

## **An assessment of initial symptoms in patients admitted to the ER of a tertiary healthcare institution and diagnosed with acute myocardial infarction.**

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### **Abstract**

**Aim:** The aim of this study is to identify the initial symptoms in patients that are admitted to the emergency room (ER) and diagnosed with acute myocardial infarction.

**Material and method:** This study was conducted retrospectively based on the medical records of patients aged 18 and over, who were admitted between 1 January and 31 December 2014 to the ER. For the purpose of this study, the researchers recorded the age, gender, initial symptom/symptoms as well as laboratory results including CK-MB, myoglobin and troponin t values of the patients aged 18 and over admitted to the ER and diagnosed with acute myocardial infarction.

**Results:** This study was conducted with a total of 285 patients whose distribution by gender was as follows: 59 (20.70%) women and 226 (79.30%) men. The average age of patients was  $64.03 \pm 12.05$  years. The most common symptom in patients was chest pain (58.90%). Among 285 patients, the number of patients diagnosed with non-ST segment elevation myocardial infarction (NSTEMI) was 64 (22.50%), and the number of patients diagnosed with ST segment elevation myocardial infarction (STEMI) was 221 (77.50%). The most common comorbidities were hypertension (203 patients, 71.20%), atherosclerotic cardiovascular disease (ASCVD) (198 patients, 69.50%), hyperlipidemia (163 patients, 57.20%), and diabetes mellitus (DM) (103 patients, 36.10%). Coronary angiography was done in 254 (89.10%) out of 285 patients, and no blockage was not detected in 27 (10.60%) patients. Seen in 161 (63.40%) patients, one blocked artery was the most common blockage.

**Conclusion:** The symptomatology of myocardial infarction is quite extensive. It should thus be kept in mind that patients with myocardial infarction may present to hospital with atypical symptoms. Patients' knowledge of particularly atypical MI symptoms is below the average. Enhancing knowledge of atypical symptoms is important especially for avoiding delays in patients' presentation to the hospital.

**Keywords:** Myocardial infarction, ER, Initial symptom.

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### **Introduction**

Cardiovascular diseases are among the leading causes of death and disability in the world although they are treatable and avoidable to a great extent. The World Health Organization has reported that coronary heart diseases are the cause of 12.8% of total deaths in the world [1]. In Turkey, coronary heart diseases rank first (22%) among the causes of death [2]. Thus, it is of vital importance to diagnose and initiate treatment of acute coronary syndrome in the ER. Demographic and anamnesis data, clinical signs, ECG results and elevation in indicators constitute the basis of risk assessment in the ER [3]. A substantial proportion of the causes of presentation to the ER are coronary artery diseases and acute myocardial infarction (AMI).

Patients with AMI present to the ER with various clinical symptoms, including chest pain, upper extremity pain, mandibular and epigastric discomfort, and ischemic symptoms such as dyspnea and fatigue. The discomfort related to AMI generally takes longer than 20 minutes, and is diffuse rather than regional, positional or related to movement of the region. It may be accompanied by sweating, nausea or fainting. However, these symptoms are not specific to myocardial ischemia. MI is likely to present atypical symptoms such as palpitation and cardiac arrest. It may also occur without any symptoms, for instance, in women, older people, diabetic patients and postoperative and critically ill patients [4].

## Aim

The aim of this study is to identify the initial symptoms in patients that are admitted to the ER and diagnosed with acute myocardial infarction, and hence contribute to raising awareness of this medical condition.

## Materials and Methods

After approval was received from the Board of Ethics, this study was conducted retrospectively based on the medical records of patients aged 18 and over, who were admitted between 1 January and 31 December 2014 to the ER of Eskişehir Osmangazi University Hospital. For the purpose of this study, the researchers recorded the age, gender, initial symptom/symptoms as well as laboratory results including CK-MB, myoglobin and troponin t values of the patients aged 18 and over admitted to the ER and diagnosed with acute myocardial infarction. For the purpose of this study, the following laboratory test values were considered the normal range: troponin t between 0 and 0.014 ng/ml, CK-MB between 0 and 4.94 ng/ml in men and between 0 and 2.88 ng/ml in women, and myoglobin between 0 and 72 ng/ml in men and between 0-58 ng/ml in women. Furthermore, patients' progress after diagnosis was taken into consideration. Patients aged under 18 were not included in the study. Patients' data were received from the records in the Program in Emergency Medicine, Faculty of Medicine, Eskişehir Osmangazi University.

