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Chest Pain Characteristics Experienced in Patients with ST Elevation Myocardial Infarction

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ABSTRACT

Background and Aim: Diagnosis and management of acute myocardial infarction (AMI) require a thorough and rapid evaluation of the patient's history, particularly chest pain, as it is the most prevalent symptom. Therefore, evaluating the characteristics and description of chest pain in patients with AMI is of utmost importance. This study focused on identifying unique and specific features of chest pain in patients with ST-elevation myocardial infarction (STEMI).

Methods: This prospective, observational, multicenter study was conducted between July 2021 and November 2022. Patients of both genders, over 20 years of age, who experienced STEMI consecutively, were included in the study.

Results: There were 193 STEMI patients, 170 (88.1%) male and 23 female. Chest pain was reported as the initial symptom in 175 (90.7%) patients, which was the main reason for seeking emergency medical care. Chest pain was mostly described as pressure and weighting, and 51.3% of patients reported pain radiation to the left hand. Chest pain was the worst pain experience for 116 (60.4%) patients. Sweating was the most common accompanying symptom, and neck radiation was significantly higher in women than men. There were no significant differences in anterior vs. inferior STEMI patients regarding age, pain description, symptom onset, radiation of pain, accompanying symptoms, and pain duration.

Conclusion: Patients experiencing STEMI typically present with chest pain as their initial symptom and mainly as a pressure-like feeling.

INTRODUCTION

Acute myocardial infarction (AMI) represents a life- threatening cardiovascular emergency necessitating immediate recognition and intervention. Among its variants, ST-elevation myocardial infarction (STEMI) is a critical form primarily diagnosed through clinical history- particularly the characteristics of chest pain- alongside electrocardiographic changes, cardiac biomarkers, and imaging modalities (1-3).

Chest pain is the hallmark symptom of STEMI, usually described as pressure, heaviness, or tightness, and may radiate to the left arm, neck, or jaw. However, variations can occur based on age, gender, comorbidities, and other demographic factors. Still, diagnostic guidelines highlight the importance of recognizing symptoms and understanding disparities in pain presentation across different population groups (1-4).

In Iran, cardiovascular disease continues to be the leading cause of mortality.[5] Some studies reveal an increasing incidence of STEMI with significant delays in hospital presentation remaining a persistent concern (6, 7). Many Iranian patients fail to recognize the severity of their symptoms, and disparities in healthcare across provinces further influence outcomes (7-9). Moreover, the economic

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burden of AMI is considerable, encompassing direct hospitalization costs, long- term medication expenses, and performance losses (10, 11).

While numerous international studies have evaluated chest pain in AMI, a notable gap exists in symptom-focused research specific to Iranian STEMI patients (5). Local cultural factors, health literacy, and access to healthcare likely impact symptom interpretation and reporting. Understanding these differences is crucial for enhancing early diagnosis and minimizing treatment delays.

This study aims to investigate the characteristics of chest pain symptoms among Iranian patients diagnosed with STEMI, with an emphasis on the type, radiation, severity, timing, and associated signs of pain. It further compares these features across various clinical subgroups- such as age, sex, body mass index (BMI), diabetes status, and infarct location-to identify potential patterns or disparities. By elucidating presentations of chest pain within this population, the research seeks to diminish diagnostic uncertainty, facilitate prompt reperfusion therapy, and ultimately improve patient outcomes.

MATERIALS and METHODS

1. *Study Design and Setting*

This prospective, observational, multicenter study was conducted from July 2021 to November 2022 at Taleghani Hospital and Shahid Modarres Hospital, both of which are affiliated with Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran. The study was carried out concurrently with a Phase 3, randomized, double- blind, non- inferiority clinical trial entitled "Assessment of Reperfusion Efficacy of Altelyse Versus Actilyse in Patients with Acute Myocardial Infarction" (Iranian Registry of Clinical Trials ID: IRCT20190729044366N1) involving patients at Taleghani Hospital (12), as well as another observational study entitled "Culprit Lesion Location in ST Elevation Myocardial Infarction: Association with Risk Factors and Left Ventricular Ejection Fraction" (ethical code: IR.SBMU.MSP.REC.1402.430) involving patients at Modarres Hospital (13). The current observational sub-study focused on characterizing chest pain among STEMI patients within the same study population. All participants provided informed consent, and confidentiality was maintained throughout the study, in accordance with the Declaration of Helsinki.

