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## Clinical-epidemiological aspects of acute coronary syndrome in the morbidity and mortality in the Republic of Moldova

\*Iana Coropceanu, Gheorghe Ciobanu

Department of Emergency Medicine, *Nicolae Testemitanu* State University of Medicine and Pharmacy  
National Center of Prehospital Emergency Medical Care, Institute of Emergency Medicine  
Chisinau, the Republic of Moldova

Authors' ORCID iDs, academic degrees and contributions are available at the end of the article

\*Corresponding author – Iana Coropceanu, e-mail: [ianacoropceanu@gmail.com](mailto:ianacoropceanu@gmail.com)

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### Abstract

**Background:** Acute coronary syndrome (ACS) is associated with high costs of hospital care, frequent recurrences and high risks of sudden death and short-term mortality.

**Material and methods:** The retrospective study was based on the evaluation of 140 patients who met the ACS criteria. Clinical and epidemiological data were obtained based on the analysis of statistical reports of the Ministry of Health during 2016-2020.

**Results:** The mean age of the patients was  $65.0 \pm 27.7$  years. Incidence of acute myocardial infarction (AMI) in the population increased from 4.7 to 5.2 cases per 1000 inhabitants. The study found the following occurrence of risk factors: history of cardiovascular disease – 42 (91.3%) patients, hypertension in 35 (76.1%), obesity in 21 (45.6%), diabetes mellitus in 14 (30.4%) and smoking in 13 (28.3%). The share of risk factors in the male group was distributed as follows: history of cardiovascular disease – 82 (87.2%) patients, hypertension – 63 (67.1%) patients, smoking – 40 (42.5%) patients, diabetes mellitus – 27 (28.7%) patients and obesity was established in 24 (25.5%) of men.

**Conclusions:** ACS affects men more frequently, compared to women, in a ratio of 2.04:1. People under the age of 65 years constitute 57.5%. The results of the study showed that compared to men, women with ACS were older and had significantly more comorbidities.

**Key words:** acute coronary syndrome, acute myocardial infarction.

### Cite this article

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### Introduction

Cardiovascular disease causes about a third of all deaths in the world, of which 7.5 million deaths are estimated to be caused by ischemic heart disease. Acute coronary syndromes (ACS) and sudden death cause the most deaths related to ischemic heart disease (IHD), which accounts for 1.8 million deaths per year, or 20% of all deaths in Europe, although there are large variations from one country to another. The incidence rate in European countries is between 43 and 144 per 100.0000 inhabitants per year [1-3]. Previous studies suggest that women with ACS have different onset symptoms compared to men. There is a fairly clear tendency for STEMI to occur more frequently in young people than in the elderly and as often in men as in women. The incidence of IHD, in general, and ACS increases with age, although, on average, it occurs 7-10 years earlier in men compared to women [4]. ACS occurs much more often in

men than in women under the age of 60, but women represent the majority of patients over the age of 75. The risk of acute coronary events throughout life is related to exposure to traditional cardiovascular risk factors. ACS is a major health problem associated with high costs of hospital care, frequent recurrences and high risks of sudden death and short-term mortality [5]. The frequency of ACS increases with age and is a medical-social problem that increases with the aging of the population of the Republic of Moldova. Mortality in patients with ACS is influenced by multiple factors, including old age, Killip class, delayed treatment, therapeutic strategy, history of myocardial infarction, diabetes, renal failure, number of affected coronary arteries, and left ventricular ejection fraction [6]. Early diagnosis of patients with ACS is important for the selection and success of treatment. Currently, there are limited data on the clinical and epidemiological aspects of ACS in women. Therefore,

the aim of the study was to evaluate the clinical-epidemiological aspects of ACS in the population of the Republic of Moldova.

### Material and methods

The retrospective study was conducted based on the evaluation of 156 acute medical unit (AMU) statistical forms (SF No 110/e) approved by the Ministry of Health (MHL) (order No 1079 of 30.12.2016) of patients with ACS during January - July 2020 by the prehospital emergency medical service. Of all the records examined, 140 patients who met the ACS-ST elevation (STE) and ACS- non ST elevation (NSTEMI) criteria were included in the study and clinically confirmed. Patients with ACS-NSTEMI were older ( $P < 0.001$ ) than those with ACS-STE. The mean age of the patients included in the study was  $65.0 \pm 27.7$  years, including 46 women with a mean age of  $69.7 \pm 28.4$  years and 94 men with a mean age of  $64.6 \pm 20.8$  years. In order to study the mortality and morbidity of the population caused by ACS, the statistical reports of MHL were also analyzed during the years 2014-2020 (SR No 30-health, ST No 12-health). Statistical analysis of the results obtained was performed using the Statistical Package for Social Sciences (SPSS 19.0) and the Microsoft Excel 2010 version. The confidence intervals were calculated at the level of 95%. A p value below 0.05 was considered statistically significant. Demographic variables and risk factors were also analyzed in terms of frequency and percentage.

