Original Article

Factors Affecting Smoking Cessation After Acute Myocardial Infarction

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Abstract

OBJECTIVE: Persistent smoking after acute myocardial infarction is associated with an increased risk of recurrent cardiovascular events. Our aim was to determine the changes in smoking habits in patients after acute myocardial infarction and evaluate the factors affecting smoking cessation.

MATERIAL AND METHODS: A total of 322 patients who had an acute myocardial infarction while smoking were included in the study. Participants were asked to fill out a 30-question survey. According to smoking status, 2 groups were identified, those who quit smoking (n = 155) and those who continued smoking (n = 167).

RESULTS: The rate of smoking cessation among study participants was 48.2% (n = 155). Most of smoker participants had the intention to quit smoking (n = 124, 74.2%). The most common barriers for smoking cessation were nicotine withdrawal symptoms and the cessation rate was over 3 times higher in those with low nicotine dependence ($P < .01$). Weight gain was another common problem seen in 163 (50.6%) participants; among which the cessation rate was relatively low (43.6%). A total of 231 (71.7%) participants got an advice from their doctor to quit smoking and the probability of quitting was around 5 times higher in this group ($P < .01$). A total of 174 (54%) participants stated that they were considering quitting whenever they see the pictorial health warnings on cigarette packs and the probability of quitting was doubled in this group ($P < .01$).

CONCLUSION: High number of patients continue on smoking after acute myocardial infarction. The most common barriers for smoking cessation are nicotine withdrawal symptoms. Doctors should play an active role in helping the patient quit smoking. Strict regulations of tobacco control can be very helpful in this regard.

KEYWORDS: Acute myocardial infarction, nicotine dependence, smoking cessation, tobacco control

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INTRODUCTION

Coronary artery disease (CAD) is a major cause of morbidity and mortality worldwide.[1] Smoking is an important risk factor for CAD.[2] Smoking causes an increase in oxidative stress, vascular inflammation, vasoconstriction, and platelet reactivity leading to vascular endothelial dysfunction.[3] A study showed that half of the nonfatal acute myocardial infarction (AMI) occurring in young and middle-aged people can be attributed to smoking.[4] In patients with CAD, persistent smoking was associated with an acceleration of an ongoing atherosclerotic process.[5] Studies have shown that smoking cessation after AMI can reduce the risk of recurrent infarctions by half.[2] This risk reduction was found to be consistent regardless of age, gender, ethnicity, or the time of diagnosis.[6] Therefore, smoking cessation after AMI can be very helpful in decreasing patients' morbidity and mortality.

Unfortunately, rates of persistent smoking following a diagnosis or hospitalization for CAD are still high.[7] Studies showed that around half of those diagnosed with CAD continue on smoking.[8,9] Similar results was observed in the EUROASPRE-V study that was conducted by the European Society of Cardiology.[10] Many patients struggle while quitting smoking after AMI and on many occasions professional help becomes a necessity. In this study, we aimed to determine the changes in smoking habits after AMI and identify the factors affecting smoking cessation.

MATERIAL AND METHODS

Setting and Participants
Between June 2021 and June 2022, patients who applied to our cardiology outpatient clinic at least 1 year after an AMI were evaluated. Patients who were smoking during the index event (n = 322) was included in this cross-sectional observational study. Nonsmokers or those who started smoking any time after AMI was not included. Any patients with psychotic illness, cognitive impairment, or inability to answer survey questions was also excluded. The sample size analysis was done with a 5% margin of error at 95% CI.

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Data Collection

Participants were asked to fill out a 30-question survey prepared specifically for this study. Patients were assigned into 2 groups according to smoking status. The first group consisted of those who continued to smoke after AMI (n = 167), while the second group consisted of those who quitted smoking (n = 155). The sociodemographic characteristics of the participants (including gender, age, body mass index, occupation, and educational level) were documented. The educational level was categorized as primary school, secondary school, high school, or university graduate. Medical records were used to document past medical history and laboratory test results.