2. *Participants*

The study included patients of both genders aged 20 years or older who experienced STEMI, as defined by the fourth definition of MI (14). Contraindications for fibrinolytic therapy were considered exclusion criteria. Furthermore, patients who expired, were in critical condition, or did not provide informed consent were excluded.

3. *Variables and Data Collection*

The study assessed a range of variables, including demographic data, cardiovascular risk factors, past medical history, and detailed descriptions of chest pain (e.g., onset, intensity, character, radiation, associated symptoms). Data were collected at the time of patient admission to the hospital. Trained clinical staff inquired using a standardized verbal questionnaire, and their responses were documented on uniform forms.

The questionnaire forms provided by a qualified cardiologist closely resembled those used in previous research on the characteristics of chest pain (2, 15-17).

The definition of each past medical history was either a previous diagnosis or ongoing treatment with medications.

An expert cardiologist evaluated each patient's initial electrocardiogram (ECG) to confirm the diagnosis and to determine the infarct location. Based on ECG findings, infarctions were categorized into two main groups:

- Anterior STEMI: ST-segment elevation in leads V1-V6 and/or leads I, aVL
- Inferior STEMI: ST-segment elevation in leads II, III, aVF, with or without elevation in lateral leads (V4-V6).

4. *Statistical methods*

All the statistical analyses were performed using SPSS version 21 (IBM Corp, Armonk, NY, USA). Continuous variables were presented as mean ± standard deviation (SD) or median (interquartile range (IQR): 25th percentile - 75th percentile) when appropriate, and categorical variables as absolute numbers and percentages. The Shapiro-Wilk test was used to determine whether variables were normally distributed. Categorical variables were compared using the Chi-square test or Z-test when appropriate. Continuous variables were compared using an independent two-sample t-test for normally distributed groups and a Mann-Whitney test for nonparametric groups. Statistical significance was considered when $P < 0.01$.

RESULTS

1. *Demographic and Clinical Characteristics*

Between July 2021 and November 2022, 193 patients with STEMI were recruited for this study: 81 (42.0%) patients from Taleghani Hospital and 112 (58.0%) patients from Shahid Modarres Hospital. The mean age of the patients was 57.17 ± 11.23 years (range, 25 to 86 years old). Twenty-three patients (11.9%) were under 45 years old, all of whom were male (Table 1).

Table 1. Demographic and Clinical Characteristics of the Patients at Baseline*

Characteristics	Total (n = 193)
Demographics	
Age - yr	57.17 ± 11.23
Male sex - no. (%)	170 (88.1)
Age < 45 - no. (%)	23 (11.9)
Body-mass index - kg/m² ‡	
Mean	27.01 ± 4.25
Body-mass index ≥ 30 - no. (%)	42 (22.0)
Education - no. (%)	
Illiterate	35 (18.1)
Below diploma	59 (30.6)
Diploma	64 (33.1)
Bachelor	19 (9.8)
Master	11 (5.7)
Doctoral	5 (2.6)
Risk factors - no. / total no. (%)	
Diabetes mellitus	36/193 (18.7)
Hypertension	68/191 (35.6)
Dyslipidemia	48/192 (25)
Current smoker	74/182 (40.6)
Medical history - no. / total no. (%)	
Prior PCI	21/190 (11.05)
Prior MI	17/190 (8.95)
Prior CABG	1/189 (0.53)
Accompanying symptoms - no. (%) ¶	
Dyspnea	65 (33.7)
Distal paresthesia	23 (11.9)
Sweating	82 (42.5)
Vomiting	51 (26.4)
Chills	36 (18.7)

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding. CABG denotes coronary artery bypass grafting, CAD coronary artery disease, MI myocardial infarction, and PCI percutaneous coronary intervention.**

‡ The body mass index is the weight in kilograms divided by the square of the height in meters. Data were missing for two participants.

¶ Each patient may have selected one or more options, or none.

2. Chest Pain

Chest pain was reported as the initial symptom in 175 (90.7%) patients.

The main reason for patients seeking emergency medical care was "pain" (184 of 191 (96.3%)).

