the above results. However, a multiple logistic regression analysis revealed that only nicotine dependence (OR=0.79, 95% CI=0.66–0.94) and depression (OR=1.10, 95% CI=1.02–1.20) were predictors of the intentions to quit smoking Table 4.

Table 1. Baseline data of different smoking statuses of male patients with coronary artery disease (*n*=368)

	Male participants	Never smoked[1] (*n*=85)	Quit smoking[2] (*n*=149)	Continued to smoke[3] (*n*=134)	F/X^2	p-value	LSD post-hoc comparison
	Mean±SD/*n* (%)	Mean±SD/*n* (%)	Mean±SD/n(%)	Mean±SD/*n* (%)			
Age	62.05±9.45	62.61±10.49	63.65±9.02	59.93±8.89	5.82	0.003	1.2>3
BMI	26.18±3.18	26.02±3.02	26.32±3.13	26.12±3.35	0.28	0.76	
Educational level					27.60	<0.001	
Primary or secondary school	86 (23.4)	12 (14.1)	41 (27.5)	33 (24.6)			
High or vocational school	171 (46.5)	30 (35.3)	65 (43.6)	76 (56.7)			3>1
College or university	111(30.2)	43 (50.6)	43 (28.9)	25 (18.7)			1>2.3
AMI					6.66	0.04	
No	264 (71.7)	66 (77.6)	96 (64.4)	102 (76.1)			
Yes	104 (28.3)	19 (22.4)	53 (35.6)	32 (23.9)			
Intravascular stent					7.96	0.02	
No	71 (19.3)	14 (16.5)	21 (14.1)	36 (26.9)			3>2
Yes	297 (80.7)	71 (83.5)	128 (85.9)	98 (73.1)			2>3
Nicotine dependence	1.32±2.30	0.00±0.00	0.00±0.00	3.63±2.49	247.84	<0.001	3>2.1
CO concentration	7.54±5.16	4.86±2.97	5.05±1.90	12.01±5.67	138.61	<0.001	3>2.1
Depression	5.91±5.40	4.29±3.83	4.30±4.52	8.72±5.99	33.73	<0.001	3>2.1
Resilience	3.79±0.67	3.74±0.64	3.78±0.65	3.82±0.71	0.47	0.63	

1=never smoked; 2=quit smoking; 3=continued to smoke; SD=standard deviation; LSD=least significant difference; BMI=body-mass index; AMI=acute myocardial infarction

Table 2. Univariate and multivariate analysis of factors associated with the risk of still smoking

	Univariate analysis			Multivariate analysis		
	OR	95% CI	p-value	OR	95% CI	p-value
Age	0.96	0.93–0.98	0.001	0.95	0.90–0.99	0.02
BMI	0.98	0.91–1.05	0.60	0.95	0.84–1.07	0.40
Education level						
Primary or secondary school	Ref.			Ref.		
High or vocational school	1.45	0.83–2.56	0.20	0.90	0.36–2.24	0.82
College or university	0.72	0.37–1.42	0.34	0.76	0.26–2.24	0.61
AMI						
No	Ref.			Ref.		
Yes	1.76	1.05–2.96	0.03	0.49	0.20–1.16	0.10
Intravascular stent						
No	Ref.			Ref.		
Yes	0.45	0.25–0.81	0.008	0.40	0.15–1.06	0.07
CO concentration	1.72	1.51–1.96	0.000	1.74	1.51–2.01	0.000
Depression	1.17	1.11–1.23	0.000	1.13	1.04–1.23	0.003
Resilience	0.87	0.82–0.92	0.000	0.96	0.87–1.07	0.46

OR=odds ratio; CI=confidence interval; Ref=reference; BMI=body-mass index; AMI=acute myocardial infarction

3.1. Smoking status of men diagnosed with CAD

In this study, 36.4% of the surveyed men diagnosed as having CAD continued to smoke. This is consistent with other research results in which 35.5% of men with CAD continued to smoke [30]. As revealed in a long-term follow-up study of 13,355 community residents, 1,798 were diagnosed with CAD, with 33.93%, 45.11%, and 20.97% never having smoked, had smoked in the past, and continued to smoke, respectively [31]. Notably, the percentage of patients who continued to smoke was lower than that identified in this study, which is likely attributable to the focus on men in this study, who typically have a higher smoking rate than women. According to the World Health Organization, by 2018, 23.6% of people over 15 years of age had consumed tobacco products worldwide, as had 38.6% and 8.5% of all men and women, respectively; the number of males smoking in 2015 was 4.5 times that of females, and it is estimated that it will be 5.2 times in 2025 [32]. A meta-analysis that included eight studies showed that females with coronary heart disease were less likely to be smokers than males (OR=0.30, 95% CI=0.13–0.70) [33]. Moreover, men with CAD surveyed in this study exhibited a higher smoking rate than that of all men aged 18 years or older (23.4%) [34] This indicates that people with CAD exhibit a higher smoking rate than those without CAD.

