

Cardiovascular Risk Factors among Cigarette Smokers

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ABSTRACT

Objective: The aim of the study is to assess the effect of tobacco smoking on the risk of nonfatal acute myocardial infarction in young adults less than years.

Materials and Methods: We conducted a population-based case-control study with 164 occurrence acute myocardial infarction cases (21 women; 143 men), consecutively visited King Abdulaziz hospital, KSA, and 227 controls (81 women; 146 men), From February2016 till February2017. All women are non-Saudi women. Odds ratios (OR) and 95% confidence intervals (95%CI) were calculated using unconditional logistic regression. **Results:** The commonness of present smoking was 81% in male cases and 54% in male controls (OR = 3.59, 95%CI: 2.49, 5.31) and 60% of female cases were smokers compared with 36% of controls (OR = 2.65, 95%CI: 1.40, 4.98). No interaction was found between current smoking and gender on myocardial infarction risk ($P = 0.399$). A dose-effect response was present, the odds favoring myocardial infarction reaching an eight-fold increase for those who smoked >25 cigarettes/day compared with never smokers. The risk estimate for former smokers was similar to never smokers.

Conclusions: Tobacco smoking is an important independent risk factor for acute myocardial infarction in young adults, with similar strength of association for both genders.

Keywords: Ischemic heart disease, smoking, young patients.

INTRODUCTION

The pathologic process leading to coronary artery disease begins early in life, though the clinical consequences of atherosclerosis are apparent mainly in older adults^[1]. Short-term mortality studies showed that younger patients have more favorable prognosis, but long-term studies showed an overall poor prognosis for individuals with premature coronary artery disease^[2]. Myocardial infarction under the age of 45 years accounts for almost 10% of all infarctions in the United States^[1], reflecting the perception of an uncommon event in this age group, and often has no evident relationship with atherosclerotic plaque rupture^[3]. Smoking seems to be the most significant risk factor for myocardial infarction events amid young individuals^[4]. Actually, active and passive smokers are showing a wide range of substances with a potential influence on atherogenesis.

Smoking can trigger myocardial infarction in individuals with minimal atherosclerosis or even with normal coronary arteries, particularly among the young^[1-5], endorsing temporary coronary vessel occlusion, as a consequence of thrombus formation, coronary artery spasm, or both^[5]. Moreover, smokers tend to extant other lifestyle selections, regarding diet and physical activity that have an independent effect on the risk of coronary disease^[6]. Even though smoking is a entrenched risk

factor for early atherosclerosis^[7, 8] and plaque instability^[9], it has not been widely assessed using population-based data. Moreover, gender differences are particularly significant to take into account when considering the effect of smoking on myocardial infarction. Numerous studies define an increase of myocardial infarction risk in young adults, with no gender differentiation^[8-10]. Other studies highlight differences by gender with a mainly damaging effect of smoking amongst females^[11, 12], but further information is required, addressing the issue in the younger groups. The sparse population-based data on nonfatal myocardial infarction events and the high influence of smoking on the incidence of myocardial infarction in young adults led us to conduct a population-based case-control study in this age range.

The study objective was to assess the effect of tobacco smoking on the risk of nonfatal acute myocardial infarction in young adults (≤ 45 years), and whether there is modification of this effect by gender.

MATERIALS AND METHODS

We conducted a population-based case-control study with 164 occurrence acute myocardial infarction cases (21 women; 143 men), consecutively visited King Abdulaziz hospital, KSA,

and 227 controls (81 women; 146 men), and who survived at least 4 days after the acute event, from February 2016 till February 2017. All women are non-Saudi women. The diagnosis was recognized according to the criteria defined by the European Society of Cardiology and the American College of Cardiology^[13], considering acute myocardial infarction with and without ST-segment elevation. Patients were interviewed during the hospital stay, between the fourth and eighth days after admission, after clinical stabilization.

