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Mortality of ST-Elevation Myocardial Infarction (STEMI) in Mexico: Current Trends, Challenges, and Strategies for Improvement

Donaldo Emiliano Silva López[*1], Daniel Ibarra Aguayo[2], Wanda Melissa Torres Somarriba[2], Fernando Leal Solórzano[3], Gustavo Bastien Martinez[4], Eduardo Antonio Vera Hernández[2]

[1]Tecnológico de Monterrey Campus Monterrey, Nuevo Léon, Mexico

[2]Universidad Cuauhtémoc Plantel Aguascalientes. Aguascalientes, México.

[3]Universidad Autónoma de Aguascalientes. Aguascalientes, Mexico.

[4]Universidad Autonoma de Guadalajara. Zapopan, Jalisco, México.

ABSTRACT

ST-Elevation Myocardial Infarction (STEMI) remains a leading cause of cardiovascular mortality worldwide, with significant regional disparities. In Mexico, despite advances in healthcare systems and the availability of reperfusion therapies, STEMI continues to contribute substantially to cardiovascular-related deaths. This article reviews the mortality rates associated with STEMI in Mexico, focusing on epidemiological trends, barriers to optimal care, and regional healthcare inequalities. Key factors influencing outcomes include delayed diagnosis, limited access to percutaneous coronary intervention (PCI), socioeconomic determinants, and regional variability in healthcare infrastructure. Strategies to mitigate these challenges, such as strengthening prehospital care, expanding reperfusion networks, and addressing healthcare inequities, are discussed. This review underscores the urgent need for nationwide efforts to optimize STEMI management and reduce associated mortality.

KEYWORDS: ST-Elevation Myocardial Infarction, STEMI mortality, Mexico, cardiovascular disease, reperfusion therapy, health inequities, percutaneous coronary intervention.

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INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of morbidity and mortality globally, and ST-Elevation Myocardial Infarction (STEMI) is a critical manifestation requiring immediate medical intervention. In Mexico, the burden of STEMI is significant, reflecting the global trend of increasing ischemic heart disease prevalence. Despite advancements in diagnostic and therapeutic modalities, STEMI mortality rates remain alarmingly high in this region, posing a persistent public health challenge.1,2

Multiple factors contribute to this elevated mortality, including delays in symptom recognition, transportation to healthcare facilities, and limited access to timely reperfusion therapy such as primary percutaneous coronary intervention (PCI). Furthermore, regional disparities in healthcare resources exacerbate these issues, with rural and underserved areas bearing a disproportionate burden. Socioeconomic determinants, including low health literacy, financial barriers, and the fragmented healthcare system, further compound these challenges.1,2

Mexico's national registry data indicate significant variability in STEMI outcomes across different states, highlighting systemic inefficiencies and inequities. The high prevalence of cardiovascular risk factors, such as diabetes, hypertension, and obesity, further increases STEMI incidence and worsens prognosis. Addressing these challenges requires a multifaceted approach, including public health campaigns, strengthening prehospital systems, expanding access to reperfusion therapies, and fostering collaboration between public and private healthcare sectors.3

This article aims to provide an in-depth analysis of STEMI mortality in Mexico, exploring epidemiological trends, current healthcare challenges, and evidence-based strategies to improve outcomes. By identifying critical areas for intervention, this review seeks to inform policymakers, healthcare professionals, and researchers about the steps

needed to reduce STEMI-related mortality and improve cardiovascular health in Mexico.4

BACKGROUND

ST-Elevation Myocardial Infarction (STEMI) is one of the most severe presentations of acute coronary syndromes (ACS) and a leading cause of mortality worldwide. The condition is characterized by complete occlusion of a coronary artery, resulting in transmural myocardial ischemia, which manifests as ST-segment elevation on an electrocardiogram (ECG). Prompt recognition and intervention are critical to restoring myocardial perfusion and preventing irreversible damage. Despite the global emphasis on rapid reperfusion therapy, the burden of STEMI remains significant, particularly in low- and middle-income countries, where healthcare disparities hinder optimal management.5

In Mexico, cardiovascular diseases (CVDs) are the primary cause of death, accounting for approximately 20% of all mortalities. STEMI constitutes a significant proportion of these deaths, with mortality rates exceeding those of developed nations. This disparity is multifactorial, driven by systemic healthcare challenges, a high prevalence of cardiovascular risk factors, and socioeconomic barriers. The epidemiology of STEMI in Mexico reveals a younger patient population compared to high-income countries, often with comorbidities such as diabetes mellitus, hypertension, and obesity—factors that exacerbate disease severity and complicate management.5