Out of 186 patients, the pain was described as pressure in 111 (59.7%) and as a burning feeling in 40 (21.5%). Out of 189 patients, 51.3% of patients reported chest pain radiating to their left hand, while 36.5% of patients reported no radiation. The pain lasted over 30 minutes in 91.5% and over 20 minutes in 94.7% of patients. The highest frequency (31.2%) of symptom onset occurred between 06:00 a.m. and 12:00 p.m., while the lowest frequency (17.7%) was reported between 18:00 and 24:00 (Table 2).

Table 2. Descriptive of Chest Pain*

Characteristics	Total (n = 189)
Time of symptom onset- no./ total no. (%)	
06:00-12:00	58/186 (31.2)
12:00-18:00	47/186 (25.3)
18:00-24:00	33/186 (17.7)
24:00-06:00	48/186 (25.8)
Description of pain - no. / total no. (%)	
Pressure	111/186 (59.7)
Weighting	35/186 (18.8)
Burning	40/186 (21.5)
Dyspnea	8/186 (4.3)
Stabbing	7/186 (3.8)
Crushing	4/186 (2.2)
Suffocate	2/186 (1.1)
Radiation - no. (%) ¶	
No radiation	69 (36.5)
Left hand	97 (51.3)
Back	55 (29.1)
Right hand	29 (15.3)
Neck	6 (3.2)
Jaw	5 (2.6)
Epigastric	2 (1.1)
Intensity score - median (IQR) ‡	10 (8-10)
Duration of pain - no. (%)	
1-5 minutes	3 (1.6)
5-10 minutes	6 (3.2)
10-20 minutes	1 (0.5)
20-30minutes	6 (3.2)
> 30 minutes	173 (91.5)

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding. IQR denotes interquartile range. Data were missing for four participants.**

¶ Each patient may have selected one or more options, or none.

‡ Chest pain scores range from 0 to 10, with the highest score indicating the most pain.

Chest pain was the worst pain experienced in 116/192 (60.4%) patients, and the mean ± SD of the intensity score (a visual analog scale (VAS), ranging from 0 for no pain to 10 for worst pain) was 8.93 ± 1.62; 158 of 187 (84.5%) patients had an intensity score greater than or equal to 8.

Chest pain occurred at rest in 121 of 189 (64.0 %) patients and during activity in the others.

Of the 190 patients, 60.0% believed their pain originated from the heart, 25.3% thought it arose from the

gastrointestinal tract, and only 3 (1.6%) patients believed the pain derived from their bones or muscles. Nineteen (10.0%) patients weren't concerned regarding the initiation of their chest pain.

Sweating was the most common accompanying symptom in 82 (42.5%) patients (Table 1).

3. *Subgroup Analysis*

In the comparison between patients aged 65 years and older and those under 65, left-hand radiation was more prevalent in patients under 65 years of age (56.5% vs. 33.3%, p = 0.008). No significant differences were observed in the other features (Table S1).

There were no significant differences in the comparison features between patients aged 45 years or older and those under 45 (Table S2) and between patients with a BMI of 30 kg/m^2 or higher and those with a BMI lower than 30 kg/m^2 (Table S3).

Women were older than men (67.30 ± 11.86 vs. 55.79 ± 10.43, p < 0.001), and the neck radiation rate was higher in women than in men (13.0% vs. 1.8%, p = 0.004). No significant differences were observed in the other features (Table S4).

The comparison features between non- diabetes mellitus (DM) patients and those with DM were not significantly different (Table S5).

In the comparison between anterior and inferior STEMI locations, no significant differences were found in age, description of pain, time of symptom onset, radiation of pain, accompanying symptoms, or duration of pain (Table 3).