Study Survey

The survey questions assessed the patient's desire to quit smoking as well as changes in daily lifestyles following AMI. Those who were still smoking were asked about the reasons for not being able to quit. The advice and guidance they received from their doctors in terms of quitting smoking were asked. Patients were also asked about their thoughts on tobacco control regulations imposed by the government. All the questions were closely reviewed by the authors for clarity, validity, and content after testing with 5 patients to ensure ease of use and comprehensiveness. The final part of the survey contained the Fagerström nicotine dependence test.[11] According to test results, addiction levels of the patients were classified as low (0-3 points), medium (4-6 points), and high (≥7 points) based on test results.

All procedures were conducted in accordance with the ethical standards of Helsinki Declaration and the ethical committee approval was obtained from Lokman Hekim University Faculty of Medicine (Doc. no:2021136). The patients were informed about the study and were enrolled after providing informed voluntary consent forms.

Data Management and Statistical Analysis

Descriptive statistics of the continuous variable such as mean and SD is used for summarizing. Percentages and frequencies are used for presenting categorical variables. As a preliminary analysis, the relationships between categorical variables are investigated using the chi-square test. Once relationships are found to be statistically significant with chi-square test, further analyses are conducted with logistic regression.

MAIN POINTS

- High number of patients continue to smoke cigarettes after having an acute myocardial infarction.

- The most common barriers for smoking cessation were nicotine withdrawal symptoms and the cessation rate was highest among those with low nicotine dependence.

- Considering its low costs and the proven benefits, smoking cessation should be a primary goal in patients with acute myocardial infarction.

- Evidence-based programs supported by behavioral therapy in which the doctors take an active role can make smoking cessation interventions more effective.

- Strict tobacco control regulations by the government may be highly beneficial in the efforts to stop smoking.

One-way analysis of variance is used for comparing group means. *F* dependence score is taken as continuous variable of the study. This continuous variable is analyzed with ANOVA *F* test. Normality assumption of the *F* test is checked with Shapiro–Wilk test. Equality of variances of the *F* test is checked with Levene test. All assumptions are satisfied. The statistical analysis was carried out by the Statistical Package for Social Sciences (SPSS) version 23.0 (IBM Corp.; Armonk, NY, USA).

RESULTS

Among the 322 participants of the study, 51.8% (n = 167) continued smoking after AMI and 48.2% (n = 155) have quitted smoking. There was no significant difference between the 2 groups in terms of basal sociodemographic and clinical characteristics (Table 1). A significant difference was found in the educational level of the 2 groups (*P* = .04) with smoking cessation rate being highest among university graduates (68.8%) and regression analysis showing a higher probability of quitting in this group (Table 2). On the other hand, no significant association was found between smoking cessation after AMI and other sociodemographic factors (Table 3).

Most smoker participants had the intention to quit smoking (n = 124, 74.2%) and believed that they would succeed in quitting after AMI (n = 98, 58.7%). The most common difficulty they faced was ''nervous temper'' in 197 (61.2%) participants (Table 4). Weight gain was another important problem seen in 163 (50.6%) participants among which the rate of smoking cessation was relatively low (43.6%). Physical exercise, on the other hand, was associated with a significant increase in the probability of quitting smoking (*P* < .01). Nicotine dependence level was low in 154 (47.8%), moderate in 148 (46%), and high in 20 (6.2%) participants.

Table 1. The Basal Clinical Characteristics and Sociodemographic Properties of the Study Participants

Variable	Nonsmokers, (n = 155)	Smokers, (n = 167)	P
Age, years	56.7 ± 5.8	57.2 ± 4.3	.38
BMI, kg/m²	27.1 ± 3.9	26.6 ± 2.8	.18
Basal HR, b/m	88.9 ± 7.1	87.9 ± 8.8	.26
Systolic BP, mmHg	127.7 ± 11.8	129.4 ± 11.2	.19
Diastolic BP, mm Hg	86.7 ± 12.6	87.2 ± 11.3	.7
Hemoglobin, g/dL	13.8 ± 1.7	14.2 ± 2.6	.1
TC, mg/dL	196.2 ± 24.7	199.4 ± 32.2	.32
LDL, mg/dL	139.6 ± 22.7	138.7 ± 33.4	.78
Triglyceride, mg/dL	182.6 ± 32.4	185.4 ± 41.5	.5
HDL, mg/dL	32.8 ± 3.2	33.2 ± 4.5	.36
Calcium, mg/dL	9.2 ± 0.71	9.3 ± 0.82	.24
Sodium, mEq/L	140.9 ± 1.5	141.1 ± 1.3	.2
Potassium, mEq/L	4.1 ± 0.9	4.2 ± 0.2	.16
TSH, mIU/L	3.3 ± 1.4	3.5 ± 0.8	.11

