Comparative Analysis of Cardiovascular Disease Risk Factors Influencing Nonfatal Acute Coronary Syndrome and Ischemic Stroke

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The aim of the present work was to compare the influence of classic cardiovascular disease (CVD) risk factors on the development of acute coronary syndrome (ACS) and ischemic stroke. During 2009−2010, 1,000 participants were enrolled: 250 were consecutive patients with a first ACS, 250 were consecutive patients with a first ischemic stroke, and 500 were population-based, control subjects, 1-for-1 matched to the patients by age and gender. The following CVD risk factors were evaluated: smoking/passive smoking, family history of CVD, physical inactivity, hypertension, hypercholesterolemia, diabetes mellitus, presence of overweight and obesity, trait anxiety (assessed with the Spielberger State-Trait Anxiety Inventory form Y-2), and adherence to the Mediterranean diet (assessed by the MedDiet-Score). Furthermore, participants graded the perceived significance of the aforementioned factors, using a scale from 1 (not important) to 9 (very important). The risk factors with the highest effect size for ACS, as determined by the Wald criterion, were smoking and hypercholesterolemia; regarding stroke, they were anxiety and family history of CVD (all $p < 0.01$). When the odds ratios of each factor for ACS and stroke were compared, insignificant differences were observed, except for smoking. On the basis of the participants' health beliefs, smoking and stress emerged as the most important risk factors, whereas all subjects graded passive smoking as a least important factor. In conclusion, similarities of the risk factors regarding ACS and ischemic stroke facilitate simultaneous primary prevention measures.   © 2013 Elsevier Inc. All rights reserved. (Am J Cardiol 2013;112:349−354)

The aims of the present study were to compare the effect of individual cardiovascular disease (CVD) risk factors on the occurrence of acute coronary syndrome (ACS) versus ischemic stroke and to evaluate the perceived importance of CVD risk factors in a sample of 1,000 CVD patients and healthy subjects.

Methods

This was a multicenter, case-control study with individual (1-for-1) matching by age (within $\pm$ 3 years) and gender.[1] From October 2009 to December 2010, 500 of the 615 consecutive patients with a first ACS event (n = 250, 209 acute myocardial infarction, 41 unstable angina) or ischemic stroke (n = 250) and without any suspicion of previous CVD who presented to the cardiology or pathology clinics or emergency units of 3 major general hospitals in Greece agreed to participate (participation rate 81%). For the

stroke patients who were unable to communicate (speech disorders, aphasia, memory problems), the information was obtained by a valid surrogate respondent (first-degree relative living in the same home as the patient and aware of the participant's dietary habits and medical history). Patients with chronic neoplasmatic disease or chronic inflammatory disease, as well as individuals with recent changes in their dietary habits, were not enrolled in the study. Five hundred control subjects (250 matched 1-for-1 with ACS patients and another 250 matched 1-for-1 with stroke patients) were selected concurrently with the patients on a volunteer, population basis and from the same region as the patients. Controls were without any clinical symptoms or suspicions of CVD in their medical history, as assessed by a physician.

On the basis of a priori statistical power analysis, a sample size of 500 patients (250 ACS, 250 stroke) and 500 age- and gender-matched healthy subjects, was adequate to evaluate 2-sided odds ratios (ORs) equal to 1.20, achieving statistical power >0.80 at 0.05 probability level (p value).

The study was approved by the Ethics Committee of the University Hospital of Ioannina and was carried out in accordance with the Declaration of Helsinki (1989) of the World Medical Association. Before collection of any information, participants (or valid surrogate respondents) were informed about the aims and procedures of the study and provided their signed consent.

Regarding the ACS patients, clinical symptoms were evaluated at hospital entry and a 12-lead electrocardiogram was performed. Evidence of myocardial cell death was assessed with blood tests and measurement of the levels of

Table 1
Sociodemographic, lifestyle, and clinical characteristics of the study participants

