

Clinical Profile of Patients With ST-Elevation Myocardial Infarction in the Kurdistan Region of Iraq: A Cross-Sectional Study

Majeed T. Ahmed¹, Shivan Umar Muhammed¹, Ronahi Y. Ibrahim¹, Azri Salih Haji Sgery^{2*}, Neshwan Albarwari³

¹Department of Biomedical Sciences, College of Medicine, University of Zakho, Zakho, Kurdistan Region, Iraq.

²Department of Preventive Medicine, General Directorate of Health, Duhok, Kurdistan Region, Iraq.

³Department of Medicine, College of Medicine, University of Duhok.

*Correspondence to: Dr. Azry Sgery (E-mail: azrysgery23@gmail.com)

(Submitted: 09 December 2025 – Revised version received: 27 December 2025 – Accepted: 15 January 2026 – Published online: 26 February 2026)

Abstract

Background and Objectives: ST-elevation myocardial infarction (STEMI) is an acute, life-threatening manifestation of acute coronary syndrome. It occurs due to the complete occlusion of one or more coronary arteries and requires urgent intervention within 90 to 120 minutes. The objective of this study is to analyze the clinical presentation of STEMI among patients admitted to Zakho Emergency Teaching Hospital.

Methods: This prospective observational study was conducted at Zakho Emergency Teaching Hospital in the Kurdistan Region of Iraq. A total of 200 patients were enrolled between June 2024 and June 2025. Inclusion criteria included all individuals undergoing percutaneous coronary intervention (PCI) for STEMI, regardless of age or gender. Patients who underwent coronary angiography solely for assessment were excluded.

Results: Among 200 patients, 161 were male (80.5%), and 39 were female (19.5%). Most patients (52.5%) were aged 46 to 60 years. In terms of medical history, 37.0% had diabetes, 40.5% had hypertension, 57.5% were smokers, 27.5% reported a positive family history of myocardial infarction, and 8% had a previous history of heart disease. Diabetic patients experienced longer durations of chest pain and greater delays in hospital presentation ($P < 0.001$). Previous heart disease ($P = 0.187$), hypertension ($P = 0.23$), and the affected myocardial wall ($P = 0.38$) did not significantly affect time to presentation.

Conclusion: Diabetic patients were more likely to present later than two hours after symptom onset. Early presentation in cases of myocardial infarction is critical for timely treatment and effective management.

Keywords: Acute coronary syndrome, PCI: STEMI, time of presentation

Introduction

To date, coronary artery disease (CAD) is the leading cause of morbidity and mortality worldwide, resulting in over 160 million disability-adjusted life years (DALYs) lost annually, with a continued global rise in mortality rates.¹⁻³ CAD involves myocardial ischemia, invariably caused by atherosclerosis through the gradual buildup of coronary plaque. Although it could be asymptomatic, CAD usually presents as chronic coronary syndrome (CCS), including stable angina, ischemia with non-obstructive coronary artery (INOCA), and silent ischemia. In contrast, the more severe and potentially lethal form of presentation is acute coronary syndromes (ACS). ACS encompasses a heterogeneous cluster of manifestations, unstable angina, non-ST-elevation myocardial infarction (NSTEMI), ST-elevation myocardial infarction (STEMI), sudden cardiac arrest, and myocardial infarction with non-obstructive coronary artery (MINOCA).^{4,5}

STEMI represents one-third of all ACS cases and occurs from the complete occlusion of one or more of the coronary arteries. The occlusion leads to an imbalance between myocardial oxygen supply and demand, causing transmural myocardial ischemia and subsequent myocardial cell necrosis.^{6,7} Clinically, STEMI is diagnosed by the presence of two of three criteria: typical chest pain, ECG changes, and elevated highly sensitive cardiac biomarkers, such as troponins.^{7,8} Rapid and accurate diagnosis is essential due to the narrow therapeutic window time and patients must undergo primary percutaneous coronary intervention (PPCI) within 90 to 120 minutes of first

medical contact.⁹ Without timely intervention, patients are at high risk for serious complications, including fatal arrhythmias such as ventricular tachycardia and ventricular fibrillation, mechanical complications such as myocardial rupture and ventricular septal defect, and ultimately, death may occur.¹⁰⁻¹²

The aim of this study was to evaluate the clinical characteristics of patients with STEMI presenting to our hospital.