BMI, body mass index; BP, blood pressure; HDL, high-density lipoprotein; HR, hazard ratio; LDL, low-density lipoprotein; TC, total cholesterol; TSH, thyroid-stimulating hormone.

Table 2. Logistic Regression Analysis for the Probability of Smoking Cessation in Relation to Different Variables

Variables	Standard Error	Odds Ratio	95% CI		P
			Lower	Upper	
Being a university graduate	0.236	2.076	1.3062	3.3013	<.01
Performing regular physical exercise	0.284	2.925	1.6742	5.1104	<.01
Having low nicotine dependence	0.264	3.143	1.8955	5.3536	<.01
Got a doctor's advice to quit smoking	0.271	5.185	3.0528	8.8069	<.01
Affected by the pictorial health warnings on cigarette packs	0.269	2.061	1.2157	3.4960	<.01

Regression analysis showed that smoking cessation rate was over 3 times higher in the group with low nicotine dependence (P < .01).

The number of patients who received an advice from their doctor to quit smoking was 231 (71.7%) and the probability of quitting smoking was 5 times higher in this group (P < .01). However, the number of those referred to a specialized smoking cessation department was small (n = 68, 21.1%). Most participants stated that they support the government's strict regulations on tobacco control, believing that it can be effective in decreasing smoking rates (Table 5). More than half of

study participants (54%, n = 174) said that they were considering quitting smoking when seeing the pictorial health warnings on cigarette packs and the probability of quitting smoking was doubled in this group (Table 2).

DISCUSSION

The present study evaluated the changes in smoking habits after AMI and aimed to analyze the factors that influence smoking cessation. Study results showed that more than half of the patients continue on smoking after AMI. The most common difficulties standing against their will to quit smoking

Table 3. The Associations Between Smoking Cessation With Social and Medical Conditions

Social and Medical Conditions	Parameters	Still Smoking, n (%)		Total (%)	P
		Yes (167)	No (155)		
Gender	Female	79 (54.9)	65 (45.1)	144 (44.7)	.33
	Male	88 (49.4)	90 (50.6)	178 (55.3)	
Working status	Retired	81 (53.3)	71 (46.7)	152 (47.2)	.62
	Active worker	86 (50.6)	84 (49.4)	170 (52.8)	
Education level	Primary school	81 (57)	61 (43)	142 (44.1)	.04
	Secondary school	49 (55.1)	40 (44.9)	89 (27.6)	
	High school	27 (45.7)	32 (54.3)	59 (18.3)	
	University	10 (31.2)	22 (68.8)	32 (10)	
Weight gain	No	75 (47.2)	84 (52.8)	159 (49.4)	.09
	Yes	92 (56.4)	71 (43.6)	163 (50.6)	
Physical exercise	No	117 (59.7)	79 (40.3)	196 (60.9)	<.01
	Yes	50 (39.6)	76 (60.4)	126 (39.1)	
Alcohol consumption	No	119 (49.4)	122 (50.6)	241 (74.8)	.24
	Social drinker	36 (57.1)	27 (42.9)	63 (19.6)	
	Heavy drinker	12 (66.6)	6 (33.4)	18 (5.6)	
Hypertension	No	112 (51.9)	92 (48.1)	204 (63.4)	.15
	Yes	55 (43.2)	63 (56.8)	118 (36.6)	
Diabetes mellitus	No	129 (51.2)	123 (48.8)	252 (78.3)	.65
	Yes	38 (54.2)	32 (45.8)	70 (21.7)	
Dyslipidemia	No	109 (51.2)	104 (48.8)	213 (66.1)	.73
	Yes	58 (53.2)	51 (46.7)	109 (33.9)	
Cerebrovascular disease	No	162 (52.1)	149 (47.9)	311 (96.6)	.66
	Yes	5 (45.4)	6 (54.6)	11 (3.4)	
Peripheral artery disease	No	139 (53.7)	120 (46.3)	259 (80.4)	.19
	Yes	28 (44.4)	35 (55.6)	63 (19.6)	
Asthma	No	142 (52.6)	128 (47.4)	270 (83.9)	.55
	Yes	25 (48)	27 (52)	52 (16.1)	
Chronic obstructive lung disease	No	152 (52.8)	136 (47.2)	288 (89.4)	.34
	Yes	15 (44.1)	19 (55.9)	34 (10.6)	

