

Smoking and the risk of acute coronary syndrome in young women treated in an emergency department

Alberto Dominguez-Rodriguez^{1,2,3*}, Eduardo Arroyo-Ucar¹, Pedro Abreu-Gonzalez^{3,4},
Guillermo Burillo-Putze^{2,5}

¹Department of Cardiology, Hospital Universitario de Canarias, Tenerife, Spain

²Facultad de Ciencias de la Salud, Universidad Europea de Canarias, Tenerife, Spain

³Instituto Universitario de Tecnologías Biomédicas, Tenerife, Spain

⁴Department of Physiology, Universidad de La Laguna, Tenerife, Spain

⁵Department of Emergency Medicine, Hospital Universitario de Canarias, Tenerife, Spain

Email: *adrvdg@hotmail.com

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ABSTRACT

The aim of this study is to compare the clinical characteristics of young women (<40 years) with older (≥40 years) admitted to the hospital emergency department with the diagnosis of acute coronary syndrome (ACS), and identify which cardiovascular risk factors are predictors to suffer an ACS in the group of young women. We included women consecutively admitted in a tertiary hospital with a diagnosis of ACS. A total of 118 women with a diagnosis of ACS were included. Young women were more likely to smoke and had a higher proportion of coronary artery disease of one vessel. The multivariable logistic regression analysis showed that smoking was the only variable associated independently with the presence of ACS in young women (OR: 6.451, 95% CI: 1.479 to 28.571, $p = 0.01$). The findings of this study indicate that smoking is an independent predictor of ACS in women less than 40 years.

Keywords: Women; Smoke; Acute Coronary Syndrome; Emergency Department; Risk Factors

1. INTRODUCTION

In the western world, cardiovascular disease is the leading cause of death in women. Numerous previous studies have drawn attention to the worst hospital prognosis of women experiencing an acute coronary syndrome (ACS). Epidemiological studies have identified risk factors such as high blood pressure (HT), diabetes mellitus (DM),

smoking and physical inactivity as responsible, in large part, for ischemic heart disease in women [1]. However, probably due to the low incidence of ACS in young women, there are any published studies concerning this specific population [2]. The aim of this study is to compare the clinical characteristics of young women (<40 years), compared to with older (≥40 years) admitted to the hospital emergency department with the diagnosis of ACS, and identify which factors are predictors to suffer an ACS in this group of patients.

2. METHOD

2.1. Study Population

Prospective cohort study with hospitalary follow-up, which evaluated all patients attended to the emergency department of a tertiary care hospital with a diagnosis of ACS. The population was divided into two groups, depending on their age: group A that included young women (<40 years), and group B formed by older women (≥40 years). The diagnosis of ACS was established according to the criteria published in the literature [3]. ACS with ST-elevation was defined by the presence of compatible symptoms, persistent (>20 min) ST-segment elevation ≥1 mm in at least 2 contiguous leads or the presence of left bundle branch block presumed to be a new occurrence, and elevated cardiac troponin-I ≥ 0.5 ng/ml (cut-off point ≥ 0.5 ng/ml for the diagnosis of AMI; immunological reagents of the Orthoclinical Diagnostics Vitros 5100 system, United States). ACS without ST-elevation was defined by the presence of compatible symptoms, cardiac troponin-I ≥ 0.5 ng/ml and/or dynamic ST-segment changes (≥1 mm decrease in

*Corresponding author.

the ST-segment or non-persistent elevation in at least 2 contiguous leads) [3].

Both groups were analysed cardiovascular risk factors (DM, HT, dyslipidemia, smoking and physical inactivity), time of onset of symptoms, pre-hospital care, hospital arrival form, analytical parameters, hospitalary anti-ischemic treatment and degree of coronary artery disease. Diagnostic coronary angiography was performed using 4 - 7 French Judkins catheters through femoral or radial approaches [4]. The study was approved by the Ethics Committee for Clinical Research of the institution, and all patients gave written informed consent.

2.2. Statistical Analysis

Qualitative variables were assessed using the χ^2 test and Fisher's test, when it was necessary. Quantitative variables were compared using the *t*-test of Student. A multivariate analysis using binary logistic regression model was performed, being the dependent variable "group" and as independent variables, the ones that were statistically significant in the univariate analysis and those that could have clinical implications and/or could be etiologically possible. All P values were calculated by assuming the bilaterally and were considered significant when their value was less than 0.05. Statistical analysis was performed using SPSS 15.0.

3. RESULTS

The baseline characteristics of the study population are summarized in **Table 1**. One hundred eighteen women were studied sequentially. Group A consisted of 18 women <40 years versus group B with a total of 100 women \geq 40 years. 61.1% of women <40 years were admitted with the diagnosis of ST-elevation ACS. On the other hand, 73% of women \geq 40 years were admitted with a diagnosis of ACS without ST elevation. Regarding the degree of coronary artery disease, in Group A predominated 1 vessel disease (61.1%) and in Group B 3 vessel disease (34%). Between both groups there were no statistically significant differences in the time of onset of symptoms to arrival to emergency department, pre-hospitalary emergency assistance, hospital arrival form, anti-ischemic drug therapy and revascularization treatment. None of the patients admitted with ACS were treated with oral contraceptives or hormone replacement therapy. Regarding cardiovascular risk factors, women in group A had lower proportions of diabetes and HT compared to group B. Smoking was more common between women in group A, as well as higher numbers of leukocytes and lower HDL cholesterol. The younger women smoked one more pack per day and the duration of smoking was of 15 ± 3 years. The multivariable logistic regression analysis (**Table 2**) showed that smoking was the only

Table 1. Baseline characteristics of the population study.

