

## CARDIOLOGY

### CLINICAL SYMPTOMS AND ECG DATA IN WOMEN WITH ACUTE CORONARY SYNDROME

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#### ABSTRACT

**Background.** There are many differences in chest pain symptoms between men and women in terms of location, nature, and additional symptoms. The issue of describing the differences in chest pain in men and women with acute coronary syndrome (ACS), as well as their correlation with changes in the electrocardiogram (ECG) and coronary angiography (CAG) remains relevant.

**Methods.** The study included 588 patients of the cardiology department of the Novokuznetsk City Clinical Hospital No. 1 from 2013 to 2017 with a diagnosis of ACS. Depending on the gender, the subjects were divided into two groups: Group I – 330 men; Group II – 258 women.

**Results.** ACS with ST elevation was more common in men (45.8 %) than in women (33.3 %;  $p = 0.002$ ). There were no pathological ECG changes in women in 58.1 % of cases, in men – in 45.5 % ( $p < 0.001$ ). ECG type Q/ST elevation was detected more often in men (45.8 %) than in women (33.3 %;  $p = 0.002$ ). The absence of coronary artery lesions was observed in 27.9 % of men and 44.2 % of women ( $p < 0.001$ ). Hemodynamically significant coronary artery stenosis was more common in men (57.6 %) than in women (38.7 %;  $p < 0.001$ ). In a typical angina clinic, hemodynamically significant coronary artery disease in patients with Q/without ST elevation ACS was detected in 40.2 % of men and in 58.5 % of women ( $p = 0.002$ ). In the atypical angina clinic, hemodynamically significant lesions of coronary artery were more common in men (40.6 %) than in women (34.1 %;  $p = 0.02$ ).

**Conclusion.** In women atypical chest pains and intact coronary arteries were detected more often than in men, and hemodynamically significant coronary artery stenosis were found less often than in men. In men, a more pronounced pathology of the coronary arteries in ACS was revealed, in women – great difficulties in diagnosing ACS.

**Key words:** acute coronary syndrome, gender differences, diagnosis of coronary symptoms

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## ОСОБЕННОСТИ КЛИНИЧЕСКОЙ СИМПТОМАТИКИ И ДАННЫХ ЭКГ У ЖЕНЩИН С ОСТРЫМ КОРОНАРНЫМ СИНДРОМОМ

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### РЕЗЮМЕ

Существует много различий в симптомах боли в груди между мужчинами и женщинами в отношении локализации, характера и дополнительных симптомов. Остаётся актуальным вопрос описания различий болевого синдрома в груди у мужчин и женщин с острым коронарным синдромом (ОКС), а также соотношение их с изменениями электрокардиограммы (ЭКГ) и данными коронароангиографии (КАГ).

**Методы.** В исследование были включены 588 пациентов кардиологического отделения ГБУЗО КО «Новокузнецкая городская клиническая больница № 1» с 2013 по 2017 г. с диагнозом ОКС. В зависимости от половой принадлежности исследуемых разделили на две группы: I группа – 330 мужчин; II группа – 258 женщин.

**Результаты.** ОКС с подъёмом сегмента ST (ОКС nST) чаще наблюдался у мужчин (45,8 %), чем у женщин (33,3 %;  $p = 0,002$ ). Патологических изменений на ЭКГ у женщин не было в 58,1 % случаев, у мужчин – в 45,5 % ( $p < 0,001$ ). Тип ЭКГ Q/nST чаще выявлялся у мужчин (45,8 %), чем у женщин (33,3 %;  $p = 0,002$ ). Отсутствие поражения коронарных артерий (КА) отмечено у 27,9 % мужчин и у 44,2 % женщин ( $p < 0,001$ ). Гемодинамически значимый стеноз КА чаще встречался у мужчин (57,6 %), чем у женщин (38,7 %;  $p < 0,001$ ). При типичной клинике стенокардии гемодинамически значимое поражение КА у больных ОКС Q/nST (без подъёма сегмента ST) выявлено в 40,2 % случаев у мужчин и в 58,5 % – у женщин ( $p = 0,002$ ). При атипичной клинике стенокардии гемодинамически значимые поражения КА встречались чаще у мужчин (40,6 %), чем у женщин (34,1 %;  $p = 0,02$ ).

**Заключение.** У женщин чаще, чем у мужчин, выявляли атипичные боли в грудной клетке, интактные КА и реже – гемодинамически значимые стенозы КА. У мужчин выявлена более выраженная патология коронарных артерий при ОКС, у женщин – большие трудности диагностики ОКС.