### Results

According to the statistical data of the National Bureau of Statistics of the Republic of Moldova (2020), presented in table 1, the coefficient of population aging in the period 2014-2020 increased from 17.5 to 21.8, including men from 14.5 to 18.1 and women from 20.3 to 25.1. There was found an acceleration of the aging process of the population, in the referenced time period, and an increase of the aging coefficient by 3.6 in men and 4.8 in women, and the average for both sexes by 4.3.

**Table 1. Coefficient of population aging during the years 2014-2020 (on January 1, the number of people aged 60 and over per 100 inhabitants)**

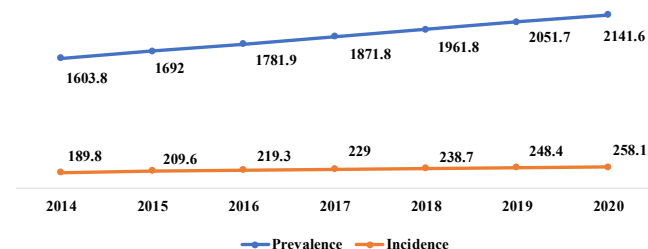
Total	2014	2015	2016	2017	2018	2019	2020
Men	14.5	15.0	15.4	16.0	16.7	17.5	18.1
Women	20.3	21.0	21.5	22.2	23.0	23.9	25.1
Both sexes	17.5	18.1	18.5	19.2	20.0	20.8	21.8

Note: According to the J. Beaujeu-Garnier-E. Rosset scale, the value of indicator 12 and above qualifies as "demographic aging".

The study of the morbidity of the population of the Republic of Moldova due to cardiovascular diseases, years 2014-2020 (per 100 thousand population) demonstrates

an ascending dynamics, both of prevalence and incidence (fig. 1).

The prevalence of cardiovascular diseases in the population increased from 1604.8 cases in 2014 to 2141.6 cases in 2020, per 100 thousand inhabitants, or by 133.5%. During the reference period, the incidence of the population due to cardiovascular diseases increased from 189.8 cases in 2014 to 258.1 cases in 2020 per 100 thousand inhabitants, or by 136.0%.



**Fig. 1. Prevalence and incidence of cardiovascular diseases in the population of the Republic of Moldova, years 2014-2020 (per 100 thousand population)**

The analysis of the morbidity of the population of the Republic of Moldova due to acute myocardial infarction during the years 2014-2020 (fig. 2), established an increase in the prevalence from 4.7 cases to 5.2 cases per 10 thousand inhabitants.

The study of the general mortality and mortality caused by cardiovascular diseases of the population of the Republic of Moldova during the years 2014-2020 shows a high level in 2020 – 1147.9 and 649.3 deaths per 100 thousand inhabitants, respectively (tab. 2).

**Table 2. General mortality and through cardiovascular diseases of the population of the Republic of Moldova, years 2014-2020 (per 100,000 population)**

Indicators	2014	2015	2016	2017	2018	2019	2020
General mortality	1110.5	1122.8	1083.5	1036.3	1049.3	1037.2	1147.9
Mortality through CVD	642.5	648.2	617.3	605.6	609.4	608.5	649.3
Mortality through IHD	359.5	348.6	314.9	317.7	320.6	313.7	356.6
Mortality through stroke	240.7	206.9	237.8	151.9	147.4	146.1	142.0
Mortality through AMI	51.7	53.2	56.3	51.3	53.2	53.0	49.6

Note: CVD – cardiovascular diseases; IHD – ischemic heart disease; AMI – acute myocardial infarction.

The pathology of the circulatory system continues to remain on the first place in causes of death of the population, constituting 56.6% in 2020. Out of the total 40466 deaths registered in the Republic of Moldova in 2020, 22889 deaths

were caused by cardiovascular diseases, including ischemic heart disease causing 12571 deaths, or 54.9%, which are 356.6 cases per 100 thousand inhabitants. The mortality of the population by myocardial infarction remains at a constant level, constituting 49.6 cases per 100 thousand inhabitants, especially in rural areas. The study of the mortality of the rural and urban population due to cardiovascular diseases highlights an over-mortality in rural areas (tab. 3).