Table S1. Comparison According to the Age of Patients*

Characteristics	Age ≥ 65 (n=43)	Age < 65 (n = 150)	P-value
Age - yr	72.33 ± 6.19	52.82 ± 8.14	---
Description of pain - no. / total no. (%) ¶			
Pressure	22/40 (55.0)	89/146 (61.0)	0.496
Weighting	10/40 (25.0)	25/146 (17.1)	0.259
Crushing	1/40 (2.5)	3/146 (2.1)	0.863
Burning	5/40 (12.5)	35/146 (24.0)	0.118
Stabbing	1/40 (2.5)	6/146 (4.1)	0.636
Dyspnea	2/40 (5.0)	6/146 (4.1)	0.806
Suffocate	2/40 (5.0)	0/146 (0.0)	0.007
Time of symptom onset - no. / total no. (%)			
06:00-12:00	13/42 (30.2)	45/144 (31.3)	0.968
12:00-18:00	9/42 (21.4)	38/144 (26.4)	0.515
18:00-24:00	11/42 (26.2)	22/144 (15.3)	0.103
24:00-06:00	9/42 (21.4)	39/144 (27.1)	0.459
Duration of pain, >30 minutes - no. / total no. (%)	40/43 (93.0)	133/146 (91.1)	0.689
Radiation - no. / total no. (%) ¶			
No radiation	20/42 (47.6)	49/147 (33.3)	0.090
Left hand	14/42 (33.3)	83/147 (56.5)	0.008
Right hand	4/42 (9.5)	25/147 (17.0)	0.235
Back	13/42 (31.0)	42/147 (28.6)	0.764
Neck	1/42 (2.4)	5/147 (3.4)	0.739
Jaw	0/42 (0.0)	5/147 (3.4)	0.226
Accompanying symptoms - no. (%) ¶			
Dyspnea	13 (30.2)	52 (34.7)	0.588
Distal paresthesia	2 (4.7)	21 (14.0)	0.095
Sweating	16 (37.2)	66 (44.0)	0.427
Vomiting	13 (30.2)	38 (25.3)	0.521
Chills	7 (16.3)	29 (19.3)	0.650
Intensity score - median (IQR) ‡	10 (8-10)	10 (8-10)	0.962

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding.**

¶ Each patient may have selected several options or none.

‡ Chest pain scores range from 0 to 10, with the highest score indicating the most pain. Data were missing for three patients under 65 years old and a patient above 65 years old.

Table S2. Comparison According to the Age of Patients*

Characteristics	Age ≥ 45 (n = 170)	Age < 45 (n = 23)	P-value
Age - yr	59.64 ± 9.35	38.87 ± 5.50	---
Description of pain - no. / total no. (%) ¶			
Pressure	95/164 (57.9)	16/22 (72.7)	0.184
Weighting	230/164 (18.3)	5/22 (22.7)	0.617
Crushing	3/164 (1.8)	1/22 (4.5)	0.410
Burning	35/164 (21.3)	5/22 (22.7)	0.882
Stabbing	5/164 (3.0)	2/22 (9.1)	0.162
Dyspnea	7/164 (4.3)	1/22 (4.5)	0.952
Suffocate	2/164 (1.2)	0/22 (0.0)	0.603
Time of symptom onset - no. / total no. (%)			
06:00-12:00	51/163 (31.3)	7/23 (30.4)	0.936
12:00-18:00	38/163 (23.3)	9/23 (39.1)	0.103
18:00-24:00	30/163 (18.4)	3/23 (13.0)	0.528
24:00-06:00	44/163 (27.0)	4/23 (17.4)	0.322
Duration of pain, >30 minutes - no. / total no. (%)	152/162 (91.6)	21/23 (91.3)	0.645
Radiation- no. / total no. (%) ¶			
No radiation	61/167 (36.5)	8/22 (36.4)	0.988
Left hand	81/167 (48.5)	16/22 (72.7)	0.033
Right hand	23/167 (13.8)	6/22 (27.3)	0.099
Back	51/167 (30.5)	4/22 (18.2)	0.230
Neck	6/167 (3.6)	0/22 (0.0)	0.366
Jaw	5/167 (3.0)	0/22 (0.0)	0.411
Accompanying symptoms - no. (%) ¶			
Dyspnea	56 (32.9)	9 (39.1)	0.556
Distal paresthesia	18 (10.6)	5 (21.7)	0.121
Sweating	73 (42.9)	9 (39.1)	0.729
Vomiting	44 (25.9)	7 (30.4)	0.642
Chills	33 (19.4.3)	3 (13.0)	0.462
Intensity score - median (IQR) ‡	10 (8-10)	10 (8-10)	0.497

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding.**

¶ Each patient may have selected several options or none.