Table 4. The Difficulties Faced the Patients While Trying to Quit Smoking

Difficulties	Parameters	Still Smoking n (%)		Total (%)	P
		Yes (167)	No (155)		
Nervous temper	Yes	109 (55.3)	88 (44.7)	197 (61.2)	.11
	No	58 (46.4)	67 (53.6)	125 (38.8)	
Weight gain	Yes	92 (56.4)	71 (43.6)	163 (50.6)	.09
	No	75 (47.2)	84 (52.8)	159 (49.4)	
Excessive urge to smoke	Yes	33 (47.8)	36 (52.2)	69 (21.4)	.57
	No	134 (52.9)	119 (47.1)	253 (78.6)	
Headache	Yes	27 (55.1)	22 (44.9)	49 (15.2)	.62
	No	140 (51.2)	133 (48.8)	273 (84.8)	
Sleep disturbances	Yes	12 (38.7)	19 (61.3)	31 (9.6)	.12
	No	155 (53.3)	136 (46.7)	291 (90.4)	
Concentration disturbances	Yes	7 (43.7)	9 (56.3)	16 (4.9)	.51
	No	160 (52.3)	146 (47.7)	306 (95.1)	
Numbness	Yes	7 (46.6)	8 (53.4)	15 (4.6)	.17
	No	160 (52.1)	147 (47.9)	307 (95.4)	
Oral ulcers	Yes	6 (54.5)	5 (45.5)	11 (3.4)	.03
	No	161 (51.8)	150 (48.2)	311 (96.6)	
Constipation	Yes	4 (44.6)	5 (55.6)	9 (2.7)	.65
	No	163 (52.1)	150 (47.9)	313 (97.3)	

were nicotine withdrawal symptoms. Self-motivation and desire alone were insufficient to assist the patients to quit smoking but the effects of doctors' guidance and tobacco control regulations were more effective in this regard.

Smoking is the main cause of preventable diseases and premature deaths worldwide.[12] It increases the risk of coronary heart disease and cardiovascular-related morbidity and mortality.[13] Patients who continue on smoking after the diagnosis of cardiovascular diseases constitute a high-risk group for the recurrence of major adverse cardiovascular events (MACE).[6,14] On the other hand, quitting smoking is associated with a substantial lower risk of such events.[15] Even reducing the number of cigarettes smoked per day was found to be

beneficial in this regard.[16] Large-scale studies conducted in different countries showed high rates of patients who continue on smoking after AMI.[8-10] Similarly, in our study, more than half of the patients continued on smoking after AMI.

Studies have revealed that sociodemographic characteristics can affect an individual's commitment to the smoking cessation path.[17] For example, high educational level can be associated with higher confidence in the ability to quit smoking which would increase the likelihood of quitting.[18] In our study, the educational level of the participants was also found to be a significant factor as smoking cessation rates were highest among university graduates and lowest among primary school graduates (68.8% vs. 43%, respectively).

