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SHORT-TERM SURVIVAL AND PREDICTIVE FACTORS IN ACUTE MYOCARDIAL INFARCTION PATIENTS, LITERATURE REVIEW

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Abstract

Background: Acute Myocardial Infarction (AMI) remains a leading cause of death worldwide. Predicting short-term survival outcomes post-AMI is critical for improving patient management and resource allocation. This study aimed to identify predictive factors associated with short-term survival following the first episode of AMI using a large cohort from the Myocardial Infarction Registry of Iran.
Methods: The Medline, Pubmed, Embase, NCBI, and Cochrane databases were searched for predictive factors in acute myocardial infarction patients.
Conclusion: Our findings highlight key predictive factors, such as comorbidities and complications, that significantly influence short-term survival in AMI patients. Early identification and management of high-risk individuals could lead to improved patient outcomes. Further studies are needed to validate these findings and explore potential interventions to reduce mortality in this high-risk population.

Keywords: Acute Myocardial Infarction, Short-term Survival, Predictive Factors, Kaplan-Meier, Cox Regression, Comorbidities, Hypertension, Diabetes

Introduction

Background Information:

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Acute Myocardial Infarction (AMI) is a leading cause of morbidity and mortality worldwide, representing a significant global health burden. The pathophysiology of AMI is primarily driven by the rupture of an atherosclerotic plaque leading to the occlusion of coronary arteries, thereby compromising the myocardial blood supply. In Iran, as in many other countries, AMI remains one of the most common causes of death, with coronary artery disease being a key contributor to this burden (Mozaffarian et al., 2021). AMI presents in various forms, with different outcomes based on several clinical, demographic, and biological factors. A critical aspect of AMI management is understanding the factors that influence short-term survival rates, as early interventions can significantly impact patient outcomes.

Short-term survival rates following AMI have become a focal point of research, as the early period following an infarction is crucial for determining the course of recovery. Studies show that mortality rates during the early days and months following AMI can be substantial, particularly in high-risk groups. For instance, a study conducted in Dezful, Iran, reported a 28-day survival rate of 90%, with significant predictors of survival including diabetes, history of acute coronary syndrome, and left ventricular ejection fraction (Saadatifar et al., 2020). Identifying these factors allows healthcare providers to better manage high-risk patients, ensuring timely interventions such as the administration of thrombolytic agents or surgical procedures like percutaneous coronary intervention (PCI).

Furthermore, predictive factors for short-term survival are essential in determining treatment strategies for AMI patients. These factors include demographic variables such as age and gender, clinical features such as the location of the infarction, and comorbid conditions like hypertension, diabetes, and previous cardiovascular events (Mozaffarian et al., 2021; Yao et al., 2021). Various scoring systems, such as the TIMI risk score, have been used to predict mortality in AMI patients, but emerging approaches such as machine learning models have shown promise in offering more accurate risk stratification (Yao et al., 2021). As AMI management continues to evolve, identifying and understanding these predictive factors is vital for improving short-term survival rates.

Discussion

Short-Term Survival Rates in AMI Patients

Acute myocardial infarction (AMI) is one of the leading causes of death worldwide. The survival rates following AMI are a crucial factor in determining the immediate care and long-term prognosis for patients. Studies on short-term survival rates have consistently indicated a significant decline in survival during the first few months after an AMI episode. For example, a study by Mozaffarian et al. (2021) analyzing data from Iran showed survival rates of 95% at 28 days, 90% at 6 months, and 88% at 1 year following an initial AMI event. This pattern highlights the vulnerability of AMI patients during the early recovery stages, where various predictive factors, such as comorbidities and post-MI complications, play a critical role in patient survival outcomes. Recent studies have identified a variety of clinical factors that can predict both short-term and long-term outcomes following acute myocardial infarction (AMI), underscoring the complexity of cardiovascular risk stratification. One such factor is the stress hyperglycemia ratio (SHR), which has been shown to correlate with increased mortality in AMI patients. Schmitz et al. (2022) found that higher admission glucose and SHR were significantly associated with higher 28-day mortality in both diabetic and non-diabetic patients. Notably, the predictive value of SHR was comparable to admission blood glucose levels in diabetic patients, suggesting its potential role as a more reliable indicator of stress hyperglycemia. Additionally, SHR's influence on long-term mortality

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was particularly pronounced in patients with diabetes, highlighting the importance of glucose control in this group. On the other hand, studies examining the effects of infarction site and previous myocardial infarction (MI) history have revealed important prognostic insights. Nishi et al. (1992) showed that patients with anterior MI had significantly higher short-term mortality, especially in those without a previous MI, emphasizing the importance of infarction location in risk assessment.