‡ Chest pain scores range from 0 to 10, with the highest score indicating the most pain. Data were missing for 4 participants age above 45 years old.

Table S3. Comparison According to the Body Mass Index*

Characteristics	BMI < 30 (n = 149)	BMI ≥ 30 (n = 42)	P-value
Age - yr	57.98 ± 11.11	53.67 ± 10.6	0.026
Description of pain - no. / total no. (%) ¶			
Pressure	86/144 (59.7)	23/40 (57.5)	0.800
Weighting	30/144 (20.8)	5/40 (12.5)	0.235
Crushing	4/144 (2.8)	0/40 (0.0)	0.287
Burning	32/144 (22.2)	8/40 (20.0)	0.763
Stabbing	4/144 (2.8)	3/40 (7.5)	0.167
Dyspnea	4/144 (2.8)	4/40 (10.0)	0.048
Suffocate	2/144 (1.4)	0/40 (0.0)	0.454
Time of symptom onset - no. / total no. (%)			
06:00-12:00	43/146 (29.5)	14/38 (36.8)	0.378
12:00-18:00	42/146 (28.8)	4/38 (10.5)	0.020
18:00-24:00	22/146 (15.1)	11/38 (28.9)	0.046
24:00-06:00	39/146 (26.7)	9/38 (23.7)	0.703
Duration of pain, > 30 minutes - no. / total no. (%)	135/147 (91.8)	37/40 (92.5)	0.888

Characteristics	BMI < 30 (n = 149)	BMI ≥ 30 (n = 42)	P-value
Radiation - no. / total no. (%) ¶			
No radiation	55/146 (37.7)	13/41 (31.7)	0.483
Left hand	71/146 (48.6)	26/41 (63.4)	0.094
Right hand	20/146 (13.7)	9/41 (22.0)	0.197
Back	48/146 (32.9)	6/41 (14.6)	0.023
Neck	5/146 (3.4)	1/41 (2.4)	0.752
Jaw	5/146 (3.4)	0/41 (0.0)	0.230
Accompanying symptoms - no. (%) ¶			
Dyspnea	49 (32.9)	15 (35.7)	0.732
Distal paresthesia	17 (11.4)	6 (14.3)	0.613
Sweating	65 (43.6)	17 (40.5)	0.716
Vomiting	40 (26.8)	11 (26.2)	0.932
Chills	27 (18.1)	8 (19.0)	0.891
Intensity score - median (IQR) ‡	10 (8-10)	10 (8-10)	0.683

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding. The body-mass index (BMI) is the weight in kilograms divided by the square of the height in meters.**
¶ Each patient may have selected several options or none.
‡ Chest pain scores range from 0 to 10, with the highest score indicating the most pain. Data were missing for two patients with BMI < 30.

Table S4. Comparison According to the Genders*

Characteristics	Women (n = 23)	Men (n = 170)	P-value
Age - yr	67.30 ± 11.86	55.79 ± 10.43	<0.001
Description of pain - no. / total no. (%) ¶			
Pressure	11/20 (55.0)	100/166 (60.2)	0.652
Weighting	3/20 (15.0)	32/166 (19.3)	0.644
Crushing	0/20 (0.0)	4/166 (2.4)	0.483
Burning	3/20 (15.0)	37/166 (22.3)	0.454
Stabbing	0/20 (0.0)	7/166 (4.2)	0.349
Dyspnea	3/20 (15.0)	5/166 (3.0)	0.013
Suffocate	1/20 (5.0)	1/166 (0.6)	0.072
Time of symptom onset - no. / total no. (%)			
06:00-12:00	8/22 (36.4)	50/164 (30.5)	0.575
12:00-18:00	5/22 (22.7)	42/164 (25.6)	0.771
18:00-24:00	3/22 (13.6)	30/164 (18.3)	0.589
24:00-06:00	6/22 (27.3)	42/164 (25.6)	0.865
Duration of pain, > 30 minutes - no. / total no. (%)	21/23 (91.3)	152/166 (91.6)	0.968
Radiation- no. / total no. (%) ¶			
No radiation	8/23 (34.8)	61/166 (36.7)	0.854
Left hand	12/23 (52.2)	85/166 (51.2)	0.931
Right hand	4/23 (17.4)	25/166 (15.1)	0.771
Back	9/22 (39.1)	46/166 (27.7)	0.258
Neck	3/23 (13.0)	3/166 (1.8)	0.004
Jaw	0/22 (0.0)	5/166 (3.0)	0.399
Accompanying symptoms - no. (%) ¶			
Dyspnea	10 (43.5)	55 (32.4)	0.289
Distal paresthesia	1 (4.3)	22 (12.9)	0.233
Sweating	8 (34.8)	74 (43.5)	0.426
Vomiting	10 (43.5)	41 (24.1)	0.048
Chills	5 (21.7)	31 (18.2)	0.686
Intensity score - median (IQR) ‡	10 (10-10)	10 (8-10)	0.011