**Ключевые слова:** острый коронарный синдром, гендерные различия, диагностика коронарных симптомов

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## INTRODUCTION

Cardiovascular disease is the major reason for disability and mortality among men and women worldwide. Acute coronary syndrome (ACS) requires immediate diagnosis and treatment to prevent complications and death [1, 2]. It is generally believed that difficulties and errors in diagnosis are characteristic of a rare pathology. Coronary heart disease (CHD) is a frequent and leading cause of death worldwide [3], and yet its diagnosis in medical practice is a complex problem. The study of Y.A. Prilutskaya et al. [4] showed that more than half of hospitalized patients (51 %) with a referral diagnosis of "unstable angina pectoris" had no ACS. Patients with "non-OCS" were diagnosed with various variants of chronic CHD or non-cardiac pathology. Acute coronary pathology was confirmed in only 38 % in the group with "possible ACS" (21 %); less than half (45 %) of this group were men. The difficulties in diagnosing this syndrome are due to clinical heterogeneity of ACS with and without ST segment elevation, ambiguity of pathogenesis associated with the development of atherosclerotic plaques in epicardial arteries of the heart or their functional stenosis and, often, microvascular dysfunction. The nature of chest pain among patients with ACS is of crucial diagnostic importance in some situations, but in other cases it only indicates the direction of examination. It is known that women develop CHD 5–10 years later than men [3, 5], i. e. at an older age and with a different specificity of symptoms [6, 7]. In addition, studies show that physicians use less aggressive diagnostic and therapeutic approaches to the treatment of women with CHD than men [8]. Symptoms of CHD in women often resemble other non-cardiac conditions [9, 10], especially when diabetes mellitus or other diseases are present. All this interferes with the recognition of ACS and may be associated with late treatment or delayed hospitalization [8, 11, 12]. There are many differences in chest pain symptoms between men and women in terms of its nature, localization and additional symptoms [6, 13, 14]. For example, it has previously been shown that women with ACS were less likely to report chest pain as a chief complaint and more likely to report nausea, shoulder and upper back pain. Also, women with ACS had more symptoms compared to men [15]. On the other hand, on the contrary, there is evidence that typical symptoms are more common and have greater prognostic value among women than men with myocardial infarction, regardless of whether it is diagnosed using gender-specific criteria [16]. Other information is provided by O.T. Steiro et al. [17]: differences in the manifestation of MI symptoms without ST elevation between gender and age groups were small. This may be due to known regional gender differences in clinical presentation, comorbidities, access to care and invasive treatments. Therefore, more data are needed to determine the prevalence of gender differences in ACS, as well as the factors responsible for these differences, especially cultural, socio-economic, educational and psychosocial factors [18].

**The aim of this study** was to describe the differences of chest pain among men and women, especially when combined with ECG and coronary angiography findings.

## MATERIAL AND METHODS

Within the framework of a prospective study from 2013 to 2017, data on 724 patients consecutively admitted to the base of the cardiology department of the Novokuznetsk City Clinical Hospital No. 1 with a diagnosis of ACS. Inclusion criteria were: ACS at the time of admission with subsequent diagnosis verification in the hospital; age > 18 years; hemodynamic stability; consent to participate in the study. Exclusion criteria were critical conditions (shock, pulmonary edema, presence of medical ventilator). A sample size of 588 patients was obtained based on inclusion and exclusion criteria. The study was performed in accordance with the principles of the Declaration of Helsinki, and all patients gave informed consent. The study record was approved by the local ethical committee of Research Institute for Complex Issues of Cardiovascular Diseases (Minutes No. 8 dated 10.10.2021).

The clinical status of the patient was analyzed, in particular the leading syndromes: typical, atypical, non-anginal chest pain, dyspnea [3]. Taking into account that dyspnea can be both a leading syndrome and combined with chest pain, all patients with dyspnea were grouped under the term "actual dyspnea" (A-dyspnea). Cerebral complaints were assessed if the patient had a history of dizziness, syncope, or concussion. Pulmonary pathology was established on the basis of fluorosis, silicosis, bronchial asthma, chronic obstructive pulmonary disease, previous lung surgeries; thyroid pathology – on the basis of thyroidectomy, thyroid resection, ultrasound data and endocrinologist's thyroid treatment; pathology of the musculoskeletal system – on the basis of residual changes after a lower limb trauma, arthrosis of the hip and knee joints, arthritis, herniated discs and spinal implants. ECG data in 12 leads (6 standard leads, 6 chest leads) were analyzed. The following ECG types were identified: "normal", "Q/ST elevation" and "other ECG pathology". Echocardiography was considered for differential diagnosis in case of complications. According to the CAG data (the study was performed via transradial approach on the Al-lura CV20 angiography unit (Philips, the Netherlands), the degree of stenosis was determined using computer quantitative image processing.

Depending on the gender, the subjects were divided into two groups: Group I – 330 men; Group II – 258 women.

Statistical processing was performed using the SPSS Statistics 19.0 software package (IBM Corp., USA). The distribution of quantitative variables was checked for normality using the Kolmogorov-Smirnov criterion. If the distribution is normal, data are presented as mean values (M) and mean errors (m); if the distribution is non-normal, data are presented as median (Me) and quartiles (25<sup>th</sup> and 75<sup>th</sup> percentiles). Student's t-test, Mann – Whitney U test and chi-squared test were used to compare the two groups.