Table 5. Ratios of Patients Supporting the Government's Regulations in Controlling Tobacco Industry

Regulations	Parameters	Still Smoking, n (%)		Total (%)	P
		Yes (167)	No (155)		
Supporting the printing of pictorial health warnings on cigarette packs	Yes	153 (57.5)	113 (42.6)	266 (82.6)	<.01
	No	14 (25)	42 (75)	56 (17.4)	
Believing that the pictorial health warnings can help in quitting smoking	Yes	103 (59.2)	71 (40.8)	174 (54)	<.01
	No	64 (43.2)	84 (56.8)	148 (46)	
Supporting the law of banning tobacco use indoors and in public places	Yes	147 (53.1)	130 (46.9)	277 (86)	.28
	No	20 (44.4)	25 (55.6)	45 (14)	
Supporting the law of banning the advertising of tobacco products	Yes	131 (49.1)	136 (50.9)	267 (82.9)	.27
	No	36 (65.4)	19 (34.6)	55 (17.1)	
Supporting the law of "Plain design for cigarette packs" application	Yes	116 (48.9)	121 (51.1)	237 (73.6)	.08
	No	51 (60)	34 (40)	85 (26.4)	
Supporting the law of raising the tax on tobacco products	Yes	103 (54.5)	86 (45.6)	189 (58.6)	.26
	No	64 (48.1)	69 (51.9)	133 (41.4)	
Believing that these laws can help in decreasing smoking rates	Yes	83 (48.2)	89 (51.8)	172 (53.4)	.17
	No	84 (56)	66 (44)	150 (46.6)	

Additionally, regression analysis showed that the probability of smoking cessation is doubled among university graduates ($P < .01$). On the other hand, no significant association was found between smoking cessation after AMI and other sociodemographic factors like gender, working status, or alcohol consumption (Table 3).

Numerous diseases are linked to smoking; therefore, smokers may suffer from a variety of chronic illnesses. Studies evaluating the association between smoking cessation and the presence of smoking related chronic illnesses such as cardiovascular and pulmonary diseases stated that there is no direct relationship between the 2 conditions.[19] Similar results was observed in our study as no significant association was found between smoking cessation after AMI and a prior diagnosis of such comorbidities (Table 3).

Depressive symptoms are common during the hospital stay for an AMI and can reduce the effectiveness of smoking cessation interventions.[20] Patients also experience withdrawal symptoms while trying to quit smoking which makes the quitting process more challenging.[21] Among the participants of our study, nicotine withdrawal symptoms such as nervous temper, headache, and excessive urge to smoke were the main factors that stood against their will to quit smoking. The degree of nicotine dependence is very important in this regard.[21] Our study results showed that the probability of smoking cessation after AMI was over 3 times higher in the group with low nicotine dependence compared to those with high dependence ($P < .01$). Therefore, smoking cessation programs should be supported by intensive behavioral therapy and, if necessary, psychological pharmacotherapy to make such programs more effective.

Weight changes are another important factor in the smoking cessation process, as quitting increases patients' appetite and causes weight gain.[22] This was seen in 163 (50.6%) participants of our study and demotivated them while trying to quit smoking. Beside its benefits in decreasing cardiovascular morbidity and mortality, physical exercise can help patients with weight problems to quit smoking.[23,24] Our study results showed a higher probability of smoking cessation among those who perform physical exercise but the rate of patients who exercise regularly was low (39.1%). This highlights the importance of physical exercise as part of post-AMI therapy and indicates that more efforts should be implemented in this regard.

Patients with AMI can experience high levels of stress during the interventional procedures and hospitalization in intensive care units which can urge and motivate them to quit smoking. This motivation is necessary to start the quitting process but alone is insufficient to maintain smoking cessation. In our study, 74.2% of smoker participants had the intention to quit smoking and 58.7% believed that they would succeed in quitting after AMI. A professional help is needed to boost this motivation as studies showed higher smoking cessation rates among AMI patients who got advice and guidance from healthcare professionals after the index event.[25,26] Even a brief verbal physician intervention explaining the harmful effects of smoking can yield a strong influence on the patients.[27] Among the 322 patients of our study, 231 (71.7%) patients got an advice to quit smoking from their doctor and the probability of quitting was 5 times higher in this group ($P < .01$). However, not all patients follow these simple instructions and the cessation process should include a comprehensive consulting program within specialized departments.[28] Unfortunately, the number of our study participants who referred to a specialized smoking cessation department was small (n = 68, 21.1%). These results show that there is an increased need for a comprehensive smoking cessation programs to be included within the standard treatment offered to prevent the recurrence of cardiovascular events after AMI.