### Statistical analysis

Continuous variables were presented in the form of mean ± standard deviation. Categorical variables were presented as percentages (%). Pearson's Chi-Square Test, Pearson's Exact Chi-Square Test and Fisher's Exact Chi-Square Test were used for the analysis of cross-tables. IBM SPSS Statistics 21.0 was used to carry out the analyses. The level of statistical significance was  $p < 0.05$ .

## Results

The study was conducted with a total of 285 patients, 59 (20.70%) of which were women and 226 (79.30%) of which were men. The average age of patients was  $64.03 \pm 12.05$  years. The average age of male patients was  $62.93 \pm 11.69$  years, and the average of female patients was  $68.25 \pm 12.59$  years. Out of 285 patients, 219 (76.80%) patients were brought to the ER by ambulance, 53 (18.60%) patients were brought by family members by car, and 13 (4.60%) patients drove to the ER. The most common symptom in patients was chest pain (58.90%). The distribution of initial symptoms by gender indicates that chest pain was the most frequent symptom in both women and men, and the difference between men and women was not statistically significant. The details are provided in Table 1.

**Table 1.** The Distribution of Initial Complaints by Gender.

Complaint	Men	Women	Total	P
Chest Pain	135 (59.70%)	33 (55.90%)	168 (58.90%)	
Retrosternal Burning	21 (9.30) %	3 (5.1%)	24 (8.40%)	
Epigastric Pain	16 (7.10%)	4 (6.80%)	20 (7.00%)	
Dyspnea	13 (5.80%)	6 (10.20%)	19 (6.70%)	
Left Arm Pain	8 (3.50%)	4 (6.80%)	12 (4.20%)	
Back Pain	10 (4.40%)	2 (3.40%)	12 (4.20%)	
Syncope	8 (3.50%)	0 (0%)	8 (2.80%)	
Diaphoresis	6 (2.70%)	1 (1.70%)	7 (2.50%)	
Nausea	4 (1.80%)	3 (5.10%)	7 (2.50%)	
Distress	1 (0.40%)	2 (3.40%)	3 (1.10%)	0.260
Headache	1 (0.40%)	0 (0%)	1 (0.40%)	
Shoulder Pain	1 (0.40%)	0 (0%)	1 (0.40%)	
Right Arm Pain	1 (0.40%)	0 (0%)	1 (0.40%)	
Vomiting	1 (0.40%)	0 (0%)	1 (0.40%)	
Jaw Pain	0 (0%)	1 (1.70%)	1 (0.40%)	
Total	226 (100%)	59 (100%)	285 (100%)	

Among 285 patients, the number of patients diagnosed with NSTMI was 64 (22.50%), and the number of patients diagnosed with STMI was 221 (77.50%). There was no statistical significance in patients' distribution by gender. The details are presented in Table 2.

**Table 2.** The Distribution of Diagnoses by gender.

Diagnosis	Men	Women	Total	P
NSTMI	48 (21.20%)	16 (27.10%)	64 (22.50%)	
STMI	178 (78.80%)	43 (72.90%)	221 (77.50%)	0.43
Total	226 (100%)	59 (100%)	285 (100%)	

With regard to the relationship between patients' complaint and diagnosis, we see that the most common symptom was chest pain in patients diagnosed with NSTMI and STMI. The rate of NSTMI was higher than the rate of STMI in patients that presented to the ER with dyspnea and left arm pain. The rate of STMI was higher than the rate of NSTMI diagnosis in patients that presented with complaints of syncope and nausea; however, the relationship between patients' complaints and diagnosis was not statistically significant. The details are provided in Table 3.