Patients and Methods

Study Design and Setting

This study was a prospective observational study conducted at Zakho Emergency Teaching Hospital, Zakho, Iraq. Patients who were undergoing PPCI for STEMI were included in the study. Approval from the ethical committee at the College of Medicine, University of Zakho, was obtained. Prior to conducting the study, all patients were informed of their enrollment after the process was explained, and formal consent was obtained from the patient and/or their first-degree relatives.

The study was conducted over a 1-year period, from June 2024 to June 2025, and a total of 200 patients were enrolled. The study included all patients presenting with ST-elevation myocardial infarction (STEMI) who underwent primary percutaneous coronary intervention (PPCI) at Zakho Emergency Hospital during the study period. Patients were excluded if they did not undergo PPCI, either due to contraindications, refusal, late presentation beyond the window for reperfusion therapy, or management with alternative treatment strategies.

STEMI Diagnosis and Intervention

The time of presentation in this study is the interval from symptom onset to hospital arrival. The STEMI diagnostic criteria included ischemic chest pain or equivalent symptoms, accompanied by characteristic ECG changes—specifically new ST-segment elevation at the J-point in at least two contiguous leads (≥ 2 mm in men or ≥ 1.5 mm in women in V2–V3, or ≥ 1 mm in other contiguous leads)—in the absence of confounding conditions such as left bundle branch block or left ventricular hypertrophy. Elevated cardiac biomarkers, such as troponin, provide supportive evidence, but the diagnosis is primarily clinical and ECG-based.

Each patient who was considered a candidate for PPCI was included, and detailed information was collected via a questionnaire. The cases were initially managed in the catheterization laboratory, and pre-discharge information was obtained. Data collection included: sociodemographic features: age and gender, past medical history of diabetes mellitus, hypertension, positive family history of coronary artery disease, positive history of previous heart disease, and tobacco smoking. Additionally, the duration of chest pain (whether >2 or <2 hours) and the infarct location (anterior, inferior, lateral, posterior, anterolateral, or anteroinferior, according to the wall involved on electrocardiography) were reported on a questionnaire.

Data Analysis

Initially, data were entered in a Microsoft Excel spreadsheet. SPSS version 26 was used for statistical analysis of the study. Frequencies were calculated, followed by statistical analysis using the Pearson chi-square (χ^2). The *P*-value was set at 0.05, and values less than 0.05 were considered statistically significant. The Pearson Chi-squared test was used to compare the medical characteristics of chest pain duration (in hours at presentation) with Diabetes, Hypertension, a history of previous heart disease, and the type of MI according to the myocardial wall involved.

Results

Sociodemographic characteristics of the sample were evaluated. Most cases (52.5%) were aged 46–60 years, 19% were aged 21–45 years, and 28.5% were aged 60 years or older. Males comprised 80.5% of the sample, while females accounted for 19.5%. Medical profile assessment revealed that 37.0% had diabetes, 40.5% had hypertension, 57.5% were smokers, 27.5% reported a positive family history of myocardial infarction, and 8% had a previous history of heart disease. In terms of chest pain duration at presentation, 63.5% of cases presented within one hour, 12% within two hours, 14.5% within a 2–10-hour window, 6% within a 10–24-hour window, and 4% after 24 hours from onset. Anterior myocardial infarction (MI) was the most common type (44%), followed by inferior MI (41.5%), anterolateral MI (10.5%), and other forms, including lateral (1.5%), posterior (1.5%), and anteroinferior (1.0%), as detailed in Table 1.

The influence of patients' prior history of heart disease on the duration of chest pain at presentation was evaluated. Most cases without a history of heart disease presented within 2 hours, comprising 77.2% of the sample. In contrast, 62.5% of patients with a previous history of heart disease presented

within 2 hours, while 37.5% presented after this period. These differences were not statistically significant ($P = 0.187$), as shown in Table 2.