## RESULTS

### All patients with acute coronary syndrome

Clinical and anamnestic characteristics of the examined patients with ACS are presented in Table 1. Patients admit-

**TABLE 1**  
**CLINICAL AND ANAMNESTIC CHARACTERISTICS OF PATIENTS WITH ACUTE CORONARY SYNDROME (*n* = 588)**

Parameters	Men ( <i>n</i> = 330)	Women ( <i>n</i> = 258)	<i>p</i>
Age, M ± SD	56.5 ± 0.6	61.8 ± 0.59	< 0.001
Age of patients with AH, M ± SD	57.4 ± 9.56	62.03 ± 9.35	< 0.001
<b>Medical history</b>			
Typical pain, <i>n</i> (%)	98 (29.7)	91 (35.3)	0.151
Atypical pain, <i>n</i> (%)	180 (54.5)	139 (53.9)	0.871
Non-anginal pain, <i>n</i> (%)	21 (6.4)	9 (3.5)	0.115
Dyspnea – leading syndrome, <i>n</i> (%)	31 (9.4)	19 (7.4)	0.062
A-dyspnea, <i>n</i> (%)	128 (38.8)	142 (55.0)	< 0.001
AH, <i>n</i> (%)	193 (58.5)	196 (76.0)	< 0.001
Cardiac arrhythmia, <i>n</i> (%)	66 (20.0)	60 (23.3)	0.393
Atrial fibrillation, <i>n</i> (%)	26 (7.9)	14 (5.4)	0.24
Diabetes mellitus, <i>n</i> (%)	5 (1.5)	25 (9.7)	< 0.001
Prior stroke, <i>n</i> (%)	12 (3.6)	13 (5.0)	0.403
Cerebral complaints, <i>n</i> (%)	25 (7.6)	38 (14.7)	0.008
Pulmonary pathology, <i>n</i> (%)	18 (5.5)	10 (3.9)	0.411
Thyroid pathology, <i>n</i> (%)	3 (0.9)	14 (5.4)	< 0.001
MSS pathology, <i>n</i> (%)	27 (8.2)	23 (8.9)	0.867
<b>ECG data</b>			
Normal, <i>n</i> (%)	150 (45.5)	150 (58.1)	< 0.001
Without Q/ST elevation, <i>n</i> (%)	29 (8.8)	22 (8.5)	0.911
Q/ST elevation, <i>n</i> (%)	151 (45.8)	86 (33.3)	0.002
<b>Types of ACS</b>			
ACS without ST elevation, <i>n</i> (%)	179 (54.2)	172 (66.7)	0.002
ST elevation ACS, <i>n</i> (%)	151 (45.8)	86 (33.3)	0.002
<b>CAG data</b>			
Intact coronary arteries, <i>n</i> (%)	92 (27.9)	114 (44.2)	< 0.001
Coronary artery stenosis < 70 %, <i>n</i> (%)	48 (14.5)	44 (17.1)	0.473
Coronary artery stenosis ≥ 70 %, <i>n</i> (%)	190 (57.6)	100 (38.8)	< 0.001

**Note.** AH – arterial hypertension; MSS – musculoskeletal system.

ted to the hospital after the 1<sup>st</sup> day from the onset of symptoms prevailed (456 patients – 77.6 %); the proportion of patients admitted on the 1<sup>st</sup> day from the onset of symptoms was lower (132 patients – 22.4 %). There were no statistically significant differences in the duration of hospitalization between men and women. At the prehospital stage all pa-

tients with ST elevation ACS received narcotic analgesics; only one patient received thrombolytic therapy.

Female patients were statistically significantly older (*p* < 0.001) than males. Anamnestically, arterial hypertension (AH) was detected in 389 (66.2 %) patients. High blood pressure was statistically significantly more frequent

in the female group (196 cases (76.0 %)) than in the male group (193 cases (58.5 %);  $p < 0.001$ ). Women with hypertension were older than men:  $62.03 \pm 9.35$  and  $57.04 \pm 9.56$  years, respectively ( $p < 0.001$ ). Atrial fibrillation was detected in 40 patients (6.8 %) with no significant differences between men and women (7.9 % and 5.4 %, respectively;  $p = 0.24$ ).

When assessing the gender peculiarities of the prevalence of ECG changes, no pathological ECG changes were found in women at the time of examination in 58.1 % of cases, in men – in 45.5 % of cases ( $p < 0.001$ ). At the moment of hospitalization 237 patients (40.3 %) were diagnosed with ST elevation ACS. ST elevation ACS was statistically significantly less frequent in the female group (86 (33.3 %)) than in the male group (151 (45.8 %);  $p = 0.002$ ). ACS without ST elevation was statistically significantly more frequent among women (172 patients (66.7 %)) than among men (179 patients (54.2 %)) ( $p = 0.002$ ). All patients underwent coronary angiography. 44.5 % of women and 28.2 % of men had no coronary artery lesions ( $p < 0.001$ ). Hemodynamically significant coronary artery stenosis ( $\geq 70$  %) was statistically significantly less frequent among women (38.4 %) compared with men (57.3 %;  $p < 0.001$ ). According to the results of CAG, PCI was performed in 97.8 % of patients with hemodynamically significant stenosis ( $\geq 70$  %), and no gender differences were found.

