

# The Impact of the Associated Pathology in Acute Coronary Events

SORIN NICOLAE DINESCU<sup>1</sup>, RAMONA CONSTANTINA VASILE<sup>1</sup>,  
MARIA MARILENA FRUNZULICĂ<sup>2</sup>, VENERA CRISTINA DINESCU<sup>3</sup>,  
EMILIA BURADA<sup>4</sup>, ANDREEA TĂNASIE<sup>4</sup>,  
CĂTĂLINA ELENA BICĂ<sup>5</sup>, VICTOR GHEORMAN<sup>6</sup>,  
OVIDIU ȘTEFAN GEORGESCU<sup>2</sup>, FLORIN MARIUS ROMANESCU<sup>4</sup>

<sup>1</sup>Epidemiology Department, University of Medicine and Pharmacy of Craiova, Romania

<sup>2</sup>PhD, University of Medicine and Pharmacy of Craiova, Romania

<sup>3</sup>Health Promotion Department, University of Medicine and Pharmacy of Craiova, Romania

<sup>4</sup>Physiology Department, University of Medicine and Pharmacy of Craiova, Romania

<sup>5</sup>Paediatrics Department, University of Medicine and Pharmacy of Craiova, Romania

<sup>6</sup>Psychiatry Department, University of Medicine and Pharmacy of Craiova, Romania

**ABSTRACT:** Acute coronary events (ACE) are one of the main concerns for both clinical medicine and prophylaxis. The study aims to follow the frequency of the pathology associated with ACE and to establish its association with the occurrence of ACE. The study included 865 adult participants between the ages of 19-86. Subjects completed a complex questionnaire that included questions about health status. The study was conducted by applying the subjects to an anonymous questionnaire, in three family medicine practices between November 2018 to May 2019 and targeted healthy people. The frequencies of the following types of associated pathologies were evaluated: high blood pressure (HBP), hypercholesterolemia, stroke, diabetes, depression, stress. In hypertensive patients the prevalence of ACE was 6,99% (N=11) and in those not diagnosed with HBP of only 0,29% (N=2). The risk of ACE was 20 times higher than in those without HBP (RR=20,93; p<0.001). The prevalence of ACE was high among subjects with high cholesterol levels (21,43%) compared with those with normal values (3,03%; N=22), the risk of ACE being 7 times higher (RR=7,06; p<0.001). The prevalence of diabetes was more than four times higher in subjects with ACE (17,3%; N=9) compared with those without ACE (3,9%; N=32). Among those affected by diabetes, the prevalence of ACE was 21,95% (9/41), and risk of ACE in people with diabetes was four times higher (RR=4,21; p<0.001). Although cardiovascular disease is the most common pathology in the contemporary world, a number of comorbidities arise as ACE generators (hypertension, hypercholesterolemia, diabetes), along with psycho-emotional disorders such as depression, anxiety or stress, which outline, ensures, contributes or accelerates the progression to ACE.

**KEYWORDS:** Acute coronary event, high blood pressure, cholesterol level, stroke, diabetes, depression.

## Introduction

There are a number of factors involved in the occurrence of acute coronary events (ACE) that have been the main purpose in developing many studies and hypotheses regarding their association and their decisive role in the precipitation and evolution of this pathology [1,2,3].

The risk profile for vascular comorbidities include their recurrent association with hypertension, diabetes, but also with other risk factors [4].

Half of the overall mortality is determined by a multitude of risk factors, the most common being the behavioral, metabolic, occupational and environmental [5].

Due to the recent increase in the incidence of diabetes and obesity among the population, the

morbidity caused by ACE and the costs associated with it is a challenge for society [6].

The frequencies of the following types of associated pathologies were evaluated: high blood pressure (HBP) [2,3,4], hypercholesterolemia (HCOL) [7], stroke, diabetes [8,9], depression [10,11,12], stress [13,14].

They were included in the term of acute coronary events: angina and acute myocardial infarction (AMI) [15,16,17,18].

The study aims to monitor the frequency of pathology associated (HPB, HCOL, diabetes, stroke, depression, stress) with ACE and to establish its association with these events.

## Methods and Material

The study was conducted by applying the subjects to a complex questionnaire, in three family medicine practices between November 2018 to May 2019 and targeted healthy people.

The study included 865 adult participants aged 19 to 86 years.

All subjects included in the study completed an anonymous, complex questionnaire that included health questions.

Informed consent was obtained from all subjects included in the study.

The present study was approved by the Ethics Committee of the University of Medicine and Pharmacy of Craiova.

The risk was calculated by using relative risk, accepting the statistical significance of the association between the variables for p-values, thus facilitating a 95% confidence level, established by the chi-square test, just below 0.05.