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding.**
¶ Each patient may have selected several options or none.
‡ Chest pain scores range from 0 to 10, with the highest score indicating the most pain. Data were missing for three male patients and one female patient.

Table S5. Comparison According to the Diabetes Mellitus Status*

Characteristics	Non- DM (n = 157)	DM (n = 36)	P-value
Age - yr	56.34 ± 11.42	60.75 ± 9.69	0.033
Description of pain - no. / total no. (%) ¶			
Pressure	95/153 (62.1)	16/33 (48.5)	0.148
Weighting	27/153 (17.6)	8/33 (24.2)	0.379
Crushing	4/153 (2.6)	0/33 (0.0)	0.348
Burning	29/153 (19.0)	11/33 (33.3)	0.068
Stabbing	6/153 (3.9)	1/33 (3.0)	0.807
Dyspnea	7/153 (4.6)	1/33 (3.0)	0.692
Suffocate	2/153 (1.3)	0/33 (0.0)	0.509
Time of symptom onset - no. / total no. (%)			
06:00-12:00	44/151 (29.1)	14/35 (40.0)	0.211
12:00-18:00	42/151 (27.8)	5/35 (14.3)	0.969
18:00-24:00	26/151 (17.2)	7/35 (20.0)	0.696
24:00-06:00	39/151 (25.8)	9/35 (25.7)	0.992
Duration of pain, > 30 minutes - no. / total no. (%)	143/153 (93.5)	30/36 (83.3)	0.05
Radiation- no. / total no. (%) ¶			
No radiation	55/154 (35.7)	14/35 (40.0)	0.635
Left hand	81/154 (52.6)	16/35 (45.7)	0.462
Right hand	22/154 (14.3)	7/35 (20.0)	0.397
Back	47/154 (30.5)	8/35 (22.9)	0.368
Neck	6/154 (3.9)	0/35 (0.0)	0.235
Jaw	5/154 (3.2)	0/35 (0.0)	0.280
Accompanying symptoms - no. (%) ¶			
Dyspnea	53 (33.8)	12 (33.3)	0.961
Distal paresthesia	20 (12.7)	3 (8.3)	0.462
Sweating	72 (45.9)	10 (27.8)	0.048
Vomiting	43 (27.4)	8 (22.2)	0.526
Chills	27 (17.2)	9 (25.0)	0.278
Intensity score - median (IQR) ‡	10 (8-10)	9 (7-10)	0.185

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding. DM denotes diabetes mellitus.**
¶ Each patient may have selected several options or none.
‡ Chest pain scores range from 0 to 10, with the highest score indicating the most pain. Data were missing for three non-DM patients and one DM patient.

Table 3. Comparison According to the Location of Myocardial Infarction*

Characteristics	Anterior (n = 82)	Inferior (n = 100)	P-value
Age - yr	55.80 ± 10.76	57.73 ± 11.24	0.243
Description of pain - no. / total no. (%) ¶			
Pressure	53/79 (67.1)	52/96 (54.2)	0.082
Weighting	16/79 (20.3)	18/96 (18.8)	0.803
Crushing	2/79 (2.5)	1/96 (1.0)	0.450
Burning	15/79 (19.0)	24/96 (25.0)	0.342
Stabbing	2/79 (2.5)	3/96 (3.1)	0.815
Dyspnea	4/79 (5.1)	4/96 (4.2)	0.777
Suffocate	0/79 (0.0)	1/96 (1.0)	0.363
Time of symptom onset - no. / total no. (%)			
06:00-12:00	28/82 (34.1)	27/95 (28.4)	0.412
12:00-18:00	20/82 (24.4)	26/95 (27.4)	0.652
18:00-24:00	13/82 (15.9)	17/95 (17.9)	0.718
24:00-06:00	21/82 (25.6)	25/95 (26.3)	0.912
Duration of pain, > 30 minutes - no. / total no. (%)	73/81 (90.1)	89/97 (91.8)	0.535