When analyzing concomitant pathology, women were statistically significantly more likely to have type 2 diabetes mellitus, thyroid pathology and cerebral complaints (more often – dizziness, less often – history of syncope, without previous stroke) ( $p < 0.05$ ).

Next, the prevalence of ECG changes depending on the significance of the coronary artery lesion was assessed (Fig. 1).

The comparison of ECG and CAG revealed that among the patients with Q/ST elevation ECG type there were statistically significantly more cases of significant coronary artery lesions (55.6 %;  $p < 0.001$ ). At the same time, in patients with normal ECG, coronary arteries were more often intact in 65.4 % of cases ( $p < 0.001$ ).

### Acute coronary syndrome with ST elevation

No gender differences in pain patterns and CAG data were found when evaluating symptoms and clinical data of patients with ST elevation ACS. A-dyspnea was observed in 96 (40.5 %) patients when evaluating clinical symptoms of the patients. It was found that A-dyspnea was noted more frequently in women (51.2 %) than in men (34.4%;  $p = 0.012$ ). ECG comparison revealed that Q/ST elevation ECG type was statistically significantly more frequent in men (63.7 % in men, 36.3 % in women;  $p = 0.001$ ). Type 2 diabetes mellitus, thyroid pathology and cerebral complaints were statistically significantly more frequent in women with ST elevation ACS ( $p < 0.001$ ) (Table 2).

Patients with ACS with ST elevation had predominantly typical (29.1 % of cases) and atypical chest pain (57.4 % of cases). In case of intact coronary arteries atypical pain clinic was more frequent (32 patients (23.5 %)), and in case of hemodynamically significant coronary artery stenosis – typical anginal pain (60 patients (87.0 %)) ( $p < 0.001$ ) (Table 3).

Comparison of clinical symptoms at different CAG changes in patients with ST elevation ACS did not reveal gender differences (Fig. 2).

### Acute coronary syndrome without ST elevation

The clinical and medical history characteristics of patients with ACS without ST elevation are presented in Table 4.

At the time of inclusion, men had a younger age compared to women ( $p < 0.001$ ). Arterial hypertension was prevalent in women with ACS without ST elevation ( $p < 0.001$ ). The groups did not differ in terms of pain nature. When assessing the clinical symptoms of the studied patients, dyspnea was detected in 174 (50.1 %) patients. It was found that A-dyspnea was noted more frequently in women (98 (57.0 %) patients) than in men (76 (42.5 %) patients;  $p = 0.009$ ). No gender differences were found in the comparison of ECGs in patients with ACS without ST elevation. CAG analysis revealed that hemodynamically significant CA stenosis was statistically significantly more frequent in men (82 (45.8 %) patients). Whereas in women, coronary arteries were more often intact (94 (54.7 %) patients;  $p < 0.001$ ). A con-

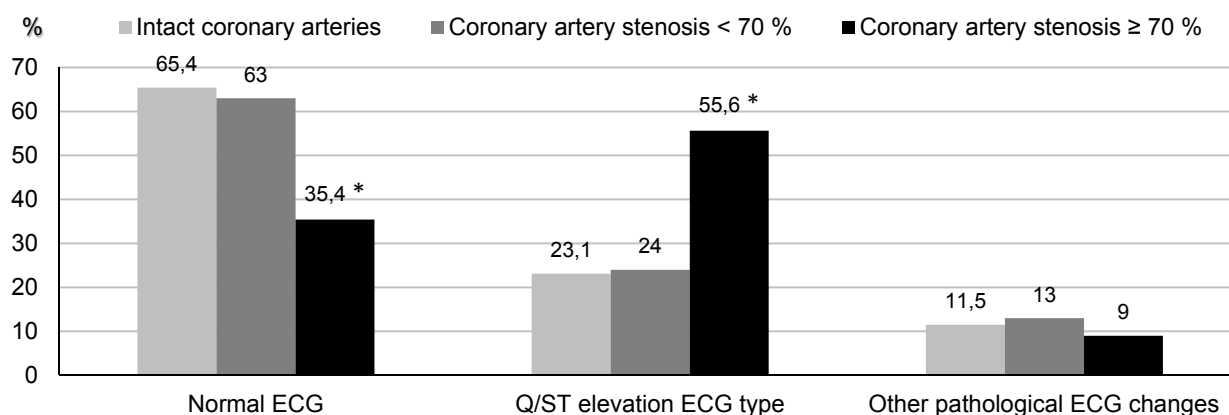


FIG. 1.