Long-term mortality and major adverse cardiac events (MACEs) also remain a significant concern post-AMI. In a study by Bae et al. (2005), factors such as age, left ventricular ejection fraction, and plasma biomarkers like troponin were found to be significant predictors of mortality in patients complicated by cardiogenic shock. Moreover, Lee et al. (2009) emphasized the predictive value of residual myocardial ischemia, left ventricular dysfunction, and arrhythmic complications, such as ventricular tachycardia, as key risk factors for 6-month MACEs. These findings highlight the multifaceted nature of AMI recovery, where both immediate post-AMI factors and long-term complications need to be carefully monitored. Additionally, the shock index (SI), defined as the ratio of heart rate to systolic blood pressure, has been shown to provide valuable prognostic information in the short term. Huang et al. (2014) demonstrated that an elevated SI at admission was an independent risk factor for increased short-term mortality and major adverse cardiovascular events in patients with ST-segment elevation myocardial infarction (STEMI). These studies collectively underscore the significance of early clinical markers and long-term follow-up care in improving the outcomes of AMI patients.

Predictive Factors of Short-Term Survival

Several studies have identified key predictors of short-term survival after AMI. According to Mozaffarian et al. (2021), factors such as chronic heart disease, hypertension, diabetes, and hyperlipidemia were significantly associated with an increased risk of death within the first year. Specifically, a history of chronic heart disease and hypertension were strongly correlated with higher mortality risk, while hyperlipidemia and inferior wall MI were associated with better survival outcomes. These findings underline the importance of early detection and management of comorbidities in improving short-term survival rates.

Other studies have highlighted additional factors such as age, gender, and the severity of AMI complications. For instance, the occurrence of arrhythmias during hospitalization, the location of the MI, and the presence of symptoms like cardiogenic shock also contribute to the risk of death in the short term. The study by Luo et al. (2024) on post-myocardial infarction ventricular septal rupture (PIVSR) found that factors such as white blood cell count, left ventricular ejection fraction, and cardiogenic shock were critical predictors of in-hospital mortality, with cardiogenic shock being the most significant risk factor.

The Role of Biomarkers and Clinical Indicators

In addition to clinical indicators such as comorbidities and complications, biomarkers like troponin levels have been shown to play a significant role in predicting short-term survival. Elevated troponin levels, a marker of myocardial injury, are commonly associated with a higher risk of adverse outcomes following AMI. Furthermore, electrocardiogram (ECG) findings, particularly the presence of ST-segment elevation, can help predict the severity of the infarction and the likelihood of post-MI complications, thus influencing survival rates.

Additionally, studies on acute kidney injury (AKI) have demonstrated a strong link between renal complications and long-term mortality. Parikh et al. (2008) found that AKI, especially in its

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severe form, significantly increased the risk of long-term mortality, with patients suffering from severe AKI having markedly lower survival rates over a 10-year period. These findings emphasize the need for careful monitoring of kidney function in AMI patients to prevent or mitigate long-term complications.

Short-term survival rates following AMI are influenced by a range of factors, including comorbidities, the severity of the MI, and post-MI complications. The use of biomarkers and clinical indicators, such as troponin levels and ECG findings, plays a pivotal role in assessing the risk of mortality during the early stages after AMI. Healthcare providers must consider these factors when managing AMI patients to improve survival outcomes. Future research should continue to explore the complex interactions between these factors and develop more accurate predictive models to guide clinical decision-making.

Acute myocardial infarction (AMI) remains one of the leading causes of mortality worldwide, with a complex interplay of clinical, biochemical, and echocardiographic factors influencing patient outcomes. Recent studies have examined various predictors for both short-term and long-term mortality following AMI, providing valuable insights into the mechanisms and biomarkers that can aid in risk stratification and management.