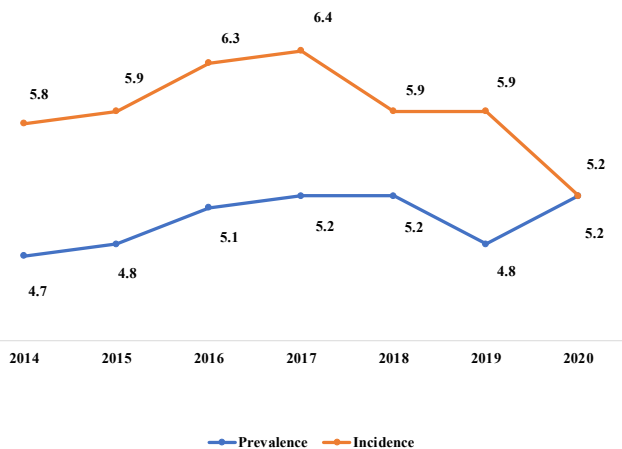


Fig. 2. Prevalence and incidence of acute myocardial infarction in the population of the Republic of Moldova, years 2014-2020 (per 10 thousand population)

Table 3. Mortality of the population of the Republic of Moldova by areas of residence, due to cardiovascular diseases, for the years 2014-2020 (per 100000 population)

Indicators	2014	2015	2016	2017	2018	2019	2020
Urban population	430.4	438.4	427.7	422.5	435.0	417.7	488.4
Rural population	720.0	725.7	687.9	675.2	675.3	682.5	712.6
Total RM	642.5	648.2	617.3	605.6	609.4	608.5	649.3

The mortality rate of the population due to cardiovascular diseases increased from 642.5 deaths in 2014 to 649.3 deaths in 2020 per 100 thousand inhabitants. The mortality of the population due to cardiovascular diseases in 2020 registered 488.4 deaths in urban areas and 712.6 deaths in rural areas, per 100 thousand inhabitants. The distribution of mortality rates of the population due to cardiovascular diseases, in the referenced period, remains on the first place constituting 57.5% in 2014, 58.4% in 2017 and 56.6% in 2020 (fig. 3).

The analysis of the mortality of the population due to ischemic heart disease, by areas of residence established a high level of 359.5 deaths in 2014 and 356.6 deaths in 2020 (tab. 4).

The study showed an increase in the mortality of the urban population due to ischemic heart disease from 211.9 deaths in 2014 to 356.6 deaths in 2020. The mortality level of the rural population due to ischemic heart disease exceeds that of the urban population by 195.2% in 2014 and respectively 146.2% in 2020.

Table 4. Mortality of the population of the Republic of Moldova due to ischemic heart disease, by areas of residence, for the years 2014-2020 (per 100 thousand population)

Indicators	2014	2015	2016	2017	2018	2019	2020
Urban population	211.9	229.1	214.0	215.2	207.6	207.1	267.8
Rural population	413.6	92.9	352.5	356.6	363.3	363.3	391.5
Total RM	359.5	348.6	314.9	317.7	320.6	312.9	356.6

The assessment of the mortality of the population due to acute myocardial infarction, by areas of residence, for the years 2014-2020 established a level of 51.7 cases in 2014 and 49.6 cases in 2020, per 100 thousand inhabitants (fig. 4).

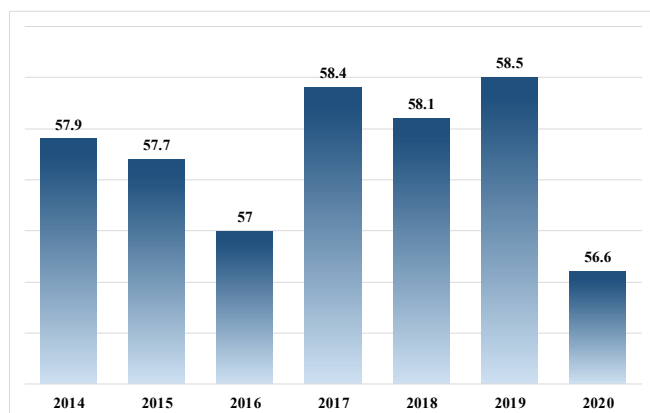


Fig. 3. The distribution of mortality rates of the population of the Republic of Moldova due to cardiovascular diseases (in%), for the years 2014-2020