A public health analysis revealed that strict tobacco control regulations could avert 50 million cardiovascular deaths over the course of the next few decades.[29] In our study, patients stated that they support the government's strict regulations on tobacco control, believing that it can be effective in decreasing smoking rates (Table 5). More than half of our study participants said that they were considering quitting smoking every time they see the pictorial health warnings on cigarette packs and the probability of quitting was doubled in this group ($P < .01$).

In conclusion, our study results showed that high number of patients continue to smoke cigarettes after having an AMI. Considering its low costs and the proven benefits, smoking cessation should be one of the primary goals in these patients. Evidence-based programs supported by behavioral therapy in which the doctors take an active role can make smoking cessation treatment more effective. More strict tobacco control regulations by the government can be very beneficial in this regard. The main limitation of our study is the relatively small number of participants. Another point is that smoking status was based on patients' statements, which sometimes can be misleading.

REFERENCES

1. Roth GA, Johnson C, Abajobir A, et al. Global, regional, and national burden of cardiovascular diseases for 10 causes, 1990 to 2015. *J Am Coll Cardiol.* 2017;70(1):1-25. [CrossRef]
2. Wilhelmsson C, Vedin JA, Elmfeldt D, Tibblin G, Wilhelmsen L. Smoking and myocardial infarction. *Lancet.* 1975;1(7904): 415-420. [CrossRef]

3. Talukder MAH, Johnson WM, Varadharaj S, et al. Chronic cigarette smoking causes hypertension, increased oxidative stress, impaired NO bioavailability, endothelial dysfunction, and cardiac remodeling in mice. *Am J Physiol Heart Circ Physiol*. 2011;300(1):H388-H396. [CrossRef]

4. Mähönen MS, McElduff P, Dobson AJ, Kuulasmaa KA, Evans AE, WHO MONICA Project MONICA Project. Current smoking and the risk of non-fatal myocardial infarction in the WHO MONICA Project populations. *Tob Control*. 2004;13(3): 244-250. [CrossRef]

5. Hallstrom AP, Cobb LA, Ray R. Smoking as a risk factor for recurrence of sudden cardiac arrest. *N Engl J Med*. 1986;314(5): 271-275. [CrossRef]

6. Critchley JA, Capewell S. Mortality risk reduction associated with smoking cessation in patients with coronary heart disease: a systematic review. *JAMA*. 2003;290(1):86-97. [CrossRef]

7. Rahman MA, Edward KL, Montgomery L, McEvedy S, Wilson A, Worrall-Carter L. Is there any gender difference for smoking persistence or relapse following diagnosis or hospitalization for coronary heart disease? Evidence from a systematic review and meta-analysis. *Nicotine Tob Res*. 2016;18(6):1399-1407. [CrossRef]

8. Cha S, Park JJ, Kim S, et al. Need for systematic efforts to modify health-related behaviors after acute myocardial infarction in Korea. *Circ J*. 2018;82(10):2523-2529. [CrossRef]

9. Dawood N, Vaccarino V, Reid KJ, et al. Predictors of smoking cessation after a myocardial infarction: the role of institutional smoking cessation programs in improving success. *Arch Intern Med*. 2008,13;168(18):1961-1967. [CrossRef]

10. Kotseva K, Wood D, De Bacquer D, et al. EUROASPIRE IV: A European Society of Cardiology survey on the lifestyle, risk factor and therapeutic management of coronary patients from 24 European countries. *Eur J Prev Cardiol*. 2016;23(6):636-648. [CrossRef]

11. Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström Test for Nicotine Dependence: a revision of the Fagerstrom Tolerance Questionnaire. *Br J Addict*. 1991;86(9):1119-1127. [CrossRef]