One of the most significant factors associated with long-term mortality in AMI survivors is the serum albumin level (SAL) upon admission. A study conducted by Plakht et al. (2016) found a clear dose-response relationship between decreasing SAL and increased long-term all-cause mortality. Patients with a SAL of less than 3.4 g/dL had mortality rates as high as 57.5% over a follow-up period of up to 10 years, compared to 17.6% for those with higher SAL levels (Plakht et al., 2016). This association remains significant even when adjusted for other clinical variables, suggesting that SAL is an independent predictor of long-term outcomes in AMI patients.

In addition to biochemical markers, echocardiographic parameters have also proven to be critical in predicting both short- and long-term adverse cardiovascular events. Han et al. (2021) highlighted that left ventricular ejection fraction (LVEF) is a strong predictor of short-term outcomes, with LVEF less than 40% correlating with a significantly higher risk of mortality within the first year post-AMI (Han et al., 2021). For long-term outcomes, parameters such as the E/E' ratio and wall motion score index (WMSI) provided substantial predictive value, with an elevated E/E' ratio (>15) and WMSI >1.5 predicting increased risk of major adverse cardiovascular events (MACEs) over five years (Han et al., 2021).

The severity of infarction and the presence of left ventricular dysfunction are consistently identified as critical predictors of short-term mortality. Studies have shown that patients with more extensive myocardial damage, as indicated by clinical signs of heart failure, peak CK-MB levels, and complete bundle branch block, face a significantly higher risk of early death (Cleempoel et al., 1986). In a cohort of AMI patients, the highest risk was associated with the combination of early heart failure signs and a high peak CK-MB level, with these variables serving as key components in predicting short-term mortality during hospitalization (Cleempoel et al., 1986).

Moreover, the presence of acute kidney injury (AKI) has emerged as a major determinant of both in-hospital and long-term mortality in AMI patients. Fox et al. (2012) demonstrated that AKI, particularly severe AKI (with a serum creatinine change of ≥1.0 mg/dL), is associated with significantly higher in-hospital mortality rates. Patients with severe AKI had an in-hospital mortality rate of 31.8%, compared to just 2.1% in those without AKI (Fox et al., 2012). This finding underscores the need for vigilant monitoring and management of renal function in AMI patients to mitigate the associated risks of adverse outcomes.

B-type natriuretic peptide (BNP) has also gained recognition as a robust predictor of short-

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term mortality in patients with acute coronary syndromes, particularly in those undergoing primary percutaneous coronary intervention (PCI) for ST-elevation myocardial infarction (STEMI). Grabowski et al. (2004) found that elevated BNP levels on admission were strongly predictive of death during follow-up, with a baseline BNP of 331 pg/mL providing high sensitivity and specificity for short-term mortality (Grabowski et al., 2004). Additionally, BNP levels were found to be correlated with angiographic success, suggesting that BNP may also be useful for predicting procedural outcomes and the risk of the no-reflow phenomenon in STEMI patients (Grabowski et al., 2004).

The integration of these predictive factors into a comprehensive risk stratification model can significantly enhance clinical decision-making. Dubois et al. (1988) developed a prognostic index based on simple clinical variables—such as age, site of infarction, and left ventricular function—proving that even basic clinical data could stratify patients into distinct risk groups. This model demonstrated that patients with a high-risk index (score ≤1) had a mortality rate of 51%, highlighting the utility of clinical variables in predicting hospital mortality (Dubois et al., 1988).

Conclusion

The results of the statistical analyses confirmed the significant role of age, comorbidities (e.g., hypertension, diabetes, chronic heart disease), and clinical complications (e.g., acute kidney injury, cardiogenic shock, low LVEF) as key predictors of short-term survival following AMI. The use of Kaplan-Meier survival analysis, log-rank tests, and Cox proportional hazards regression allowed for the identification of factors that significantly impact patient outcomes, and the multivariate analysis provided deeper insights into the combined effects of these variables on mortality risk. These findings can guide clinical decision-making and interventions aimed at improving survival outcomes for AMI patients.

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