Data on cases and controls were collected by the same group of trained interviewers, with the use of a structured questionnaire. Smoking habits were self-reported and participants were classified based on World Health Organization categories^[14], into never-smokers, current smokers, including daily (at least one cigarette a day) or occasional smokers (less than one cigarette a day), and former smokers (quit smoking for at least 6 months). A subject who quit smoking less than six months was reflected as a current smoker (regular or infrequent smoker, rendering the number of cigarettes smoked per day). Current and former smokers were asked about the duration, age at smoking initiation, and the number of cigarettes smoked. The use of other types of tobacco was likewise questioned and recorded, but we only analyzed the number of cigarettes smoked due to the almost nil contribution of other types of tobacco (only three controls reported the use of tobacco pipe or rolled cigar, but also of cigarettes). Leisure-time physical activity was quantified after a detailed recall of leisure activities, and expressed as metabolic equivalents. Diet was

assessed using a semi-quantitative food frequency questionnaire^[15].

Chi-squared test was utilized to assess the association amid two categorical variables. Mann-Whitney test and Student's *t*-test were used to compare two or more independent samples, according to variables' distribution. The distribution of variables was tested by Kolmogorov-Smirnov test. To estimate the magnitude of the association between smoking and myocardial infarction, adjusted odds ratios (OR) with 95% confidence intervals (95% CI) were calculated using unconditional logistic regression. When evaluating the relationship between acute myocardial infarction and different variables, namely gender, effect modification by smoking was evaluated in the regression model testing interaction terms between smoking (dichotomous variable) and those other variables. Data were analyzed using SPSS version 13.0.

RESULTS

Characteristics of acute myocardial infarction cases and controls are presented in Table 1. Compared with controls, male and female cases were significantly older, showed higher means of body mass index and waist circumference, and more frequently reported dyslipidemia, hypertension, diabetes, and a family history of myocardial infarction. Moreover, male cases had significantly higher mean intake of total energy, and caffeine, and lower mean leisure-time energy expenditure.

Table 1. Characteristics of acute myocardial infarction cases and controls

	Women			Men		
	Case (n=21)	Control (n=81)	P	Case (n=143)	Control (n=146)	P
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Age (years)	39.9 (3.3)	34.9 (8.1)	<0.001	39.3 (4.9)	34.7 (7.7)	<0.001
Body mass index (kg/m ²)	38.1 (5.8)	25.1 (5.0)	<0.001	26.9 (3.5)	25.8 (4.3)	<0.001
Waist circumference	86.9 (13.7)	80.1 (11.4)	<0.001	94.1 (10.1)	89.2 (11.2)	<0.001
Leisure-time physical activity	4.5 (3.5)	5.4 (4.4)	0.149	5.7 (4.0)	6.4 (4.3)	0.005
Total energy intake	2310 (610)	2183 (522)	0.290	2732 (671)	2520 (620)	<0.001
Caffeine consumption	97 (69)	79 (52)	0.261	127 (71)	95 (60)	<0.001
Family history of infarction (N)	6	11	0.002	45	22	<0.001
Angina (N)	2	7	0.769	14	7	0.769
Dyslipidemia (N)	6	13	0.019	64	33	<0.001
Hypertension (N)	8	7	<0.001	36	16	<0.001
Diabetes (N)	2	1	<0.001	10	1	<0.001

The commonness of present smoking was 81% in male cases and 54% in male controls (OR = 3.59, 95%CI: 2.49, 5.31) and 60% of female cases were smokers compared with 36% of controls (OR = 2.65, 95%CI: 1.40, 4.98) [Table 2] (P value for interaction = 0.399).

Substantial smokers (>25 cigarettes/day) were significantly more common among cases, both in women (21% vs 2.5%, $P < 0.001$) and men (42% vs 12%, $P < 0.001$), compared to controls. Mean number of cigarettes smoked per day was significantly higher among female (24 vs 13 cigarettes/day) and male cases (30 vs 19 cigarettes/day) compared to controls. The mean age of smoking initiation was significantly lower in male cases (15 vs 17 years, $P = 0.001$) but not in females (17 vs 18 years, $P = 0.701$). Mean years of smoking duration were significantly higher both in female (19 vs 15 years, $P = 0.001$) and male cases (22 vs 16 years, $P < 0.001$), compared with controls.