	Group A (women < 40 years) N = 18	Group B (women \geq 40 years) N = 100	P values
ACS-n (%)			
With ST elevation	11 (61.1)	27 (27)	0.004
Without ST elevation	7 (38.9)	73 (73)	
Hipertension	4 (22.2)	81 (81)	<0.001
Diabetes <i>mellitus</i>	4 (22.2)	60 (60)	0.003
Hypercholesterolemia	8 (44.4)	66 (66)	0.08
Smoker	8 (44.4)	6 (6)	<0.0001
Sedentary	7 (38.9)	47 (47)	0.52
Time of onset of symptoms to arrival in the emergency	212.4 \pm 66.30	223.8 \pm 72	0.53
Form of arrival at hospital			
Ambulance	13 (72.2)	64 (64)	0.74
Own	5 (27.7)	36 (36)	
Assistance pre-hospital emergency	12 (67)	60 (60)	0.44
CAD			
Without obstructive lesions	1 (5.6)	6 (6)	
One vessel	11 (61.1)	28 (28)	0.04
Two vessel	4 (22.2)	32 (32)	
Three vessel	2 (11.1)	34 (34)	
PCI	12 (66.7)	61 (61)	0.64
Pharmacologic treatment			
ASA	18 (100)	100 (100)	1
Clopidogrel	18 (100)	100 (100)	1
Statins	18 (100)	100 (100)	1
β -blockers	15 (83.3)	90 (90)	0.76
Nitrates	6 (33.3)	40 (40)	0.89
ACEI	10 (55.5)	62 (62)	0.55
Ivabradine	13 (72.2)	67 (67)	0.96
Leucocytes ($10^9/l$)	9.5 \pm 2.3	7.8 \pm 2.9	0.023
Hemoglobin (g/dl)	12.3 \pm 1.7	11.8 \pm 1.7	0.288
LDL-cholesterol (mg/dl)	111.3 \pm 50.1	94.3 \pm 41.5	0.126
HDL-cholesterol (mg/dl)	33.8 \pm 9.8	39.7 \pm 10.5	0.028
Creatinine (mg/dl)	0.68 \pm 0.36	0.89 \pm 0.56	0.138

Values are expressed as n (%) or media \pm SD. ACS: Acute coronary syndrome; ACEI: Angiotensin-converting enzyme inhibitors; ASA: Acetylsalicylic acid; CAD: Coronary artery disease; PCI: Percutaneous coronary intervention.

Table 2. Results of logistic regression analysis using as dependent variable “group A versus B”.

Variables	OR	CI 95%	P values
Hipertension	1.923	1.410 - 5.102	0.20
Diabetes mellitus	1.960	1.275 - 4.901	0.15
Smoker	6.45	1.479 - 28.571	0.01
CAD	1.007	0.631 - 1.563	0.97

OR: odds ratio; CI: Confidence Interval; CAD: Coronary artery disease.

variable independently associated with the presence of ACS in young women <40 years.

4. DISCUSSION

We observed two important findings: 1) the low incidence of ACS in young women (15.2%), which is consistent with previous literature [2]; and 2) in our study, smoking is an independent predictor of ACS in women less than 40 years. Several studies have previously shown that women who suffer ACS present an unfavourable cardiovascular risk profile. In published series, the age average at admission is greater than 70 years, the prevalence of risk factors such as HT or DM is greater, and coronary revascularization rates are lower than those observed in the male population [5]. Therefore, the American Heart Association, in collaboration with other scientific societies, has developed specific guidelines on cardiovascular prevention in women [6]. But there are still no publications that focus on the population of young women who suffer ACS and its relation to cardiovascular risk factors.

In our study, women ≥ 40 years have more often cardiovascular risk factors (HT, diabetes and dyslipidemia) in contrast to younger women, where we found a greater proportion of smokers and low HDL. These high rates of smoking among young women have a clear social behaviour [6]. Moreover, the multivariate analysis showed that smoking is the only independent predictor of ACS in young women. Our obtained data are similar to MONICA study [7], sponsored by WHO, which investigated the risk factors for cardiovascular disease in 120,000 individuals aged 35 to 64, from 21 countries, having suffered an ACS. In young male and female subjects, the risk of stroke in smokers was five times bigger compared to nonsmokers [8].

It seems clear about the great influence of smoking on this subgroup of patients, a priori low risk of cardiovascular events population. The underlying pathophysiological causes that make this population especially vulnerable remain unknown. There are many articles in the literature that demonstrate the high risk for having a coronary event in women that smoke [7,8]. Evidence-

based measures need to be implemented to assist women to quit smoking (or to not start tobacco use). Effective tobacco control, such as full implementation of the WHO's Framework Convention on Tobacco Control, would be such a method. National and international organizations such as the International Network of Women against Tobacco and the WHO's Tobacco Free Initiative are important reference organisations to promote more effective tobacco cessation in women [9]. Although more men than women smoke than women, those women under 40 years who do smoke have a greater risk of coronary heart disease, and therefore it is imperative that the physicians should try to threat “aggressively” active smoking in this population, and have it significantly presented in their clinical history and diagnostic strategies [9].

Our study has limitations that should be considered. Our study is single-center study; therefore, the results cannot be extrapolated to other hospitals, where we may find different sociodemographic and health conditions. Furthermore, the sample size may be another limiting factor; however, we are able to show differences between the study groups, after adjusting for potential confounding variables. Finally, extra-hospitalary follow up of the patients is not performed, thus it is not possible to determine morbidity and mortality aspects.

In conclusion, the findings of this study show that smoking is a strong predictor of ACS in women under 40 who attend to the emergency department of a tertiary hospital. Physicians should try to threat “aggressively” active smoking in this population and have it significantly presented in their clinical history and diagnostic strategies [2,10,11].

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