Smoking is the most critical risk factor in CAD development. The nicotine and CO in tobacco products exacerbate the deposition of cholesterol on vascular walls, changing the functions of platelets, endothelia, macrophages, and smooth muscle cells in blood vessels, undermining coronary circulation, and aggravating

vascular resistance, thus leading to atherosclerosis and thromboses [35], [36]. Results from a meta-analysis revealed that men who smoked 1, 5, and 20 cigarettes per day had 1.48-, 1.57-, and 2.04-times higher risks of a CAD diagnosis, respectively, than those who did not smoke [37]. Smokers are 1.3–2.5-times more susceptible to AMI recurrence than nonsmokers and 1.8-times more likely to die prematurely [38]. Furthermore, a long-term follow-up study on patients with CAD revealed that compared to never-smokers, hazard ratios of death for quitters and continuing smokers were 1.69 and 6.78 respectively [39]. Therefore, in addition to CAD risks, smoking also increases the risk of premature death. Assessment of the smoking status of patients with CAD and provision of smoking cessation programs to those who continue to smoke are imperative.

Table 3. Comparison of basic data of still-smokers with and without the intention to quit smoking

	All male participants Mean±SD/*n* (%)	No intention to quit (*n*=48) Mean±SD/*n* (%)	Intention to quit (*n*=86) Mean±SD/*n* (%)	t/x^2	p-value
Age	59.93±8.89	60.58±8.90	59.56±8.91	0.64	0.52
BMI	26.12±3.35	26.08±2.93	26.14±3.58	-0.10	0.93
Educational level				0.88	0.64
Primary or secondary school	33 (24.6)	13 (27.1)	20 (23.3)		
High or vocational school	76 (56.7)	28 (58.3)	48 (55.8)		
College or university	25 (18.7)	7 (14.6)	18 (20.9)		
AMI				0.05	0.82
No	102 (76.1)	36 (75.0)	66 (76.7)		
Yes	32 (23.9)	12 (25.0)	20 (23.3)		
Intravascular stent				4.31	0.04
No	36 (26.9)	18 (37.5)	18 (20.9)		
Yes	98 (73.1)	30 (62.5)	68 (79.1)		
Nicotine dependence	3.63±2.49	4.25±2.51	3.28±2.43	2.19	0.03
CO concentration	12.01±5.67	12.77±6.78	11.59±4.94	1.15	0.25
Depression	8.72±5.99	7.67±5.62	9.30±6.13	-1.52	0.13
Resilience	3.82±0.71	3.72 ± 0.72	3.88±0.70	-1.25	0.22

SD= standard deviation; BMI= body-mass index; AMI= acute myocardial infarction

Table 4. Univariate and multivariate analysis of factors associated with the risk of still-smokers with and without the intention to quit smoking (N=134)

	Univariate analysis			Multivariate analysis		
	OR	95% CI	p-value	OR	95% CI	p-value
Age	0.99	0.95–1.03	0.52	0.99	0.94–1.03	0.60
BMI	1.00	0.90–1.12	0.93	1.01	0.90–1.14	0.82
Educational level						
Primary or secondary school	Ref			Ref		
High or vocational school	1.11	0.48–2.58	0.80	1.04	0.41–2.65	0.94
College or university	1.67	0.55–5.11	0.37	1.12	0.32–3.91	0.86
AMI						
No	Ref			Ref		
Yes	0.91	0.40–2.07	0.82	0.93	0.38–2.27	0.87
Intravascular stent						
No	Ref			Ref		
Yes	2.27	1.04–4.95	0.04	2.04	0.86–4.85	0.11
Nicotine dependence	0.85	0.74–0.99	0.03	0.79	0.66–0.9	0.01
CO concentration	0.96	0.91–1.03	0.25	0.97	0.91–1.04	0.43
Depression	1.05	0.99–1.11	0.13	1.10	1.02–1.20	0.02
Resilience	0.98	0.91–1.06	0.65	0.99	0.90–1.09	0.83

OR=odds ratio; CI=confidence interval; Ref=reference; BMI=body-mass index; AMI=acute myocardial infarction

3.2. Factors affecting smoking behaviors and intentions to quit smoking

Depression was identified as a crucial predictor of smoking behaviors in men with CAD, with those who continued to smoke exhibiting more-severe depression than those who had quit. This result is consistent with that of other research [13], [14], [40]. Nicotine stimulates dopamine release, in turn increasing dopamine concentrations, which can relax people, relieve stress, and reduce feelings of depression [41]. A meta-analysis of 148 studies revealed that smoking and mental health positively influence each other, though no causal inferences were verified [9]. Depression is a risk factor and along with smoking, an exacerbating factor in nicotine dependence [42]. This argument was supported in this study ($r=0.441$, $p<0.01$), and nicotine dependence partially explains the positive relationship between depression and smoking behaviors. Participants who had never smoked or had quit smoking exhibited no nicotine dependence, whereas those who continued to smoke exhibited moderate-to-low nicotine dependence. Although another study indicated an inverse

relationship between smoking and depression in patients with CAD and a negative relationship between nicotine dependence and depression, this was because smokers had misattributed the relief of withdrawal symptoms to the antidepressive effect of nicotine [43]. Therefore, healthcare professionals must provide tailor-made educational and supportive plans to assist patients with CAD to quit smoking according to the severity of their depression.