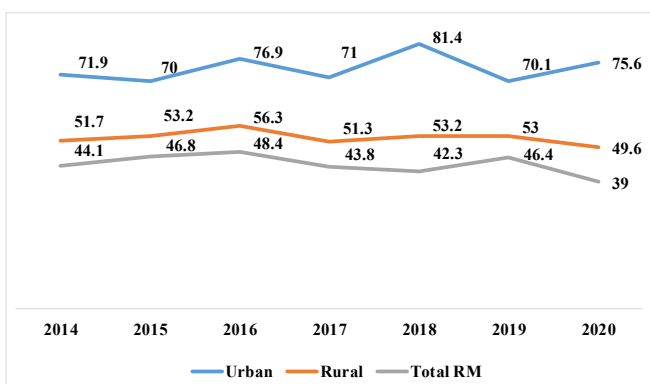


Fig. 4. Mortality of the population of the Republic of Moldova due to acute myocardial infarction, for the years 2014 - 2020 (per 100 thousand population)

The evaluation of 140 application forms for patients with ACS - STE and NSTEMI showed a total mean age of 65.0 ± 22.7 years, that is 69.7 ± 28.4 years for women and 64.6 ± 20.8 years for men (P < 0.001), (tab. 6).

**Table 5. Medical assistance provided to patients with ACS in the Republic of Moldova the years 2015-2020 at the hospitals level**

Indicators	2015	2016	2017	2018	2019	2020
<b>Acute coronary syndrome</b>						
Total hospitalization	7276	7838	6694	6408	8771	6338
Transported in the therapeutic window	4758	5464	4362	4499	5764	4987
Coronary angiography was performed	1060	1671	1130	879	2278	2408
Thrombolytic treatment was performed	633	683	502	587	642	310
Percutaneous coronary angioplasty was performed	671	919	682	576	1759	112

Of the group of patients included in the study, 67 (49.3%) patients were under 64 years of age and 71 (50.7%) were patients aged 65 years and over. At the hospital level, ACS-STE was established in 27 (19.3%) patients, ACS-NSTE in 38 (27.1%) and UA in 75 (53.6%). Of 46 (32.9%) women with ACS included in the study, 15 (32.6%) were under 65 years and 31 (67.4%) were aged 65 years and over. The male group consisted of 94 (67.1%) patients, of whom 54 (57.4%) were up to 65 years of age and 40 (42.6%) were aged 65 years and over. In the under 65 age category, ACS is more common

in men – 57.4% compared to women – 32.6% ( $P < 0.001$ ). In the over 65 age category, ACS is more common in women, accounting for 67.4% cases compared to 42.6% in men ( $P < 0.001$ ). The study of risk factors in the general group showed the presence of hypertension in 98 (70.0%) patients, diabetes mellitus in 51 (36.4%) patients, obesity in 45 (32.1%) and history of cardiovascular disease in 128 (91.4%). In the female group, history of cardiovascular disease was present in 42 (91.3%) patients, hypertension in 35 (76.1%), obesity in 21 (45.6%), diabetes mellitus in 14 (30.4%) and smoking in 13 (28.3%) patients. The distribution of risk factors in the male group was as follows: history of cardiovascular disease – 82 (87.2%) patients, hypertension – 63 (67.1%) patients, smoking – 40 (42.5%) patients, diabetes mellitus – 27 (28.7%) patients and obesity was established in 24 (25.5%) patients. In women, there was a higher level of history of cardiovascular disease (91.3%), hypertension (76.1%), obesity (45.6%) and diabetes mellitus (30.4%) compared to men ( $P < 0.001$ ).

### Discussion

The aim of the study was to evaluate the clinical-epidemiological aspects of acute coronary syndrome in the population of the Republic of Moldova. The study group included 140 patients with ACS, the mean age of the patients in the study was  $65.0 \pm 27.7$  years, among them 46 (32.8%) women with a mean age of  $69.7 \pm 28.4$  years and 94 (67.1%)

**Table 6. Clinical-epidemiological aspects of acute coronary syndrome**

Indicators	Total		Women		Men		P value
	Abs	%	Abs	%	Abs	%	
Total	140	100	46	32.9	94	67.1	< 0.001
Mean age	$65 \pm 27.7$		$69.7 \pm 28.4$		$64.6 \pm 20.8$		< 0.001
<b>Age categories</b>							
<45years	12	8.6	3	6.5	9	9.6	< 0.001
46 -64 years	57	40.7	12	26.1	45	47.9	< 0.001
65 – 79 years	50	35.7	22	47.8#	28	29.8	< 0.001
> 80 years	21	15.0	9	19.6	12	12.8	< 0.001
<b>Risk factors</b>							
Smoking	53	37.8	13	28.3	40	42.5	< 0.001
Hypertension	98	70.0	35	76.1#	63	67.1	< 0.001
Diabetes mellitus	51	36.4	14	30.4#	27	28.7	< 0.001
Obesity	45	32.1	21	45.6#	24	25.5	< 0.001
History of CVD	128	91.4	42	91.3	82	87.2	< 0.001
ACS--STE	39	27.8	18	12.8	21	22.3	< 0.001
ACS-NSTE	85	60.7	26	56.5	59	62.8	< 0.001
Killip Class I	109	78.0	32	69.5	77	81.9	< 0.001
Killip Class II-IV	33	23.6	12	26.1#	21	22.3	< 0.001