The impact of diabetes on the duration of chest pain at presentation was further evaluated. Most patients without a history of diabetes (89.7%) presented within 2 hours, whereas only 11.1% presented after 2 hours. In contrast, among patients with diabetes, the proportion presenting within 2 hours declined to 52.7%, representing a statistically significant difference ($P < 0.0001$), as shown in Table 3.

Table 1. Sociodemographic characteristic of the cohort

Variables	Groups	No.	Percentage
Age	21–45	38	19.0
	46–60	105	52.5
	>60	57	28.5
Gender	Male	161	80.5
	Female	39	19.5
Diabetes	Absent	126	63
	Present	74	37
Hypertension	Absent	119	59.5
	Present	81	40.5
Smoking	Absent	85	42.5
	Present	115	57.5
Family History	Absent	145	72.5
	Present	55	27.5
Previous Heart Disease	Absent	184	92
	Present	16	8
Chest Pain Duration (hour)	<1 hour	127	63.5
	<2 hours	24	12
	2–10 hours	29	14.5
	10–24 hours	12	6
	>24 hours	8	4
Infarct Location	Anterior	88	44
	Inferior	83	41.5
	Lateral	3	1.5
	Posterior	3	1.5
	Anterolateral	21	10.5
	Anteroinferior	2	1
Total		200	100

Table 2. Impact of history of heart disease on time of presentation

Duration of Chest pain (hours)	Previous history of heart disease		
	No (%)	Yes (%)	Total
≤ 2 hours	142 (77.2)	10 (62.5)	152
>2 hours	42 (22.8)	6 (37.5)	48
Total	184 (100.0)	16 (100.0)	200
<i>P</i> -value = 0.187			

Table 3. Impact of diabetes on time of presentation

Duration of Chest pain (hours)	Diabetes		Total
	No (%)	Yes (%)	
≤2 hours	113 (89.7)	39 (52.7)	152
>2 hours	13 (11.1)	35 (47.3)	48
Total	126 (100.0)	74 (100.0)	200
<i>P</i> -value < 0.0001			

Table 4. Impact of hypertension on duration of chest pain

Duration of Chest pain (hours)	Hypertension		Total
	No (%)	Yes (%)	
≤2 hours	94 (79.0)	58 (71.6)	152
>2 hours	25 (21.0)	23 (28.4)	48
Total	119 (100.0)	81 (100.0)	200
<i>P</i> -value = 0.23			

Table 5. Impact of the infarct's location on the time of presentation

Duration of Chest pain (hours)	The Infarct Location						Total
	Anterior (%)	Inferior (%)	Lateral (%)	Posterior (%)	Anterolateral (%)	Anteroinferior (%)	
≤2 hours	64 (72.7)	67 (80.0)	2 (66.7)	1 (33.3)	16 (76.2)	2 (100)	152
>2 hours	24 (27.3)	16 (19.3)	1 (33.3)	2 (66.7)	5 (23.8)	0 (0.0)	48
Total	88 (100)	83 (100)	3 (100)	3 (100)	21 (100)	2 (100)	200
<i>P</i> -value = 0.38							

The effect of hypertension on the duration of chest pain at presentation was assessed. Among patients with no history of hypertension, 79% presented within 2 hours compared to 71.6% of their counterparts. The impact of chest pain duration was statistically nonsignificant (*P* value = 0.23), as shown in Table 4.

The infarct's location is classified by the region of the wall involved: anterior, inferior, lateral, posterior, anterolateral, and anteroinferior. Their impact on presentation time was assessed, and it was found that, across all types except posterior MI, the majority presented within 2 hours: 72.7%, 80.0%, 66.7%, 33.3%, 76.2%, and 100%, respectively. Nevertheless, the *P* value was non-significant at 0.38 as seen in Table 5.