Variable	ACS Patients (n = 250)	ACS Controls (n = 250)	Stroke Patients (n = 250)	Stroke Controls (n = 250)
Age (yrs)	60 ± 12	60 ± 12	77 ± 9	73 ± 9
Men	208 (83.2%)	208 (83.2%)	139 (55.6%)	139 (55.6%)
Smoking habits				
No smoker/no passive smoker	20 (8.4%)*	62 (26.4%)	59 (33.7%)	77 (33.2%)
No smoker/passive smoker	32 (13.4%)	37 (15.7%)	38 (21.7%)	51 (22.0%)
Ever smoker/no passive smoker	37 (15.5%)	45 (19.1%)	24 (13.7%)	27 (11.6%)
Ever smoker/passive smoker	150 (62.5%)	91 (38.7%)	54 (30.9%)	77 (33.2%)
Physical inactivity	84 (35.9%)*	43 (17.5%)	111 (52.9%)*	61 (25.2%)
Family history of CVD	81 (36.2%)*	39 (16.7%)	51 (31.3%)*	38 (16.7%)
Hypertension	148 (62.2%)*	90 (37.7%)	206 (84.4%)*	137 (56.8%)
Hypercholesterolemia	165 (71.4%)*	100 (45.5%)	159 (68.5%)†	119 (54.1%)
Diabetes mellitus	58 (26.1%)*	29 (12.4%)	71 (32.9%)†	50 (21.5%)
Body mass index (kg/m²)	27.82 ± 4.29	27.23 ± 3.50	26.72 ± 3.57	27.35 ± 4.24
Normal weight (18.5−24.9)	57 (24.9%)	63 (26.3%)	79 (33.1%)	73 (30%)
Overweight (25−29.9)	116 (50.7%)	132 (55%)	124 (51.9%)	120 (49.4%)
Obese (>30)	56 (24.5%)	45 (18.8%)	36 (15.0%)	50 (20.6%)
MedDietScore (range 0−55)	30.67 ± 5.02*	32.50 ± 4.41	29.99 ± 3.79*	32.03 ± 4.08
First tertile (0−29)	86 (41.1%)*	50 (21.9%)	94 (49.5%)*	60 (26.8%)
Second tertile (30−33)	66 (31.6%)	79 (34.6%)	64 (33.7%)	82 (36.6%)
Third tertile (34−55)	57 (27.3%)	99 (43.4%)	32 (16.8%)	82 (36.6%)
STAI Y-2 (range 20−80)	40.52 ± 10.05*	36.55 ± 9.26	45.66 ± 7.17*	38.65 ± 9.86
20−39: low anxiety	109 (48.7%)*	158 (64.5%)	37 (17.9%)*	135 (54.9%)
40−59: moderate anxiety	105 (46.9%)	84 (34.3%)	167 (80.7%)	106 (43.1%)
60−80: severe anxiety	10 (4.5%)	3 (1.2%)	3 (1.4%)	5 (2%)

Data are expressed as mean ± SD or frequencies (n, %). p Values derived from Student's *t* test or the chi-square test. Patients whose average blood pressure levels were ≥140/90 mm Hg or were under antihypertensive medication were classified as having hypertension. Hypercholesterolemia was defined as total serum cholesterol levels >200 mg/dL or the use of lipid-lowering agents.

* p <0.001 compared with the ACS or stroke control group, respectively.

† p <0.05 compared with the ACS or stroke control group, respectively.

Table 2
Results from logistic regression analysis developed to evaluate the likelihood of having acute coronary syndrome (ACS) or ischemic stroke (outcome), according to exposure to potential cardiovascular disease risk factors

Independent Variables	ACS		Stroke		p
	OR (95% CI)	Wald	OR (95% CI)	Wald	
MedDietScore (per 1/55 unit)	0.93 (0.88−0.99)	5.98	0.91 (0.84−1.00)	4.12	0.710
Physical inactivity (yes/no)	2.94 (1.47−5.88)	9.22	1.97 (0.91−4.26)	2.96	0.414
Smoking habits					
No smoker/no passive smoker (reference)	1.00	—	1.00	—	—
No smoker/passive smoker	4.33 (1.52−12.38)	7.49	1.32 (0.55−3.18)	0.37	0.054
Ever smoker/no passive smoker	5.15 (1.82−14.53)	9.57	1.69 (0.43−6.69)	0.55	0.127
Ever smoker/passive smoker	8.62 (3.52−21.14)	22.16	0.75 (0.29−1.94)	0.35	<0.001
Family history of CVD (yes/no)	2.40 (1.23−4.69)	6.63	2.35 (1.07−5.17)	4.51	0.960
Hypertension (yes/no)	2.81 (1.52−5.21)	10.75	1.60 (0.74−3.44)	1.45	0.223
Hypercholesterolemia (yes/no)	3.80 (2.15−6.68)	21.31	1.86 (0.89−3.87)	2.75	0.090
Diabetes mellitus (yes/no)	1.91 (0.88−4.15)	2.68	1.31 (0.60−2.86)	0.45	0.483
Overweight/obese (yes/no)	0.56 (0.29−1.08)	2.99	1.00 (0.44−2.24)	<0.001	0.236
STAI-Y2 (per 1/80 unit)	1.04 (1.01−1.07)	5.48	1.06 (1.02−1.10)	8.92	0.257

All groups (ACS cases, ACS control participants, stroke cases, stroke control participants), n = 250. Results are presented as OR (95% CI), Wald test, obtained from multiple conditional logistic regression. p Values derived from cross-model postestimation tests regarding the comparison between the ORs of each CVD risk factor.

troponin I and the MB fraction of total creatinine phosphokinase (according to the Universal Definition of Myocardial Infarction, Joint European Society of Cardiology/American College of Cardiology Foundation/American Heart Association/World Heart Federation Task Force)[2]; unstable angina was defined by the occurrence of ≥1 angina episode(s), at rest, within the preceding 48 hours, corresponding to class III of the Braunwald classification.[3] Ischemic strokes were defined through symptoms of neurologic dysfunction of acute onset of any severity, consistent with focal brain ischemia and imaging/laboratory confirmation of an acute vascular ischemic pathology.[4]