**Table 3.** The distribution of patients' complaints by diagnosis.

Complaint	NSTMI (N)	NSTMI (%)	STMI (N)	STMI (%)	P
Chest Pain	40	62.50	128	57.92	
Retrosternal Burning	5	7.81	19	8.60	

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Epigastric Pain	4	6.25	16	7.24	
Dyspnea	6	9.37	13	5.89	
Left Arm Pain	5	7.81	7	3.16	
Back Pain	2	3.12	10	4.53	0.458
Syncope	0	0	8	3.62	
Diaphoresis	1	1.57	6	2.72	
Nausea	0	0	7	3.16	
Distress	0	0	3	1.36	
Other	1	1.57	4	1.80	
Total	64	100	221	100	

Information was received about patients' medical history. It was found out that 258 (90.50%) patients had at least one comorbid disease. The most common comorbidities were hypertension (HT) (203 patients, 71.20%), atherosclerotic cardiovascular disease (ASCVD) (198 patients, 69.50%), hyperlipidemia (163 patients, 57.20%), and diabetes mellitus (DM) (103 patients, 36.10%). The details are provided in Table 4.

*Table 4. The distribution of patients' comorbidities.*

Comorbid Diseases		Frequency (n)	Percentage (%)
	Hypertension	203	71.20
Cardiovascular Diseases	Atherosclerotic Disease	198	69.50
	Heart Failure	43	15.10

*Table 5. The distribution of patient's diagnosis with regard to presence of hypertension.*

		NSTEMI	STEMI	TOTAL	P
HT	Present	46 (71.90%)	157 (71.00%)	203 (71.20%)	
	Non-present	18 (28.10%)	64 (29.00%)	82 (28.80%)	1.000
Total		64 (100%)	221 (100%)	285 (100%)	

*Table 6. The distribution of patient's diagnosis with regard to presence of diabetes.*

		NSTEMI	STEMI	Total	P
DM	Present	30 (46.90%)	73 (33.00%)	103 (36.10%)	
	Non-present	34 (53.10%)	148 (67.00%)	182 (63.90%)	0.060
TOTAL		64 (100%)	221 (100%)	285 (100%)	

*Table 7. The distribution of patient's diagnosis with regard to presence of atherosclerotic cardiovascular disease.*

		NSTEMI	STEMI	TOTAL	P
ASDH	Present	49 (76.60%)	149 (67.40%)	198 (69.50%)	

	Heart Valve Disease/Heart Rhythm Disorders	33	11.60
	Cardiomyopathy	23	8.10
Endocrine Diseases	Hyperlipidemia	163	57.20
	Diabetes Mellitus	103	36.10
	Hypothyroid	12	4.20
Rheumatic Diseases	Rheumatoid Arthritis	5	1.80
	Fibromyalgia	2	0.70
Neurological Diseases	Cerebrovascular Accident	14	4.90
	Alzheimer's Disease	3	1.10
	Parkinson's Disease	1	0.40
	Epilepsy	1	0.40
	Anxiety Disorder	5	1.80
Mental Disorders	Mood Disorder	5	1.80
	Psychosis	2	0.70
COPD		41	14.40
Chronic Kidney Disease		18	6.30
Cancer		10	3.50
Osteoporosis		3	1.10

The results indicate that the relationship between patients' diagnosis and the most common comorbidities (i.e. diabetes mellitus, hypertension and atherosclerotic cardiovascular disease) was not statistically significant. The details are presented in Tables 5-7.

Non-present	15 (23.40%)	72 (32.60%)	87 (30.50%)	0.213
Total	64 (100%)	221 (100%)	285 (100%)	

The relationship between the complaints that made patients present to the ER and the most common comorbidities (i.e. diabetes mellitus, hypertension and atherosclerotic cardiovascular disease) was not statistically significant (p: 0.833, p:0.589, p:0.676).