ECG characteristics in comparison with coronary angiography results in patients with acute coronary syndrome: \* –  $p < 0.05$

TABLE 2

CLINICAL AND ANAMNESTIC CHARACTERISTICS OF PATIENTS WITH ACUTE CORONARY SYNDROME WITH ST ELEVATION (n = 237)

Parameters	Men (n = 151)	Women (n = 86)	p
Age, M ± SD	56.0 ± 11.48	62.7 ± 9.76	0.001
Age of patients with AH, M ± SD	58.2 ± 9.48	63.5 ± 9.59	0.001
<b>Medical history</b>			
Typical pain, n (%)	45 (29.8)	24 (27.9)	0.872
Atypical pain, n (%)	85 (56.3)	51 (59.3)	0.753
Non-anginal pain, n (%)	9 (6.0)	3 (3.5)	0.598
Dyspnea – leading syndrome, n (%)	12 (7.9)	8 (9.3)	0.947
A-dyspnea, n (%)	52 (34.4)	44 (51.2)	0.012
AH, n (%)	89 (58.9)	65 (75.6)	0.01
Cardiac arrhythmia, n (%)	15 (9.9)	18 (20.9)	0.019
Diabetes mellitus, n (%)	5 (3.3)	13 (15.1)	< 0.001
Prior stroke, n (%)	6 (4.0)	3 (3.5)	0.868
Cerebral complaints, n (%)	4 (2.6)	12 (14.0)	0.001
Pulmonary pathology, n (%)	6 (4.0)	3 (3.5)	0.868
Thyroid pathology, n (%)	0	18 (20.9)	< 0.001
MSS pathology, n (%)	12 (7.9)	10 (11.6)	0.262
<b>ECG data</b>			
Q/ST elevation, n (%)	96 (63.7)	31 (36.1)	0.001
<b>CAG data</b>			
Intact coronary arteries, n (%)	27 (17.9)	20 (23.3)	0.450
Coronary artery stenosis < 70 %, n (%)	16 (10.6)	6 (7.0)	0.446
Coronary artery stenosis ≥ 70 %, n (%)	108 (71.5)	60 (69.8)	0.512

Note. AH – arterial hypertension; MSS – musculoskeletal system.



TABLE 3

CHARACTERISTICS OF THE LEADING ANAMNESTIC SIGNS IN COMPARISON WITH THE RESULTS OF CORONARY ANGIOGRAPHY IN PATIENTS WITH ACUTE CORONARY SYNDROME WITH ST ELEVATION ( $n = 237$ )

Parameters	Typical pain ( $n = 69$ )	Atypical pain ( $n = 136$ )	Non-anginal pain ( $n = 12$ )	Dyspnea ( $n = 20$ )	$p$
Intact coronary arteries, $n$ (%)	5 (7.2)	32 (23.5)	5 (41.7)	5 (25.0)	$< 0.001$
Stenosis $< 70$ %, $n$ (%)	4 (5.8)	13 (9.6)	4 (33.3)	1 (5.0)	$< 0.001$
Stenosis $\geq 70$ %, $n$ (%)	60 (87.0)	90 (66.2)	3 (25.0)	14 (70.0)	$< 0.001$