Characteristics	Anterior (n = 82)	Inferior (n = 100)	P-value
Radiation- no. / total no. (%) ¶			
No radiation	29/81 (35.8)	37/97 (38.1)	0.747
Left hand	45/81 (55.6)	48/97 (49.5)	0.419
Right hand	15/81 (18.5)	12/97 (12.4)	0.255
Back	21/81 (25.9)	29/97 (29.9)	0.557
Neck	4/81 (4.9)	2/97 (2.1)	0.290
Jaw	2/81 (2.5)	2/97 (2.1)	0.855
Accompanying symptoms - no. (%) ¶			
Dyspnea	29 (35.4)	35 (35)	0.959
Distal paresthesia	9 (11.0)	11 (11.0)	0.996
Sweating	33 (40.2)	41 (41.0)	0.918
Vomiting	23 (28.0)	26 (26.0)	0.757
Chills	18 (22.0)	17 (17.0)	0.399
Intensity score - median (IQR) ‡	10 (8.63-10)	9 (8-10)	0.016

*** Plus- minus values is means ± SD. Percentages may not total 100 because of rounding. Among the 193 patients, six suffered from lateral myocardial infarction, one had a posterior infarction, and four remained undiagnosed. As a result, the abovementioned cases were excluded from the analysis.**

¶ Each patient may have selected one or more options, or none.

‡ Chest pain scores range from 0 to 10, with the highest score indicating the most pain. Data were missing for 2 participants in the anterior location and one patient in the inferior location.

DISCUSSION

In this study, we found that chest pain was the most common initial symptom among STEMI patients, reported in over 90% of cases. Most patients described their pain as a pressure- like sensation, and about 45% of cases reported radiation to the left hand (Figure 1). These findings align with the classical symptom profile of AMI described in international guidelines (1, 3).