## Results

The most known cause of ACE is accepted to be HBP which in the study population had a prevalence of 20,81% (N=180), but four times higher in subjects with ACE (73,1%; N=38) compared to those without ACE (17,5%; N=142) (Table 1).

Although only 13 subjects had a history of AMI (1,5%), most of them (N=11) had HBP in their history (84,6%) unlike those without AMI, at which the prevalence of HBP was 19,8% (Table 2).

Thus, in hypertensive patients the prevalence of ACE was 6,99% (N=11) and in those not diagnosed with HBP was only 0,29% (N=2).

In this context, of the very high prevalence of ACE among subjects with HBP, the risk of ACE was 20 times higher than in those without HBP, marking one of the strongest associations (RR=20,93; 95%CI 4,68-93,59; p<0.001), this being higher in women (RR=29,21; p=0.004) than in men (RR=9,1; p<0.001), in women, AMI in the absence of HBP being rare (0,26%) (Table 3).

**Table 1. Prevalence of associated diseases in subject with (+) and without (-) history of ACE and AMI.**

% (N)	All (N=865)	ACE+(N=52)	ACE-(N=813)	AMI+(N=13)	AMI-(N=852)
<b>HBP</b>	20,81 (180)	<b>73,1</b> (38)	17,5 (142)	<b>84,6</b> (11)	19,8 (169)
<b>HCOL</b>	16,2 (140)	<b>57,7</b> (30)	13,5 (110)	<b>69,2</b> (9)	15,4 (131)
<b>Diabetes</b>	4,7 (41)	<b>17,3</b> (9)	3,9 (32)	<b>30,8</b> (4)	4,3 (37)
<b>Stroke</b>	0,81 (7)	<b>1,9</b> (1)	0,7 (6)	<b>7,7</b> (1)	0,7 (6)
<b>Depression</b>	1,50 (13)	<b>3,8</b> (2)	1,4 (11)	<b>7,7</b> (1)	1,4 (12)
<b>Stress</b>	8,6 (74)	<b>11,5</b> (6)	8,36 (68)	<b>0,0</b> (0)	8,69 (74)

High cholesterol levels were identified in more than half of the cases with ACE (57,7%; N=32) as opposed to subjects without ACE, where high cholesterol levels were only reported by 13,5% (N=102).

The impact of hypercholesterolemia is underlined by the high prevalence of ACE among subjects with high cholesterol levels (21,43%) compared with those with normal values (3,03%; N=22), the risk of ACE in those with hypercholesterolemia being 7 times higher (RR=7,06; 95%CI 4,2-11,87; p<0.001).

Furthermore, the risk of AMI was more than 10 times higher in subjects with HBP than in those without (RR=13,71; 95%CI 4,20-43,8; p<0.001).

The prevalence of diabetes in the whole group was 4,7% (N=31), being more than four times higher in subjects with ACE (17,3%; N=9) compared with those without ACE (3,9%; N=32).

Among those affected by diabetes, the prevalence of ACE was 21,95% (9/41), the risk of ACE in people with diabetes being four times higher (RR=4,21; 95%CI 2,2-8,03; p<0.001) compared to those without a history of diabetes (3,9%; 32/813).

Women with diabetes had a higher prevalence of ACE (31,82%; N=7) than diabetic men (10,53%; N=2), although the prevalence of diabetes was similar in women (4,97%) and men (4,55%), which may suggest that women with diabetes are more likely to develop an ACE than men.

In the case of diabetes association, the risk in women was six times higher than in the absence of diabetes (RR=5,87; 95%CI 2,85-12,06; p<0.001), and to a lesser extent, in men only twice as high (RR=2,12; 95% CI 0,53-8,49; p=0.29).

**Table 2. Prevalence of ACE and AMI in subject according with presence of associated disease.**  
 (+) - Presence of associated disease;  
 (-) - Absence or unconfirmed associated disease.

		ACE	AMI
<b>HBP</b>	+	21,11%	84,6%
	-	2,04%	19,8%
<b>HCOL</b>	+	21,43%	69,2%
	-	3,03%	15,4%
<b>Diabetes</b>	+	21,95%	30,8%
	-	5,22%	4,3%
<b>Stroke</b>	+	14,29%	7,7%
	-	5,94%	0,7%
<b>Depression</b>	+	15,38%	7,7%
	-	5,87%	1,4%
<b>Stress</b>	+	8,11%	0,0%
	-	5,82%	8,7%