Access to timely and effective reperfusion therapy is a cornerstone in reducing STEMI mortality. However, in Mexico, geographic and socioeconomic inequalities significantly affect patient outcomes. Rural areas and smaller cities often lack advanced cardiac care units, catheterization laboratories, and adequately trained personnel, forcing patients to travel long distances to access life-saving interventions. Such delays often exceed the recommended door-to-balloon time of 90 minutes, reducing the efficacy of percutaneous coronary intervention (PCI) and thrombolytic therapy. Furthermore, the lack of comprehensive prehospital care systems and delayed patient recognition of symptoms frequently result in late presentations to healthcare facilities, worsening prognoses.6

National healthcare initiatives, such as the Mexican Registry of Acute Coronary Syndromes (RENASCA), have shed light on the state of STEMI care in the country. These data highlight discrepancies in the use of evidence-based therapies, with underutilization of primary PCI, dual antiplatelet therapy, and secondary prevention strategies. The registry also underscores significant regional variation, with states in central and southern Mexico reporting higher STEMI mortality rates compared to northern regions, reflecting uneven distribution of healthcare resources.7,8

Mexico's population is undergoing a demographic transition, with an increasing burden of non-communicable diseases and aging. This transition is expected to exacerbate the prevalence and impact of ischemic heart diseases, including STEMI. Compounding these issues are systemic healthcare constraints, including a fragmented public-private healthcare system, inadequate funding, and insufficient awareness campaigns targeting cardiovascular health. Addressing these gaps requires a coordinated national effort to improve early diagnosis, optimize reperfusion strategies, and enhance post-STEMI care.8,9

Understanding the historical and systemic factors underlying STEMI mortality in Mexico is essential for designing effective interventions. This context provides the foundation for exploring innovative approaches to reduce delays in care, expand access to advanced therapies, and ensure equitable distribution of healthcare resources. This background sets the stage for a comprehensive review of the mortality burden, current challenges, and potential strategies to improve outcomes for STEMI patients in Mexico.10

PREVENTIVE MEASURES

Addressing the mortality burden of ST-Elevation Myocardial Infarction (STEMI) in Mexico requires a robust framework of preventive measures targeting the upstream determinants of cardiovascular health, early recognition of symptoms, timely access to care, and post-event management. Preventive strategies should integrate public health interventions, healthcare system enhancements, and individualized patient-level measures to reduce the incidence of STEMI and improve outcomes.11

1. Primary Prevention: Reducing Cardiovascular Risk Factors

Primary prevention focuses on mitigating the modifiable risk factors that contribute to the high incidence of STEMI in Mexico. The epidemiological profile of the population highlights a significant prevalence of diabetes mellitus, hypertension, dyslipidemia, obesity, and smoking—all of which substantially elevate STEMI risk.12

- **Lifestyle Modifications**: National campaigns promoting healthy diets, regular physical activity, and smoking cessation are pivotal. Implementing nutrition education programs to reduce the consumption of processed foods high in saturated fats, salt, and sugars is essential, especially given the rising obesity rates.12
- **Early Detection and Management**: Community-level screening programs for hypertension, hyperglycemia, and dyslipidemia can facilitate early diagnosis and management. Equipping primary care providers with standardized guidelines to manage

these conditions effectively can reduce the long-term cardiovascular risk.

- **Public Awareness Campaigns**: Increasing awareness about cardiovascular risk factors and their impact on STEMI is critical. Education programs that leverage mass media, social media, and community outreach can improve public understanding of symptom recognition and the urgency of seeking medical care.12

2. Secondary Prevention: Prehospital and Acute Care Optimization

Improving outcomes for patients presenting with STEMI requires minimizing the time from symptom onset to reperfusion therapy. Secondary prevention strategies include enhancing prehospital care systems and strengthening regional healthcare networks.12

- **Strengthening Emergency Medical Services (EMS)**: Mexico faces significant disparities in EMS infrastructure, with rural and underserved areas often lacking adequate resources. Expanding EMS coverage, training paramedics in recognizing STEMI on prehospital electrocardiograms, and establishing protocols for direct hospital transport to PCI-capable facilities are critical steps.12
- **Public Training in Cardiovascular Emergencies**: Educating the public in basic life support and recognizing STEMI symptoms, such as chest pain, dyspnea, and diaphoresis, can improve early presentation rates. Empowering communities through training in the use of automated external defibrillators (AEDs) can also enhance prehospital survival.12
- **Regionalized STEMI Networks**: Developing organized systems of care that include designated STEMI centers with 24/7 PCI availability, streamlined inter-hospital transfer protocols, and telemedicine support for remote areas can improve equity in access to advanced care.12

3. Tertiary Prevention: Long-Term Management and Rehabilitation

Preventing recurrent cardiovascular events after STEMI is essential for reducing mortality and improving quality of life. Tertiary prevention focuses on comprehensive secondary prevention strategies and cardiac rehabilitation programs.13