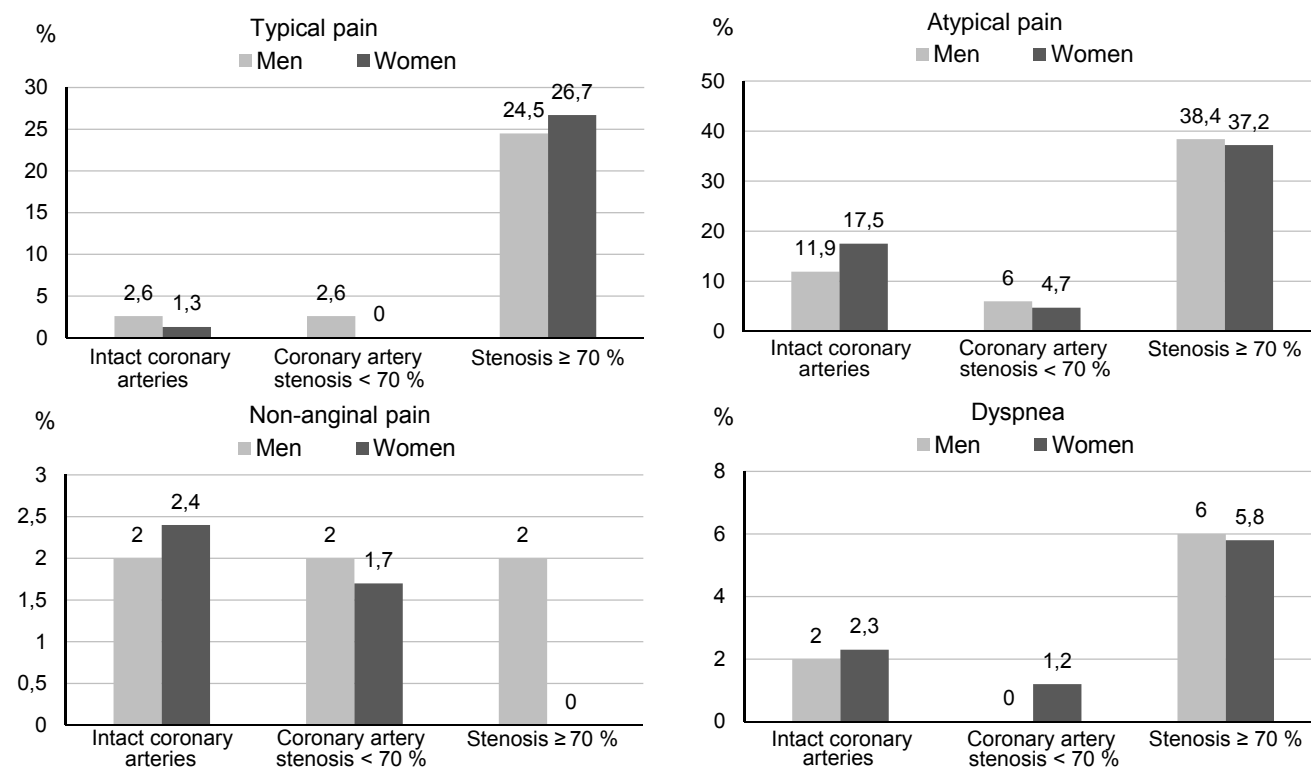


FIG. 2.

Clinical symptoms at various changes in coronary angiography in men and women with acute coronary syndrome with ST elevation ( $n = 237$ ),  $p > 0.05$

comitant diagnosis of type 2 diabetes mellitus and thyroid pathology was statistically significantly more frequently detected in women with ACS without ST elevation ( $p < 0.001$ ).

Patients with ACS without ST elevation had typical, atypical, and non-anginal chest pain. In case of intact coronary arteries, atypical pain clinic was more common (99 (54.1 %) patients), while typical anginal pain was more common in case of hemodynamically significant coronary artery stenosis (60 (50.0 %) patients;  $p < 0.001$ ) (Table 5).

The results of correlation of clinical symptoms and coronary artery changes detected through CAG in men and women with ACS without ST elevation are presented in Figure 3.

With the predominance of typical angina clinic in case of ACS without ST elevation, intact coronary arteries were statistically significantly less frequently detected in men than in women (15.4 % vs. 27.4 %;  $p = 0.002$ ). The same trend was noted for hemodynamically significant

coronary artery lesions (40.2 % in men, 58.5 % in women;  $p = 0.002$ ). In cases with atypical pain, intact coronary arteries were diagnosed in more than half of the cases among both men (61.5 %) and women (62.5 %), while hemodynamically significant coronary artery lesions were statistically significantly more common for men (40.6 % (men) vs 34.1 % (women);  $p = 0.02$ ).

## DISCUSSION

Our study shows that women with acute coronary syndrome more often than men were diagnosed with atypical chest pain and less often with typical chest pain. Intact coronary arteries more often revealed in women during CAG, while hemodynamically significant coronary artery stenoses were found less often (70 % and more). Also, type 2

TABLE 4

**CLINICAL AND ANAMNESTIC CHARACTERISTICS OF PATIENTS WITH ACUTE CORONARY SYNDROME WITHOUT ST ELEVATION (*n* = 351)**

Parameters	Men ( <i>n</i> = 179)	Women ( <i>n</i> = 172)	<i>p</i>
Age, M ± SD	56.9 ± 10.4	61.4 ± 9.3	< 0.001
Age of patients with AH, M ± SD	56.2 ± 9.57	61.3 ± 9.19	< 0.001
<b>Medical history</b>			
Typical pain, <i>n</i> (%)	98 (29.7)	91 (35.3)	0.811
Atypical pain, <i>n</i> (%)	97 (54.1)	92 (53.4)	0.981
Non-anginal pain, <i>n</i> (%)	21 (6.4)	9 (3.5)	0.056
Dyspnea – leading syndrome, <i>n</i> (%)	31 (10.6)	19 (7.4)	0.126
A-dyspnea, <i>n</i> (%)	76 (42.5)	98 (57.0)	0.009
AH, <i>n</i> (%)	104 (58.1)	131 (76.2)	< 0.001
Cardiac arrhythmia, <i>n</i> (%)	51 (28.5)	42 (24.4)	0.457
Diabetes mellitus, <i>n</i> (%)	0	12 (7.0)	< 0.001
Prior stroke, <i>n</i> (%)	6 (3.4)	10 (5.8)	0.354
Cerebral complaints, <i>n</i> (%)	21 (11.7)	26 (15.1)	0.362
Pulmonary pathology, <i>n</i> (%)	12 (6.7)	7 (4.1)	0.475
Thyroid pathology, <i>n</i> (%)	3 (1.7)	9 (5.2)	< 0.001
MSS pathology, <i>n</i> (%)	15 (8.4)	13 (7.6)	0.832
<b>ECG data</b>			
Normal, <i>n</i> (%)	150 (83.8)	150 (87.2)	0.451
Without Q/ST elevation, <i>n</i> (%)	29 (16.2)	22 (12.8)	0.451
<b>CAG data</b>			
Intact coronary arteries, <i>n</i> (%)	65 (36.3)	94 (54.7)	< 0.001
Coronary artery stenosis < 70%, <i>n</i> (%)	32 (17.9)	38 (22.1)	0.392
Coronary artery stenosis ≥ 70%, <i>n</i> (%)	82 (45.8)	40 (23.3)	< 0.001

**Note.** AH – arterial hypertension; MSS – musculoskeletal system.

diabetes mellitus, thyroid pathology and cerebral complaints were statistically significantly more common among women. When comparing clinical symptoms, ECG changes and CAG data, further gender differences were found.