**Note:** # – between the men and women; CVD – cardiovascular disease, SCA-STE – acute coronary syndrome with ST-segment elevation; SCA-NSTE – acute coronary syndrome without ST-segment elevation.



men with an average age of  $64.6 \pm 20.8$  years. The ratio of men to women was 2.04:1 [7]. Women were on average 5.1 years older than men ( $p < 0.001$ ). The results regarding the ratio of women to men with ACS were similar to those in the studies conducted by Muherjee S. et al. [8], and Alvi HN. et al. [1]. The majority of ACS cases are registered in men 67.1% and the majority (57.5%) are under the age of 65 [3]. Several studies of the epidemiology, risk factors, and prognosis of ACS have been published in Western countries, which have shown that women with ACS are older and have more comorbidities and risk factors [9-11]. In several studies, smoking, diabetes mellitus, hypercholesterolemia and hypertension are well-established risk factors for the development of coronary heart disease [12-15], which have different characteristics in men and women [15]. Several studies on epidemiology, risk factors and prognosis have been published [5, 16, 17]. The results of the present research showed that compared to men, women are older (69 vs 64 years;  $P < 0.001$ ) and had significantly more comorbidities, such as diabetes mellitus (30.4 vs 28.7%;  $P < 0.001$ ), hypertension (76.1 vs 67.1%;  $P < 0.001$ ), obesity (45.6 vs 25.5%;  $P < 0.001$ ) and history of cardiovascular disease (91.3 vs 87.2%), data correlating with the results of the studies [1, 15]. Men were more likely to have a history of SCA-STE (22.3 vs 12.8%;  $P = 0.001$ ), SCA NSTEMI (62.8 vs 56.5%;  $P < 0.001$ ) and smoking (42.5 vs 28.3%;  $P < 0.001$ ) [3]. The increasing share of ACS in women is due to an aging population, changing risk factor profiles and changes in diagnostic capabilities [4, 13]. 33 (23.6%) of the patients in the study group had Killip Class II-IV, including 12 (26.1%) women and 21 (22.3%) men, a situation caused by the high frequency of comorbidities and the advanced age of women [18, 19].

### Conclusions

1. Acute coronary syndrome is a major health problem for the population of the Republic of Moldova, substantially influencing the rates of morbidity and mortality.

2. The rise in the aging processes of the population, the reduced accessibility to modern methods of diagnosis and treatment, the high share of cardiovascular risk factors will determine a high incidence of ACS in future.

3. ACS affects men more frequently, compared to women, in a ratio of 2.04:1. People under the age of 65 years constitute 57.5%.

4. The results of the study showed that compared to men, women are older (69 vs 64 years;  $P < 0.001$ ) and had significantly more comorbidities, such as diabetes mellitus (30.4 vs 28.7%;  $P < 0.001$ ), hypertension (76.1 vs 67.1%;  $P < 0.001$ ) obesity (45.6 vs 25.5%;  $P < 0.001$ ) and history of cardiovascular disease (91.3 vs 87.2%).

5. Men were more likely to have a history of SCA-STE (22.3 vs 12.8%;  $P = 0.001$ ), SCA NSTEMI (62.8 vs 56.5%;  $P < 0.001$ ) and smoking (42.5 vs 28.3%  $P < 0.001$ ).

6. The study showed the presence of AMI-STE in 27

(19.3%) patients, AMI-NSTEMI in 38 (27.1%) patients and UA in 75 (53.6%) patients.

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#### Authors' ORCID iDs and academic degrees

Iana Coropceanu, MD, Undergraduate Student – <https://orcid.org/0000-0002-7471-2698>

Gheorghe Ciobanu, MD, PhD, Professor – <https://orcid.org/0000-0001-8538-0134>

#### Authors' contributions

IC conducted literature review, collected the data, interpreted the data, wrote the manuscript; GC conceptualized the idea and designed the research, collected the data, conducted literature review, wrote the manuscript, revised the manuscript critically. Both authors approved the final version of the manuscript.

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No approval was required for this study.

#### Conflict of Interests.

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