Coronary angiography was done in 254 (89.10%) out of 285 patients, and artery blockage was not detected in 27 (10.60%) patients. Seen in 161 (63.40%) patients, blockage of one artery was the most common type of blockage. There was no significant relationship between gender and the number of blocked arteries. The details are presented in Table 8.

**Table 8.** The distribution of blocked arteries by gender.

Blockage	Men	Women	Total	P
Normal	19 (9.40%)	8 (15.40%)	27 (10.60%)	

**Table 9.** The distribution of patients' complaints by number of blocked arteries.

Complaint	Normal	One artery	Two arteries	Three arteries	Total	P
Chest Pain	14 (51.90%)	99 (61.40%)	26 (52%)	8 (50.00%)	147 (57.90%)	
Retrosternal Burning	2 (7.40%)	15 (9.30%)	4 (8.00%)	1 (6.25%)	22 (8.70%)	
Epigastric Pain	4 (14.80%)	10 (6.20%)	4 (8.00%)	1 (6.25%)	19 (7.50%)	
Dyspnea	1 (3.70%)	6 (3.70%)	4 (8.00%)	2 (12.50%)	13 (5.10%)	
Left Arm Pain	2 (7.40%)	5 (3.10%)	3 (6.00%)	2 (12.50%)	12 (4.70%)	
Back Pain	0 (0%)	10 (6.20%)	2 (4.00%)	0 (0%)	12 (4.70%)	0.614
Syncope	1 (3.70%)	3 (1.90%)	3 (6.00%)	0 (0%)	7 (2.80%)	
Diaphoresis	3 (11.10%)	2 (1.30%)	0 (0%)	2 (12.50%)	7 (2.80%)	
Nausea	0 (0%)	4 (2.50%)	3 (6.00%)	0 (0%)	7 (2.80%)	
Distress	0 (0%)	2 (1.30%)	1 (2.00%)	0 (0%)	3 (1.10%)	
Other	0 (0%)	5 (3.10%)	0 (0%)	0 (0%)	5 (1.90%)	
Total	27 (10.60%)	161(63.40%)	50(19.70%)	16(6.30%)	254(100%)	

Troponin t value was within the normal range in 45 (17.90%) patients, and CK-MB value was within the normal range in 122 (48.60%) patients. In 254 patients whose angiography results were available, there was not a statistically significant relationship between the symptoms for which they presented to the ER and artery blockage, patients' diagnosis, troponin values, CK-MB values, and myoglobin values. Out of 285 patients, 280 (98.20%) patients were admitted to the intensive care unit in the cardiology department, one patient died, two patients left the ER at their own request, one patient was transferred to another hospital, and one patient was hospitalized in the cardiology department.

Blockage of One Artery	132 (65.30%)	29 (55.80%)	161 (63.40%)	
Blockage of Two Arteries	39 (19.30%)	11 (21.20%)	50 (19.70%)	0.520
Blockage of Three Arteries	12 (5.90%)	4 (7.70%)	16 (6.30%)	
Total	202 (100%)	52 (100%)	254 (100%)	

With regard to the relationship between patients' complaints and the number of blocked arteries, it was found out that there were 27 (10.65%) patients diagnosed with myocardial infarction but did not have blocked arteries. In each of the four categories, the most frequently encountered complaint was chest pain. The relationship between complaints and number of blocked arteries was not statistically significant. The details are provided in Table 9.

## Discussion

This study focuses on the relationship between the initial symptoms and laboratory test results of patients that presented to the ER of a university hospital and diagnosed with MI. Coronary artery disease (CAD) is one of the leading causes of death in the world. Cardiovascular diseases are responsible for 43% of death before age 75 in women and 38% in men [5]. The symptom of CAD is generally chest pain that travels into the neck, lower jaw and left arm. The pain is not necessarily intense. Some patients may come with atypical symptoms such as nausea and vomiting, dyspnea, fatigue, palpitation, and syncope. These patients are likely to present to the hospital later. Research reveals that about 30% of patients diagnosed

with ST segment elevation myocardial infarction (STEMI) present to healthcare centers with atypical symptoms [6]. There are studies claiming that the possibility of acute myocardial infarction (AMI) is disregarded by physicians or patients in one third of cases because of the presence of atypical complaints [7,8]. The rate of patients with chest pain was quite high in our study, but there were patients that presented to the ER with atypical symptoms, which is consistent with the literature. Physicians should suspect the presence of cardiovascular disorders in patients that present with atypical symptoms in consideration of risk factors.