Traditionally, it is believed that among women, atypical symptoms are more common among patients with ACS. However, L.H. Ruane et al. [19] showed that complaints of se-

vere or pressing pain, irradiation to the throat and back, isolated upper back pain, nausea or vomiting were more common among women compared to men. Similar characteristics of pain syndrome among women were found in the study by M.G. van der Meer et al. [20]. They were more often found to have subdural localization, irradiation to the jaw, neck, shoulder, palpitations, nausea, and dizziness. It should be rec-



TABLE 5

CHARACTERISTICS OF THE MAIN ANAMNESTIC SIGNS IN COMPARISON WITH THE RESULTS OF CORONARY ANGIOGRAPHY IN PATIENTS WITH ACUTE CORONARY SYNDROME WITHOUT ST ELEVATION ( $n = 351$ )

Parameters	Typical pain ( $n = 120$ )	Atypical pain ( $n = 183$ )	Non-anginal pain ( $n = 18$ )	Dyspnea ( $n = 30$ )	$p$
Intact coronary arteries, $n$ (%)	35 (28.2)	99 (54.1)	13 (72.2)	12 (40.0)	$< 0.001$
Stenosis $< 70$ %, $n$ (%)	25 (20.8)	36 (19.7)	2 (11.1)	7 (23.3)	$< 0.001$
Stenosis $\geq 70$ %, $n$ (%)	60 (50.0)	48 (26.2)	3 (16.7)	11 (36.7)	$< 0.001$

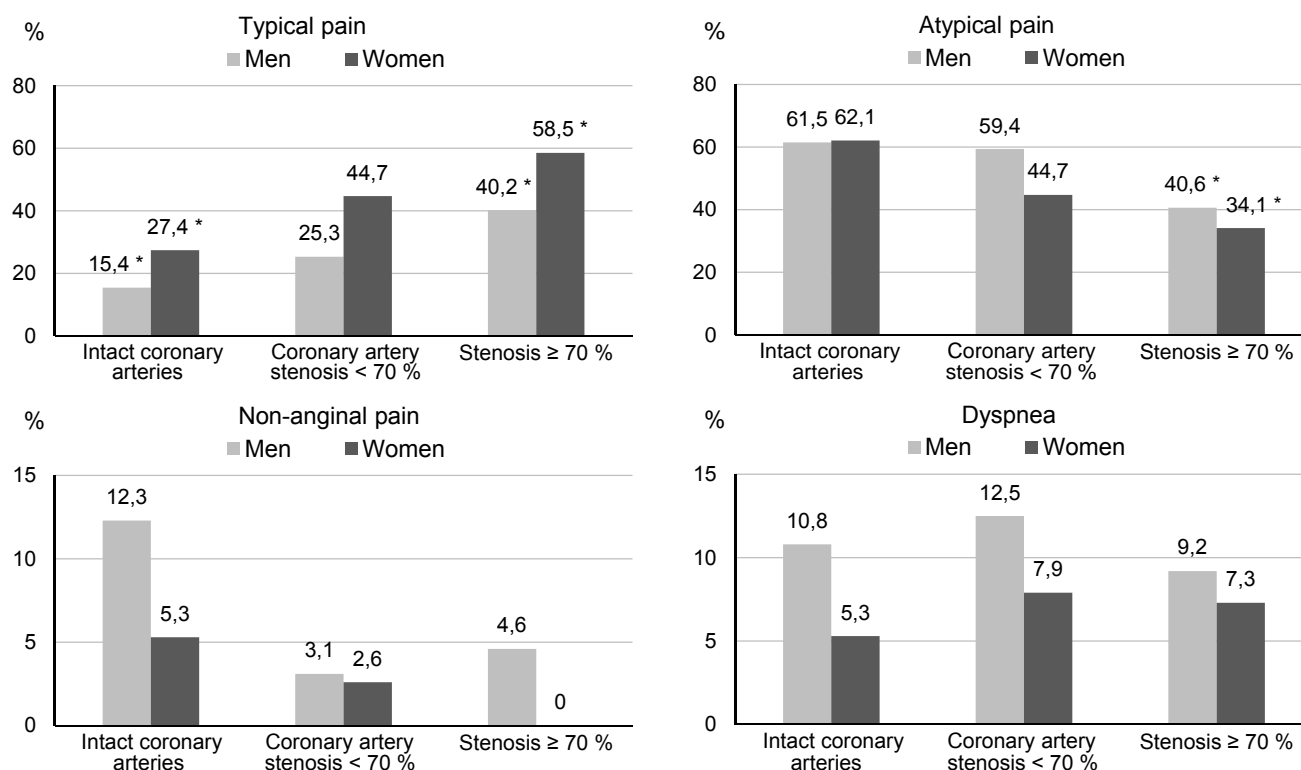


FIG. 3.