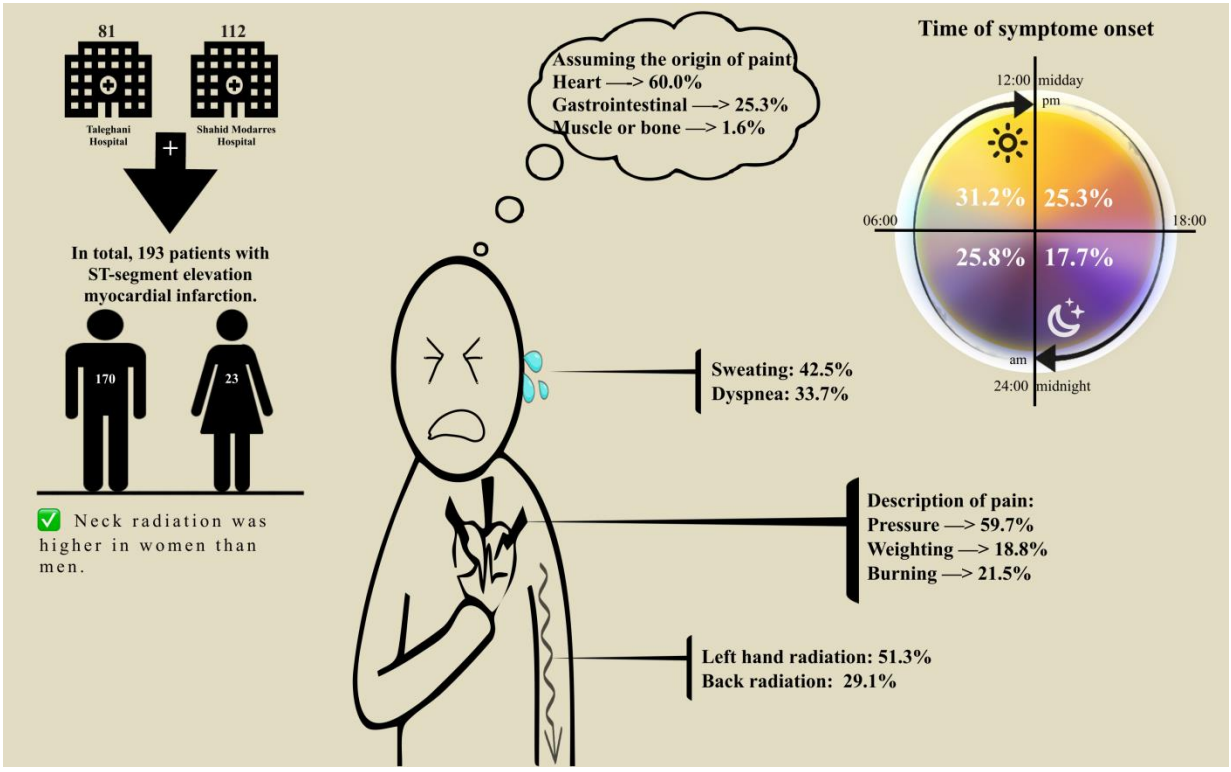

FIGURE 1. Central Illustration

The proportion in the description of pain, time of symptom onset, left-hand radiation, and assuming the origin of pain were reported among 186, 189, 189, and 190 patients with ST-segment myocardial infarction, respectively.

The pressure- like nature of chest pain observed in 59.7% of patients aligns with data from the AHA guideline report, where pressure, squeezing, and heaviness are the most suggestive symptoms of myocardial ischemia (3). Leite et al. also found that "tightness" was the most frequent descriptor in their cohort (17). Our results similarly place "pressure," "weighting," and "burning" among the top descriptors.

A notable finding was the circadian distribution of symptom onset, peaking between 6 a.m. and noon (31.2%). This pattern is consistent with circadian variations observed in AMI globally and in Iranian data (6, 9, 18). Rouzbahani et al. (9) reported a peak occurrence in western Iran during the period from 6:00 to 12:00.

Regarding gender differences, we found that women were significantly older and more often reported neck radiation and higher pain levels. Although our female sample size was small, this pattern aligns with findings from Berg et al (19) and Rubini Gimenez et al. (20), who both noted that women tend to exhibit more intense and sometimes unusual symptoms.

Interestingly, comparisons between anterior and inferior STEMI showed no significant differences in pain type, onset timing, or related symptoms. The only borderline difference was higher pain intensity in anterior STEMI, possibly reflecting the larger infarct area and more extensive myocardial damage typical of anterior wall infarctions.

The overall absence of significant differences across most subgroups-such as patients aged ≥ 65 versus those under 65 or those with and without diabetes-indicates that the core features of chest pain in STEMI, including pressure sensation, radiation, and duration, are generally consistent regardless of demographic or other factors. However, where differences did appear-such as the higher frequency of neck radiation in women- these variations merit clinical attention to prevent underdiagnosis in less typical cases. This highlights the importance of combining symptom assessment with ECG findings and cardiac biomarkers during triage.

This study has important implications for the Iranian healthcare system. Raising awareness of both common and uncommon chest pain symptoms can help reduce missed diagnoses of STEMI in emergency departments. The fact that 25.3% of patients misinterpreted their chest pain as gastrointestinal issues highlights the urgent need for targeted public education campaigns to improve early detection of heart attack signs. Finally, the observed circadian pattern in symptom onset suggests that emergency medical services (EMS) can improve efficiency by coordinating resource deployment and staff preparedness with peak morning times.

LIMITATIONS

The sample size was the limitation of this study. Additionally, reliance on self-reported symptoms may introduce recall bias.

CONCLUSION

Chest pain was confirmed as the primary and most defining symptom among Iranian patients with STEMI, typically described as a pressure- like sensation and often accompanied by radiation to the left hand and autonomic symptoms such as sweating. While the overall symptom pattern was consistent across demographic and clinical subgroups, notable variations-such as higher neck radiation in women-highlight the importance of clinician awareness of less typical presentations.

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CONFLICT OF INTEREST

All authors declare no conflicts of interest.

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USING ARTIFICIAL INTELLIGENCE (AI)

Artificial intelligence tools were not utilized in the conception, conduct, analysis, or reporting of this research.

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