Discussion

This study analyzes the clinical profile of patients presenting with ST-elevation myocardial infarction (STEMI). The data indicate that the majority of patients were male (80.5% compared to 19.5% female). This observation aligns with previous studies^{13–15} that have reported a higher incidence of STEMI in men across various populations and age groups. For instance, the French Registry documented a 77% male-to-female ratio,¹⁴ and another study involving patients younger than 45 years found a 92.5% male predominance.¹⁵ The higher prevalence in men is attributed to several factors, including a greater frequency of modifiable risk factors such as smoking, hypertension, dyslipidemia, and metabolic syndrome;^{16,17} hormonal differences, specifically lower estrogen levels in males;¹⁸ and genetic and molecular factors that result in sex-specific differences in lipid metabolism and sodium channel function.^{19,20}

More than half of the patients (52.5%) were middle-aged (46–60 years), which is consistent with findings from other studies.^{16,21} Acute coronary syndrome (ACS) occurred in 19% of patients younger than 46 years, indicating that nearly one in five STEMI cases affects this younger cohort. This trend raises concerns regarding premature coronary artery disease (CAD) in the local population.²² A local study reported a higher prevalence of angiographically confirmed premature CAD at

31%.²³ This disparity may be attributed to unhealthy lifestyle choices among the younger population, such as increased consumption of energy drinks.²⁴

The optimal time window for reperfusion therapy, often referred to as the “golden window,” is 90–120 minutes,⁹ as delays in treatment are directly linked to increased mortality.^{25,26} In this study, 76% of patients presented with chest pain lasting 2 hours or less, indicating early arrival within the golden window. Conversely, 24% of patients presented with chest pain exceeding 2 hours. Notably, 47.3% of diabetic patients, who represented 17.5% of the total sample, arrived after 2 hours of chest pain. This delayed presentation was statistically significant among diabetic patients and is likely attributable to autonomic neuropathy.²⁷ The prevalence of delayed presentation in diabetic patients was lower but comparable to global estimates of 25–50%.^{28–30}

The time required for patients with ST-elevation myocardial infarction (STEMI) to reach the hospital is a critical determinant of clinical outcomes. Delays between symptom onset and hospital arrival often result in increased myocardial damage, higher risk of complications, and elevated mortality rates.³¹ Early intervention with primary percutaneous coronary intervention (PCI) significantly improves survival. However, late presentation remains prevalent due to unrecognized symptoms, social and cultural barriers, and limited access to emergency medical services.³² Public health strategies, such as community education, improved pre-hospital triage, and continuous availability of catheterization laboratories, are essential to reduce these delays.^{33,34} Addressing these challenges benefits individual patients and reduces the overall burden of cardiovascular disease, which remains a leading cause of morbidity and mortality worldwide. Investigating the timing of hospital presentation among STEMI patients is therefore crucial for optimizing clinical care and informing effective health policy.

Limitations of the Study

Several limitations of this study should be acknowledged. First, the single-center design may restrict the generalizability of the findings to other hospitals or regions with different patient

populations and healthcare systems. Second, selection bias may have occurred by including only patients who underwent primary percutaneous coronary intervention (PPCI), thereby excluding those managed conservatively or with thrombolysis. Third, the absence of outcome data, such as in-hospital mortality, complications, or long-term follow-up, limits the assessment of the prognostic implications of the identified clinical profiles. Fourth, omitting socioeconomic and educational variables limits understanding of patient delay, health-seeking behavior, and disparities in access to timely care. Finally, recall bias regarding the exact time of symptom onset may have affected the data, as this information was self-reported by patients and may be inaccurate, especially in stressful clinical situations.

Conclusion

The clinical profile of patients presenting with ST-elevation myocardial infarction (STEMI) is a key determinant of both

clinical presentation and disease outcomes. The type of myocardial infarction, presence of hypertension, and prior history of heart disease did not significantly influence the time to presentation. However, patients with diabetes were more likely to present after two hours. Early presentation in cases of myocardial infarction is essential for timely intervention and optimal management. Consequently, increasing public awareness of myocardial infarction, especially among individuals with diabetes, is recommended to encourage earlier presentation.