This study was conducted with a total of 285 patients whose distribution by gender was as follows: 59 (20.70%) women and 226 (79.30%) men. The average age of patients was  $64.03 \pm 12.05$  years. The average age of male patients was  $62.93 \pm 11.69$  years, and the average of female patients was  $68.25 \pm 12.59$  years. The proportion of women to men was one to four among patients diagnosed with MI in the ER. The average age of women was greater than that of men. The results of Özen et al.'s study were consistent with our findings [3]. According to data collected in the US, men have seven-fold greater risk than women for CVD [9]. This study showed that 219 (76.80%) patients were brought to the ER by ambulance, 53 (18.60%) patients were brought by their family members by car, and 13 (4.60%) patients drove to the ER. In their study of 2006, Eren et al. found that 53% of the patients admitted to the ER and diagnosed with AMI were brought in by ambulance [10]. In 1998, Schneider et al. reported that only 42% of patients with chest pain were brought to the ER by ambulance [11]. These data suggest that ambulance services are more effective either today or in the town where this study was conducted.

With regard to comorbidities, we found out that 258 (90.50%) patients had at least one comorbid disease. The most common comorbidities were hypertension (203 patients, 71.20%), atherosclerotic cardiovascular disease (198 patients, 69.50%), hyperlipidemia (163 patients, 57.20%), and diabetes mellitus (103 patients, 36.10%). Supporting our findings, Özen et al. indicated that the most frequent comorbid diseases were hypertension, coronary artery disease and diabetes mellitus [3]. Diabetes and HT are significant risk factors for coronary artery disease. In individuals with diabetes or HT, the rate of MI and short- or long-term mortality after MI is apparently higher. The difference persists although there has been a decrease in post-MI death rates in recent years. There are studies showing that the rate of (short- or long-term) mortality after acute MI is two- or three-fold higher in patients with diabetes and HT compared to patients without diabetes and HT [12-14]. With respect to initial symptoms, there was no significant difference between patients with DM and ASDH and other patients.

In the present study, out of 285 patients, 64 (22.50%) were diagnosed with NSTEMI and 221 (77.50%) with STEMI. In Ceylan et al.'s study, out of 299 patients, 57 (19.06%) had NSTEMI and 242 (80.94%) had STEMI [15]. Our findings are consistent with findings in the literature. Research has shown that STEMI is more common in men while NSTEMI is more common in women [16,17]. In the present study as well, the

rate of STEMI was higher in men and the rate of NSTEMI was higher in women although the differences were not statistically significant. In the present study, coronary angiography was done for 254 out of 285 patients. The results were normal in 27 (10.60%) patients. It was found out that 161 (63.40%) patients had one blocked artery, 50 (19.70%) patients' two blocked arteries, and 16 (6.30%) patients three blocked arteries. Similarly, Gür et al. reported that, out of 299 patients diagnosed with CAD, 47.50% of patients had one blocked artery, 28.40% of patients had two blocked arteries, and 24.10% of patients had three blocked arteries [18].

The symptomatology of myocardial infarction is quite broad. Thus, it should always be kept in mind that patients may present to healthcare centers with atypical symptoms. Patients' knowledge of particularly atypical MI symptoms still remains below standard. There may be delays in diagnosis in the presence of atypical, especially, gastrointestinal symptoms. Raising awareness of atypical symptoms is necessary to avoid delays in diagnosis. A patient's disregard of symptoms may lead physicians to concentrate on diseases other than cardiovascular disorders and hence cause delays in diagnosis [19].

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