Clinical symptoms at various changes in coronary angiography in men and women with acute coronary syndrome without ST elevation:

\* –  $p < 0.05$

ognized that these symptoms are fairly typical of anginous pain. Also, the diagnostic value of clinical symptoms and risk factors for predicting CHD in patients with chest pain admitted to the emergency department was good and did not differ between women and men [20]. Similarly, when comparing only patients with a confirmed diagnosis of ACS, no significant differences in symptom presentation were noted [19]. Indeed, typical angina pains were detected equally often in male and female subjects of our work in the subgroup of patients with ACS without ST elevation and hemodynamically significant coronary artery lesions. Another recent work showed that male patients are more likely to feel left or mid-chest pain, with duration ranging from  $< 20$  min to  $> 20$  min, pain quality – moderate with a tendency to become severe. Women are more likely to feel chest pain that irradiates to the neck and chin, duration usually  $> 20$  min, pain syndrome – mild to moderate [14]. The authors emphasize that a significant difference

was found in the characteristics of chest pain in men and women with ACS. Regarding the localization, duration and nature of chest pain, men with ACS mostly have more typical symptoms, whereas women have atypical symptoms. The results of this study are consistent with our findings overall for the entire cohort of study subjects. P.G. Reuter et al. showed in their study [21] that predictors of the final diagnosis of ACS of patients admitted with chest pain or discomfort differed depending on gender. For men, these predictors were age, smoking, severe and persistent pain, nonrespiratory retrosternal localization, irradiating pain and additional symptoms. For women, the following factors were included in the predictive model: age  $\geq 60$  years, prior CHD, nonrespiratory and irradiating pain. Also, the discriminatory performance of the model was poor for females and good for males [21].

The presence of a more pronounced coronary artery lesion in men is quite consistent with the generally ac-

cepted ideas [3]. Consequently, the absence of coronary artery lesions is less common in men than in women [22]. Both of these facts are explained by the higher incidence of microvascular lesions in women [3, 23]. Indeed, current knowledge shows that angina is not necessarily associated with obstructive coronary artery disease. There are several other pathophysiological variants (vasospastic angina, microvascular angina, endothelial dysfunction, etc.). [3]. Our study also shows that more than a quarter of women with intact coronary arteries have typical anginal pain on admission. Compared to other similar studies, our study showed a very high percentage of patients without coronary artery changes during invasive CAG, which seems to be explained by the inclusion and exclusion criteria of the study.

When considering comorbidity, such comorbidities as diabetes mellitus, arterial hypertension, thyroid disease, varicose vein disease and bronchial asthma were more common among women with stable CHD compared to men [24], which is consistent with the data from our sample. If we consider epidemiological studies, the structure of comorbidity differs markedly between men and women: osteoporosis, varicose vein disease and arthritis are more common among women, while prostate disease, alcohol abuse and endocrine/metabolic disorders are more common among men [25]. When considering risk factors of patients with ACS, it was found that hypercholesterolemia and smoking were predominant among men, and unfavorable heredity among women. There were no differences in the detection of diabetes mellitus [19]. Perhaps younger mean age of the patients in this study was the reason for the difference in our data.

A limitation of the study is that when studying ACS, the male-to-female frequency ratio, the predictive role of the symptoms identified, and comorbidities were examined in patients who had already been selected for CAG, rather than at initial contact with patients in the emergency and outpatient settings. Another limitation of the study is that short-term outcomes (during hospitalization) and drug therapy during hospitalization were not studied. It is clear that this information could additionally highlight the peculiarities of the course of ACS depending on the gender of patients, but this was not our aim. The aim was to compare the clinical symptomatology of men and women with ACS on admission to hospital. We also did not perform multivariate analyses of the presenting symptoms, as such analyses were not originally foreseen in the study design.

## CONCLUSION

When assessing symptoms and clinical data of ACS patients, gender differences were revealed: atypical chest pain was detected in women more often than in men, typical chest pain – less often; CAG in women more often revealed intact coronary arteries, less often hemodynamically significant coronary artery stenoses (70 % and more). Also, type 2 diabetes mellitus, thyroid pathology and cerebral complaints were statistically significantly more common among women. Comparison of clinical symptoms, ECG changes and CAG data also revealed further gender differences, identifying symptoms in fa-

vor of significant coronary artery lesion and symptoms suggestive of possible absence of coronary artery lesion. In addition, a more pronounced pathology of CA in ACS in men and greater difficulties in diagnosing ACS in women were found.

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## Conflict of interest

The authors of this article declare the absence of a conflict of interest.

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