Conflict of Interest

Authors declare no potential conflict of interest.

Funding

None to declare. ■

References

1. Ralapanawa, U., & Sivakanesan, R. (2021). Epidemiology and the Magnitude of Coronary Artery Disease and Acute Coronary Syndrome: A Narrative Review. *Journal of Epidemiology and Global Health*, 11, 169–177. <https://doi.org/10.2991/jegh.k.201217.001>.
2. Ahmad, M., & Batcha, M.S. (2021). Coronary Artery Disease Research in India: A Scientometric Assessment of Publication during 1990–2019. *ArXiv*, <https://doi.org/10.48550/arXiv.2102.11739>.
3. Malakar, A., Choudhury, D., Halder, B., Paul, P., Uddin, A., & Chakraborty, S. (2019). A review on coronary artery disease, its risk factors, and therapeutics. *Journal of Cellular Physiology*, 234, 16812–16823. <https://doi.org/10.1002/jcp.28350>.
4. Knuuti, J., Wijns, W., Saraste, A., Capodanno, D., Barbato, E., Funck-Brentano, C., Prescott, E., Storey, R., Deaton, C., Cuisset, T., Agewall, S., Dickstein, K., Edvardsen, T., Escaned, J., Gersh, B., Svtil, P., Gilard, M., Hasdai, D., Hatala, R., Mahfoud, F., Masip, J., Muneretto, C., Valgimigli, M., Achenbach, S., & Bax, J. (2020). 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes. *European Heart Journal*, 41(3):407–477 <https://doi.org/10.1093/eurheartj/ehz425>.
5. Grech, E. (2003). Pathophysiology and investigation of coronary artery disease. *BMJ: British Medical Journal*, 326, 1027–1030. <https://doi.org/10.1136/bmj.326.7397.1027>.
6. Alpert JS, Thygesen K, Antman E, Bassand JP. Myocardial infarction redefined—a consensus document of The Joint European Society of Cardiology/American College of Cardiology Committee for the redefinition of myocardial infarction. *J Am Coll Cardiol*. 2000 Sep;36(3):959–69.
7. Ojha N, Dharmoon AS. Myocardial Infarction. [Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537076/>.
8. Patibandla S, Gupta K, Alsayouri K. Cardiac Biomarkers. [Updated 2023 Nov 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK545216/>.
9. Akbar H, Mountfort S. Acute ST-Segment Elevation Myocardial Infarction (STEMI) [Updated 2024 Oct 6]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK532281/>.
10. Mbuku, J., Kasongo, A., Goube, P., Miltoni, L., Natuhoyila, A., M'buyamba-Kabangu, J., Longo-Mbenza, B., & Phanzu, B. (2023). Factors associated with complications in ST-elevation myocardial infarction: a single-center experience. *BMC Cardiovascular Disorders*, 23. <https://doi.org/10.1186/s12872-023-03498-z>.
11. Uddin, M., Mir, T., Khalil, A., Mehar, A., Gomez-Pineiro, E., Babu, M., Sheikh, M., Soubani, A., Saydain, G., & Afonso, L. (2022). ST-Elevation Myocardial Infarction Outcomes: A United States Nationwide Emergency Departments Cohort Study. *The Journal of Emergency Medicine*. <https://doi.org/10.1016/j.jemermed.2021.10.028>.