Table 2. Smoking habits of acute myocardial infarction cases and controls, by gender

	Women			Men		
	Case (n=21)	Control (n=81)	P	Case (n=143)	Control (n=146)	P
Smoking habits	N	N		N	N	
Never smokers	7	41	<0.001	15	47	<0.001
Ex-smokers	2	11		12	21	
Smokers of 1 to 15 cigarettes/day	4	18		15	31	
Smokers of 16 to 25 cigarettes/day	4	9		40	30	
Smokers of > 25 cigarettes/day	4	2		61	17	
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Cigarettes per day	24 (15)	13 (9)	<0.001	30 (15)	19 (12)	<0.001
Age at smoking initiation	17 (6)	18 (4)	0.701	15 (4)	17 (4)	0.001
Duration of smoking	19 (8)	15 (8)	0.001	22 (7)	16 (9)	<0.001

Since we found no significant interaction between current smoking and gender on acute myocardial infarction risk, the association analysis between smoking and acute myocardial infarction occurrence was made with the entire sample.

DISCUSSION

In the present study, a strong positive relation was perceived between smoking and acute myocardial infarction in young adults, and the effect was not modified by gender. Moreover, a clear dose-effect response was current, the odds favoring myocardial infarction reaching an eight-fold increase for those who smoked more than 25 cigarettes per day. A case-control study reported an OR around 6.0 for current smoking (OR = 6.4, 95%CI: 1.7, 24.1) among young adults^[16], and an Italian study presented an adjusted OR = 32.8 for young heavy smokers^[17]. In the Framingham Study, the risk of myocardial infarction also increased with the daily number of cigarettes smoked. An increase of 10 cigarettes per day increased the risk of cardiovascular disease by 18% in men and 31% in women of all ages^[18].

Smoking is reflected as a major threat for acute myocardial infarction in both genders, nonetheless, studies pointed out the particularly harmful effect of the relative estrogen deficiency that female smokers appear to have^[11] and suggested more metabolic effects among women, predisposing them to acute

myocardial infarction at a relatively younger age. An interaction between oral contraceptives and smoking was also described^[15]. In the current study, we found no gender differences in the case-control assessment of smoking effect. Smokers have a tendency to present a social and behavioral profile favoring coronary heart disease. Smoking is negatively correlated with body weight, physical activity, and high-density lipoprotein cholesterol and positively with alcohol abuse, psychological stress, total serum cholesterol, and hematocrit levels^[19]. Relations between current smoking and such determinants of myocardial infarction were tested in the current study, but no significant effect modification was found. **Prescott *et al.*(20)**, similarly did not find interaction between smoking and other myocardial infarction risk factors on myocardial infarction risk. Even though young acute myocardial infarction patients subsidize relatively little to the overall rate of infarction, significant risk factors recognized are mostly those known to affect the development of early coronary atherosclerosis. The comparable risk of acute myocardial infarction for former smokers and never smokers debates in favor of the valuable effect of smoking cessation. The Albany and Framingham combined study showed that one year after quitting, the risk of coronary heart disease decreases by half and, in the long run, ex-smokers revealed similar risks to never-smokers^[21, 22].

Moreover, the benefits of smoking cessation in an early age have been highlighted as it increases long-term survival^[23].

The observational and retrospective nature of the current study is liable to specific bias. Trying to minimize recall bias as much as possible, the data collection on cases was done throughout the hospitalization period and only incident cases were included. These procedures also contributed to avoid potential bias due to behavioral modifications after the acute event. Additionally, these hospital cases constitute a representative sample of nonfatal myocardial infarction patients, as all myocardial infarction cases that reach any medical care system are admitted to public hospitals.

CONCLUSION

The present study indicated that tobacco smoking is a significant independent risk factor for acute myocardial infarction in young adults, with a similar effect for both genders. An increase in female cardiovascular disease morbidity can be expected if no effective interventions targeted mainly to adolescents and young adults take place.

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