Depression was also a predictor of participants' intention to quit smoking. Interestingly, high levels of depression correlated with strong intentions to quit. This contradicts other research findings that patients with high levels of depression are less inclined to attempt to quit smoking [14]–[16]. However, most studies focused on older adults rather than on patients with CAD of all ages. Additionally, this study measured the intention to quit rather than actual cessation behaviors, although a strong intention to quit is ultimately expressed in cessation behaviors. According to Pardavila-Belio [44], the intention to quit only partially regulates the rate of successful cessation (by 36.2%), and cessation self-efficacy is related to actual cessation behaviors. Another study reported that self-efficacy is positively associated with the intention to quit smoking but negatively related to risk perception, which weakens its effect on the overall intention to quit [45]. According to Hwang and Park [46], significant others are a major factor in smokers' intention to quit. Therefore, the intention to quit may only partially explain cessation behaviors, with self-efficacy and the support and assistance of significant others potentially playing major roles in smoking cessation.

Resilience is also influential in smoking behaviors [21]. Although many people continue to smoke despite knowledge of the health hazards, an interview-based study of 22 participants revealed a significant relationship between resilience and successful cessation [47]. Another South Korean study indicated that resilience predicts adults' cessation behaviors in the following six months [48]. However, results of this study did not support a relationship of resilience with smoking behaviors and intentions to quit. Participants exhibited moderate resilience levels, which had weak negative relationships with nicotine dependence (r=-0.177) and CO concentrations (r=-0.184). Thus, the roles of resilience in smoking behaviors and intentions to quit were not highlighted in this work. One study reported that 53.2% of older adults diagnosed with CAD exhibited lower resilience levels than those without CAD [49], and research in the United States revealed that the average resilience level of patients with CAD was lower than that of the general population [50]. Future studies can incorporate the resilience strength to further verify its impacts on smoking cessation behaviors.

Along with depression, nicotine dependence predicted the intention to quit smoking. This is consistent with research findings that nicotine dependence is significantly associated with research participants' smoking cessation after a CAD diagnosis [29]. Ussher *et al.* [51] also argued that smokers' addiction to tobacco products is associated with nicotine dependence, with higher nicotine dependence leading to a lower short- and medium-term intentions to quit. Nicotine is a powerful substance that induces physical dependence; an individual who ceases to smoke experiences nicotine withdrawal symptoms. Nicotine addiction is positively associated with smoking behaviors [52], which is supported by the finding that low nicotine dependence correlates with a strong intention to quit smoking.

Patients with CAD who continued to smoke in this study were relatively young. According to Tolstrup *et al.* [53], current smokers exhibited the highest risk of a CAD diagnosis relative to those who had never smoked in the youngest age group and the lowest risk in the oldest age group. Specifically, risk ratios for participants aged 40–49 years and ≥70 years were 8.5 and 3.1, respectively. Another study reported that people over 55 years of age diagnosed with CAD were more likely to be men and smokers than those without CAD (OR: 2.86; p=0.001) [7]. In this study, patients with a history of AMI exhibited a relatively low OR for continuing to smoke behaviors, and over 51.3% had quit smoking for six months following discharge; additionally, 2.19 times as many patients intended to quit smoking compared with those who did not [8]. Although this study was cross-sectional and could not verify whether patients had quit smoking because of an AMI, an effect of an AMI on patients' smoking behaviors was observed.

The strength of this study is the first study that simultaneously examined factors and predictors of smoking behaviors in men diagnosed with CAD and their intention to quit, revealing depression as a predictor of both smoking behaviors and intentions to quit. Therefore, male patients with depression must be identified, assessed, and provided with effective interventions to alleviate their depression, thereby facilitating their smoking cessation. However, only focusing on one medical center and not including female patients were limitations of this study. Future studies can recruit participants from medical institutions at different levels and include a sufficient number of female participants diagnosed with CAD to increase the representativeness and inferential power of the research results.

4. CONCLUSION

In this study, although 40.5% of male participants with CAD had quit smoking, 36.4% continued to smoke. Moreover, 35.8% of those who continued smoking expressed no intention of quitting. Depression predicted both the smoking behaviors of male participants and their intentions to quit. Assessing and mitigating

depression in men with CAD are critical in managing their smoking behaviors. Furthermore, participants who were younger and exhibited high CO concentrations in their lungs were more likely to continue smoking, and high nicotine dependence correlated with weaker intentions to quit. These factors should be further studied to verify the effectiveness of intervention measures for smoking cessation.

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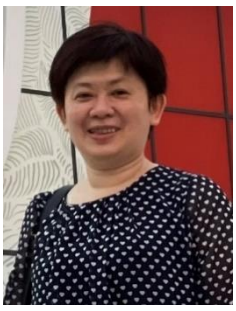

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