12. Kwok, C., Qureshi, A., Will, M., Schwarz, K., Lip, G., & Borovac, J. (2024). Structural Complications Following ST-Elevation Myocardial Infarction: An Analysis of the National Inpatient Sample 2016 to 2020. *Journal of Cardiovascular Development and Disease*, 11(2), 59. <https://doi.org/10.3390/jcdd11020059>.
13. Ahuja, K., Saad, A., Nazir, S., Ariss, R., Shekhar, S., Isogai, T., Kassis, N., Mahmood, A., Sheikh, M., & Kapadia, S. (2022). Trends in Clinical Characteristics and Outcomes in ST-elevation Myocardial Infarction Hospitalizations in the United States, 2002–2016. *Current Problems in Cardiology*, 47(12), 101005. <https://doi.org/10.1016/j.cpcardiol.2021.101005>.
14. Loyeau, A., Benamer, H., Bataille, S., Tepper, S., Boche, T., Lamhaut, L., Pirès, V., Simon, B., Dupas, F., Weisslinger, L., Bail, G., Allonneau, A., Juliard, J., Lambert, Y., & Lapostolle, F. (2018). Evolution of ST-Elevation Acute Myocardial Infarction Prevalence by Gender Assessed Age Pyramid Analysis—The Piramyd Study. *Journal of Clinical Medicine*, 7 (12), 509. <https://doi.org/10.3390/jcm7120509>.
15. Alexander, T., Kumbhani, D., Subban, V., Sundar, H., Nallamothu, B., & Mulasari, A. (2021). Acute ST-Elevation Myocardial Infarction in the Young Compared With Older Patients in the Tamil Nadu STEMI Program. *Heart, Lung & Circulation*, 30(12), 1876–1882. <https://doi.org/10.1016/j.hlc.2021.04.013>.
16. Tung, B., Ng, Z., Kristanto, W., Saw, K., Chan, S., Sia, W., Chan, K., Chan, M., Kong, W., Lee, R., Loh, J., Low, A., Poh, K., Tay, E., Tan, H., Yeo, T., & Loh, P. (2021). Characteristics and outcomes of young patients with ST segment elevation myocardial infarction undergoing primary percutaneous coronary intervention: retrospective analysis in a multiethnic Asian population. *Open Heart*, 8, e001437. <https://doi.org/10.1136/openhrt-2020-001437>.
17. Juhan, N., Zubairi, Y., Zuhdi, A., Khalid, Z., & Ahmad, W. (2018). Gender differences in mortality among ST elevation myocardial infarction patients in Malaysia from 2006 to 2013. *Annals of Saudi Medicine*, 38, 1–7. <https://doi.org/10.5144/0256-4947.2018.1>.
18. Sharafi, M., Dehghan, A., Mouseli, A., Fatemian, H., Jamali, L., Afrashteh, S., Chijan, M., Mastaneh, Z., Zakeri, A., & Alkamel, A. (2024). A cross-sectional study determining prevalence and factors associated with ST-segment elevation myocardial infarction and non-ST segment elevation myocardial infarction in Iran: results from fasa registry on acute myocardial infarction (FaRMI). *BMC Public Health*, 24, 728. <https://doi.org/10.1186/s12889-024-18140-6>.
19. Zhang, L., Liu, Z., Zhu, Y., Zeng, J., Huang, H., Yang, W., Peng, K., & Wu, M. (2024). Sex-specific impact of mild obesity on the prognosis of ST-segment elevation myocardial infarction. *Scientific Reports*, 14, 2228. <https://doi.org/10.1038/s41598-024-52515-4>.
20. Wu, M., Lee, A., Lin, Y., Chung, W., Chen, K., Lu, C., Chen, Y., Chang, C., Tsai, W., Shiao, Y., Chen, C., & Chang, K. (2024). Role of low-density lipoprotein