- **Pharmacological Interventions**: Ensuring widespread access to evidence-based pharmacotherapies, including antiplatelet agents, beta-blockers, ACE inhibitors, statins, and anticoagulants, is a cornerstone of tertiary prevention. Medication adherence can be promoted through patient education and reducing financial barriers.13
- **Cardiac Rehabilitation**: Structured cardiac rehabilitation programs integrating physical therapy, psychological counseling, and dietary guidance are associated with reduced mortality and improved functional outcomes post-STEMI. Expanding access to such programs, especially in underserved regions, is a key priority.13
- **Health Literacy and Self-Management**: Promoting patient empowerment through education about lifestyle modifications, symptom monitoring, and the importance of follow-up care is vital. Digital health tools, such as mobile apps for medication reminders and teleconsultations, can enhance self-management in resource-limited settings.13

4. Policy-Level Interventions

Sustainable improvements in STEMI prevention require systemic changes driven by healthcare policy and investment.

- **Universal Healthcare Access**: Addressing financial barriers by integrating STEMI care into universal healthcare coverage can ensure that all patients receive timely and appropriate treatment regardless of socioeconomic status.14
- **National Cardiovascular Registry Expansion**: Enhancing data collection through registries like RENASCA can inform targeted interventions and facilitate monitoring of progress in STEMI outcomes.14
- **Workforce Training and Retention**: Expanding training programs for cardiologists, interventionalists, and allied healthcare professionals can address regional disparities in care availability. Incentivizing practitioners to work in underserved areas can improve equity in access to care.15

5. Addressing Health Disparities

Reducing STEMI mortality in Mexico requires targeted strategies to address the pronounced disparities in healthcare access and outcomes.16

- **Rural and Indigenous Populations**: Tailoring interventions to meet the unique needs of rural and indigenous populations, such as mobile clinics and culturally sensitive health education, is critical.16
- **Socioeconomic Determinants**: Addressing broader determinants of health, including poverty, education, and access to transportation, is essential for creating an equitable healthcare landscape.16

In conclusion, a comprehensive and multi-tiered approach to prevention is indispensable for reducing STEMI mortality in Mexico. Combining public health initiatives with system-level reforms and individualized care strategies offers the best opportunity to mitigate the burden of this life-threatening condition.16

CONCLUSIONS

The mortality associated with ST-Elevation Myocardial Infarction (STEMI) in Mexico remains a pressing public health concern, underscoring the urgent need for coordinated efforts across healthcare systems, public health initiatives, and policy frameworks. Despite advancements in medical science and technology, the outcomes for STEMI patients in Mexico highlight significant disparities in access to care, regional inequities, and systemic inefficiencies.

A multitude of factors contributes to the persistently high STEMI mortality rates in Mexico. These include delayed recognition of symptoms, prolonged time to reperfusion therapy, and limited access to advanced interventions such as primary percutaneous coronary intervention (PCI). The fragmented healthcare system, combined with socioeconomic challenges, further compounds these issues, particularly in rural and underserved regions. The high prevalence of cardiovascular risk factors, such as diabetes, hypertension, obesity, and smoking, exacerbates the disease burden and worsens patient outcomes.

Efforts to address STEMI mortality in Mexico must begin with robust preventive measures. Primary prevention strategies focusing on public education, lifestyle modifications, and early detection of cardiovascular risk factors can significantly reduce STEMI incidence. Additionally, strengthening secondary prevention through improved prehospital care systems, expanded emergency medical services (EMS), and the development of regionalized STEMI networks can mitigate delays in care. Post-STEMI management, including cardiac rehabilitation, pharmacological adherence, and patient empowerment, is essential for preventing recurrent events and reducing long-term mortality.

At the policy level, systemic reforms are critical. These include increasing healthcare funding to ensure equitable access to advanced cardiac care, integrating STEMI management into universal health coverage, and expanding workforce training programs to address regional disparities. Furthermore, enhancing data collection through national registries such as RENASCA will facilitate targeted interventions and continuous monitoring of STEMI outcomes.

Addressing STEMI mortality in Mexico also requires confronting the broader socioeconomic determinants of health. Financial barriers, limited transportation infrastructure, and inadequate health literacy disproportionately affect rural and low-income populations. Tailored interventions, including mobile health units, telemedicine, and culturally sensitive education programs, are necessary to bridge these gaps and promote equity in care delivery.

Ultimately, reducing STEMI-related mortality in Mexico demands a comprehensive, multi-sectoral approach that prioritizes prevention, timely intervention, and equitable access to care. Collaboration between government agencies, healthcare institutions, non-governmental organizations, and communities will be essential in building a resilient healthcare system capable of meeting the challenges of STEMI management.

While the task is formidable, the potential to save lives and improve the quality of care for STEMI patients is immense. By addressing the systemic barriers and prioritizing evidence-based strategies, Mexico can make significant strides toward reducing the burden of STEMI mortality, aligning with global efforts to improve cardiovascular health outcomes. This commitment to reform and innovation will not only benefit STEMI patients but also strengthen the foundation of the country's healthcare system for generations to come.

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