12. Samet JM. Tobacco smoking: the leading cause of preventable disease worldwide. *Thorac Surg Clin*. 2013;23(2):103-112. [CrossRef]

13. White WB. Smoking-related morbidity and mortality in the cardiovascular setting. *Prev Cardiol*. 2007;10:1-4. [CrossRef]

14. Lovatt S, Wong CW, Holroyd E, et al. Smoking cessation after acute coronary syndrome: A systematic review and meta-analysis. *Int J Clin Pract*. 2021;75(12):e14894. [CrossRef]

15. Van den Berg MJ, van der Graaf Y, Deckers JW, et al. Smoking cessation and risk of recurrent cardiovascular events and mortality after a first manifestation of arterial disease. *Am Heart J*. 2019;213:112-122. [CrossRef]

16. Gerber Y, Rosen LJ, Goldbourt U, Benyamini Y, Drory Y. Smoking status and long-term survival after first acute myocardial infarction a population-based cohort study. *J Am Coll Cardiol*. 2009;54(25):2382-2387. [CrossRef]

17. Rice VH, Templin T, Fox DH, et al. Social context variables as predictors of smoking cessation. *Tob Control*. 1996;5(4):280-285. [CrossRef]

18. Tomioka K, Kurumatani N, Saeki K. The association between education and smoking prevalence, independent of occupation: A nationally representative survey in Japan. *J Epidemiol*. 2020 March 5;30(3):136-142. [CrossRef]

19. Karadoğan D, Önal Ö, Şahin DS, Kanbay Y, Alp S, Şahin Ü. Treatment adherence and short-term outcomes of smoking cessation outpatient clinic patients. *Tob Induc Dis*. 2018;16:38. [CrossRef]

20. Schlyter M, Leosdottir M, Engström G, André-Petersson L, Tydén P, Östman M. Smoking Cessation after acute myocardial infarction in relation to depression and personality factors. *Int J Behav Med*. 2016;23(2):234-242. [CrossRef]

21. John U, Meyer C, Hapke U, Rumpf HJ, Schumann A. Nicotine dependence, quit attempts, and quitting among smokers in a regional population sample from a country with a high prevalence of tobacco smoking. *Prev Med*. 2004;38(3):350-358. [CrossRef]

22. Bush T, Lovejoy JC, Deprey M, Carpenter KM. The effect of tobacco cessation on weight gain, obesity, and diabetes risk. *Obesity (Silver Spring)*. 2016;24(9):1834-1841. [CrossRef]

23. Luo J, Manson JE, Hendryx M, et al. Physical activity and weight gain after smoking cessation in postmenopausal women. *Menopause*. 2019;26(1):16-23. [CrossRef]

24. Wahid A, Manek N, Nichols M, et al. Quantifying the association between physical activity and cardiovascular disease and diabetes: a systematic review and meta-analysis. *J Am Heart Assoc*. 2016;5(9). [CrossRef]

25. Leosdottir M, Wärjerstam S, Michelsen HÖ, et al. Improving smoking cessation after myocardial infarction by systematically implementing evidence-based treatment methods. *Sci Rep*. 2022;12(1):642. [CrossRef]

26. Eggers KM, Jernberg T, Lindahl B. Risk-associated management disparities in acute myocardial infarction. *Sci Rep*. 2021;11(1): 24488. [CrossRef]

27. Siudak Z, Krawczyk-Ożóg A, Twarda I, et al. "Heart without smoke" educational campaign - the role of patient education in secondary prevention of cardiovascular disease. *Kardiol Pol*. 2018;76(1):125-129. [CrossRef]

28. Berndt N, de Vries H, Lechner L, et al. High intensity smoking cessation interventions: cardiac patients of low socioeconomic status and low intention to quit profit most. *Neth Heart J*. 2017;25(1):24-32. [CrossRef]

29. Jha P. Avoidable deaths from smoking: a global perspective. *Public Health Rev*. 2011;33(2):569-600. [CrossRef]