- electronegativity and sexual dimorphism in contributing early ventricular tachyarrhythmias following ST-elevation myocardial infarction. *Frontiers in Cardiovascular Medicine*, 11, 1285068. <https://doi.org/10.3389/fcvm.2024.1285068>.
21. Haller, P., Jäger, B., Farhan, S., Christ, G., Schreiber, W., Weidinger, F., Stefenelli, T., Delle-Karth, G., Kaff, A., Maurer, G., & Huber, K. (2018). Impact of age on short- and long-term mortality of patients with ST-elevation myocardial infarction in the VIENNA STEMI network. *Wiener Klinische Wochenschrift*, 130, 172–181. <https://doi.org/10.1007/s00508-017-1250-7>.
 22. Qayoom, R., Naseer, A., Khokhar, M., Aijaz, S., & Hanif, B. (2024). Risk factor profile and outcomes in young patients presenting with acute ST-segment elevation myocardial Infarction. *Europace*, 26, euae102.530. <https://doi.org/10.1093/europace/euae102.530>.
 23. Mohammad, A., Jehangeer, H., & Shaikhow, S. (2015). Prevalence and risk factors of premature coronary artery disease in patients undergoing coronary angiography in Kurdistan, Iraq. *BMC Cardiovascular Disorders*, 15, 155. <https://doi.org/10.1186/s12872-015-0145-7>.
 24. Abdulah, D., Sulaiman, S., & Abdulmajeed, A. (2025). Prevalence and Associated Factors with Sugar-sweetened Beverages Consumption among Kurdish High-school Children. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*, 50, 385–391. https://doi.org/10.4103/ijcm.ijcm_654_23.
 25. Saeed, E., & Faeq, A. (2024). Impact of primary percutaneous coronary intervention on ST-segment elevation myocardial infarction patients: A comprehensive analysis. *World Journal of Experimental Medicine*, 14(1), 88541. <https://doi.org/10.5493/wjem.v14.i1.88541>.
 26. Ullah, R., Khan, R., Muzaffar, I., Shehzad, K., Shah, H., & Ahmad, W. (2023). The effectiveness of early angiography and intervention for treating anterior ST-elevation myocardial infarction involving diagonal branches. *International Journal of Health Sciences*, 7(S1), 662–673. <https://doi.org/10.53730/ijhs.v7ns1.14250>.
 27. Briggs, B., Zitely, E., & Zitely, T. (2022). Abdominal and Pelvic Computed Tomography for the Diagnosis of ST-Elevation Myocardial Infarction: The Challenges of Acute Coronary Syndrome in Diabetic Patients. *Cureus*, 14(10), e30816. <https://doi.org/10.7759/cureus.30816>.
 28. Bandara, R., Medagama, A., Munasinghe, R., Dinamithra, N., Subasinghe, A., Herath, J., Ratnayake, M., Imbulpitiya, B., & Sulaiman, A. (2015). Management and outcomes of acute ST-segment-elevation myocardial infarction at a tertiary-care hospital in Sri Lanka: an observational study. *BMC Cardiovascular Disorders*, 15, 1. <https://doi.org/10.1186/1471-2261-15-1>.
 29. Witassek, F., Rickli, H., Roffi, M., Pedrazzini, G., Eberli, F., Fassa, A., Jeger, R., Fournier, S., Erne, P., & Radovanović, D. (2020). Delay between symptom onset and hospital admission in patients with ST-elevation myocardial infarction: different trends in men and women. *European Heart Journal*, 41, ehaa946.1771. <https://doi.org/10.1093/ehjci/ehaa946.1771>.
 30. Rodrigues, J., Melleu, K., Schmidt, M., Gottschall, C., De Moraes, M., & De Quadros, A. (2018). Independent Predictors of Late Presentation in Patients with ST-Segment Elevation Myocardial Infarction. *Arquivos Brasileiros de Cardiologia*, 111, 587–593. <https://doi.org/10.5935/abc.20180178>.
 31. Ibáñez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Rev Esp Cardiol (Engl Ed)*. 2017;70(12):1082. doi:10.1016/j.rec.2017.11.010
 32. O'Gara PT, Kushner FG, Ascheim DD, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol*. 2013;61(4):e78–e140. doi:10.1016/j.jacc.2012.11.019
 33. Terkelsen CJ, Sørensen JT, Maeng M, et al. System delay and mortality among patients with STEMI treated with primary percutaneous coronary intervention. *JAMA*. 2010;304(7):763–771. doi:10.1001/jama.2010.1139
 34. Aldujeli A, Hamadeh A, Briedis K, et al. Delays in Presentation in Patients With Acute Myocardial Infarction During the COVID-19 Pandemic. *Cardiol Res*. 2020;11(6):386–391. doi:10.14740/cr1175

This work is licensed under a Creative Commons Attribution-NonCommercial 3.0 Unported License which allows users to read, copy, distribute and make derivative works for non-commercial purposes from the material, as long as the author of the original work is cited properly.