**Table 3. Risk of ACE and AMI in subjects with various diseases.**

	ACE			AMI		
	RR	95%CI	p	RR	95%CI	p
<b>HBP<sup>a,b</sup></b>	<b>10,33</b>	5,72 - 18,64	<0,001	<b>20,93</b>	4,68 - 93,58	<0,001
<b>Hypercholesterolemia</b>	<b>7,06</b>	4,2 - 11,87	<0,001	<b>13,71</b>	4,29 - 43,8	<0,001
<b>Diabetes<sup>a,b</sup></b>	<b>4,21</b>	2,2 - 8,03	<0,001	<b>8,93</b>	2,87 - 27,79	<0,001
<b>Stroke<sup>b</sup></b>	<b>2,54</b>	0,41 - 15,87	0,32	<b>10,26</b>	1,53 - 68,58	0,016
<b>Depression</b>	<b>2,62</b>	0,71 - 9,65	0,15	<b>5,96</b>	1,03 - 42,83	0,046
<b>Stress</b>	<b>1,39</b>	0,62 - 3,15	0,43	<b>0,39</b>	0,02 - 6,51	0,51

<sup>a</sup>ACE p<0.001; <sup>b</sup>AMI p<0.001;

Of the subjects in this study, 8,6% (N=74/865) declared themselves affected by stress, and in those with a history of ACE, stress was recognized by 11,5% (N=6/52) compared to 8,36% (N=68/813) by those without a history of ACE (p=0.43).

## Discussions

It is currently accepted that the most important association is between ACE and HBP, having in the studied population a prevalence four times higher in subjects with ACE compared to those without ACE.

The risk of ACE was 20 times higher than in those without HBP, and this was one of the strongest associations, the highest values being recorded for women [2,3,4].

The increased cholesterol level is directly involved in the vascular wall aggression process which leads to a complex cardiovascular pathology including HBP and coronary events [6].

The prevalence of stroke in all groups was 0,81% (N=7), among stroke subjects a case also presented AMI.

The prevalence of ACE was of 1,9% and of AMI of 7,7%.

Depression was recognized by only 13 surveyed subjects (1,5%), but a double prevalence was observed among those with history of ACE (3,8%; N=2) compared with those without history of ACE (1,4%; N=11).

Also, the risk of ACE in subjects with depression was more than 2 times higher compared to those without depression, without attaining statistical significance (RR=2,62; 95%CI 0,71-9,65; p=0.15), the frequency of ACE in depressed persons being of 15,38% (N=2), and for those without depression of 5,87% (N=50), but the differences were statistically insignificant (p=0.51).

Increased cholesterol accumulation in the arterial intima leads to increased oxidative stress, that through heat shock proteins lead to production of proatherogenic cytokines like interleukins IL-1, IL-6 and TNF- $\alpha$ , leading to an amplified inflammatory response and a reduction in the nitric oxide production, a biologically active dissolved gas that normally produces smooth muscle relaxation [19].

Overall, the risk of developing ACE in people with diabetes was four times higher compared to subjects without a history of diabetes [8].

It is important to monitor and control blood sugar levels in people with diabetes and acute coronary syndrome [9].

In fact, the risk for developing an ACE in the US population is 1.7 higher for the population with diabetes, compared to those without a diagnosed diabetes, and this risk increase ranges from 1-3 for men, and 2-5 in women [20].

People with depression are more likely to develop ACE than the general population, which

might be explained by several pathogenetic mechanisms.

Thus, a lower stress resistance might be associated with lower physical training and resistance, increased risk for addictions like smoking, alcohol and other drugs that can be themselves considered direct risk factors.

It is thus recommended that patients with depression and ACE apply a complex management of both physical and mental rehabilitation [10].

Although stress is invoked by numerous studies, but also by the general perception of being strongly associated with ACE, in reality intensity of stress leads to an over-evaluation or inadequate evaluation of its association with various pathologies [13].

Measuring the cardiovascular response to stressful situations that can cause disease can be considered an effective method of prophylaxis. Studies on cardiovascular reactivity to real-life stress as a predictor of cardiovascular disease are considered uncertain [14].

It is important to develop additional strategies that should address primary and secondary prevention modalities after ACE [21].

A particularly important strategy in the management of risk factors requires multidisciplinary involvement of all those who can contribute to reducing these risk factors [22].

## Conclusions

Although cardiovascular disease is the most common pathology in the contemporary world, a number of comorbidities arise as ACE generators (hypertension, hypercholesterolemia, diabetes), along with psycho-emotional disorders such as depression, anxiety or stress, which outline, ensures, contributes or accelerates the progression to ACE.

Some of these associated diseases share common risk factors and mechanisms, which mean that controlling them, can achieve great benefits in reducing cardiovascular disease including ACE.

## Abbreviations:

ACE-Acute coronary events  
HBP-High blood pressure  
HCOL-Hypercholesterolemia  
AMI-Acute myocardial infarction

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## Conflict of interests

None to declare.

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*Corresponding Author: Ovidiu Ștefan Georgescu, PhD, University of Medicine and Pharmacy of Craiova, 2 Petru Rareș Str., 200349, Craiova, e-mail: georgescuovi@yahoo.com*