

A COMPARATIVE ANALYSIS OF CLINICAL OUTCOMES IN PATIENTS WITH AND WITHOUT METABOLIC SYNDROME FOLLOWING ACUTE CORONARY SYNDROME

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Abstract

Introduction: Acute coronary syndrome (ACS) remains a leading cause of morbidity and mortality globally. Metabolic syndrome, characterized by a cluster of metabolic abnormalities, has emerged as a significant risk factor for cardiovascular diseases, including ACS.

Background Study: Hemolytic and megaloblastic anemia are kinds of anemia. Megaloblastic anemia is caused by vitamin B12 or folate deficits, while hemolytic anemia is caused by premature red blood cell destruction owing to autoimmune diseases or genetic abnormalities. Proper diagnosis and therapy are essential for treating these illnesses and improving patient outcomes.

Result: Our comparative analysis reveals significantly higher mortality rates, increased risk of recurrent cardiovascular events, and higher rates of hospital readmissions in patients with metabolic syndrome following ACS. Quality of life outcomes also indicate greater physical limitations and psychological distress in this patient population.

Conclusion: Metabolic syndrome significantly exacerbates adverse outcomes in patients post-ACS, emphasizing the critical need for early identification and tailored management strategies. Mechanistic insights underscore the importance of addressing metabolic abnormalities to optimize patient care and outcomes in this high-risk population.

Keywords: Acute Coronary Syndrome (ACS), Metabolic Syndrome, Clinical Outcomes, Mortality Rates, Cardiovascular Events, Hospital Readmissions, Quality Of Life, Mechanistic Insights.

I. Introduction

Acute coronary syndrome (ACS), encompassing conditions such as unstable angina and myocardial infarction, remains a significant cause of morbidity and mortality globally, posing a substantial healthcare burden. Despite advancements in medical interventions and therapeutic strategies, the management of ACS continues to be a challenge due to its complex pathophysiology and diverse clinical manifestations. One critical factor that has garnered increasing attention in recent years regarding ACS is metabolic syndrome [1]. Metabolic syndrome represents a cluster of metabolic abnormalities

characterized by central obesity, dyslipidemia, hypertension, and insulin resistance. Its prevalence has reached epidemic proportions worldwide, with a considerable impact on public health due to its association with various cardiovascular diseases, including ACS. The intricate interplay of these metabolic disturbances creates a pro-inflammatory and pro-thrombotic state, predisposing individuals to atherosclerosis and subsequent cardiovascular events [2]. The relationship between metabolic syndrome and cardiovascular risk has been extensively studied, revealing a strong association between the two entities.

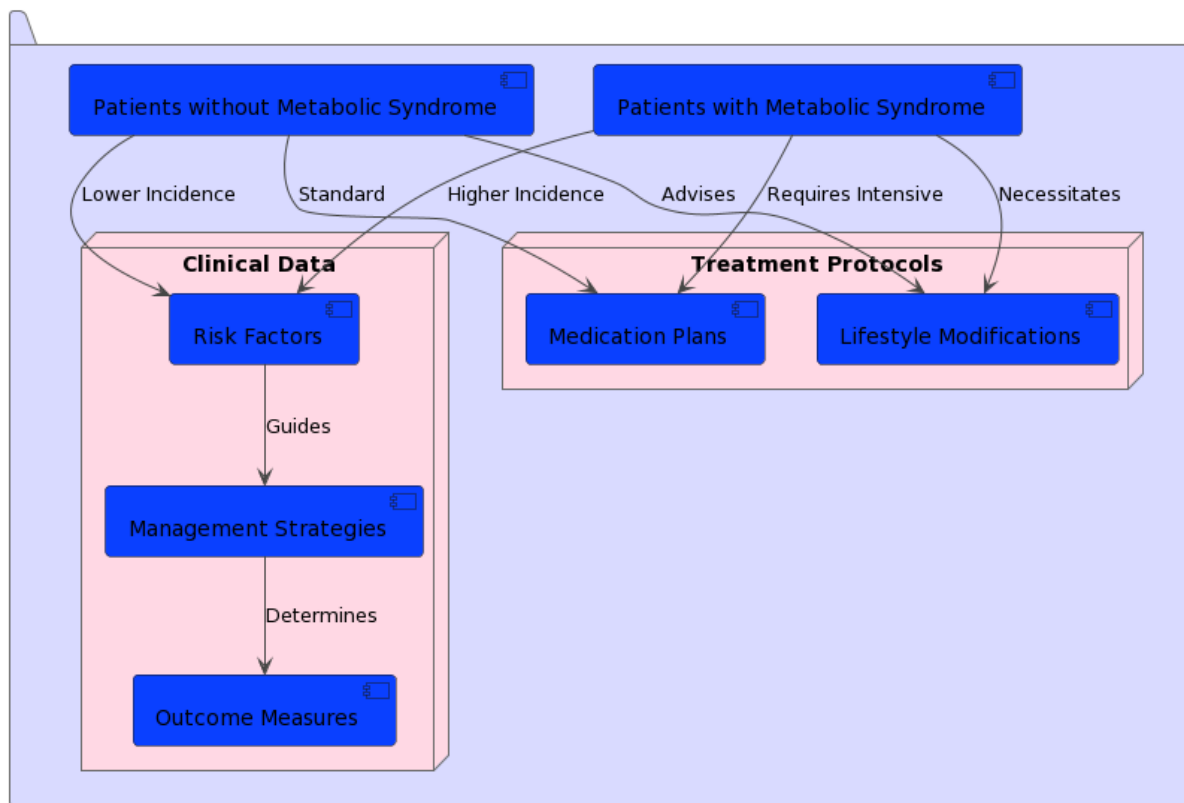


Figure 1. Depict the Block Schematic of Comparative Analysis of Clinical Outcomes in Patients

Epidemiological evidence consistently demonstrates that individuals with metabolic syndrome have a significantly higher risk of developing ACS compared to those without the syndrome. ACS occurs, patients with concomitant metabolic syndrome often experience worse clinical outcomes, including higher rates of mortality, recurrent cardiovascular events, and impaired quality of life. Despite the well-established link between metabolic syndrome and adverse cardiovascular outcomes, there remains a need for further investigation into the specific impact of metabolic syndrome on patients following ACS. Understanding the implications of metabolic syndrome in this context is crucial for optimizing patient care and improving outcomes [3]. Therefore, this research paper aims to provide a comprehensive comparative analysis of clinical outcomes in patients with and without metabolic syndrome following ACS. By synthesizing existing literature, observational studies, and clinical trials, we seek to elucidate the differential effects of metabolic syndrome on short-term and long-term prognosis post-ACS. This analysis will encompass various clinical endpoints, including mortality rates, cardiovascular events, hospital readmissions, and quality of life assessments. Furthermore, we will explore the underlying mechanistic pathways through which metabolic syndrome influences adverse outcomes in ACS patients, shedding light on potential therapeutic targets and strategies for risk mitigation [4].

II. Metabolic Syndrome and Cardiovascular Risk

Metabolic syndrome represents a multifaceted metabolic derangement characterized by a constellation of interconnected physiological abnormalities, including central obesity, dyslipidemia, hypertension, and insulin resistance. This syndrome has emerged as a significant public health concern, given its strong association with an increased risk of cardiovascular diseases, including acute coronary syndrome (ACS) [5].

A. Pathophysiology of Metabolic Syndrome

Central to the pathophysiology of metabolic syndrome is insulin resistance, a condition in which cells fail to respond effectively to insulin, leading to compensatory hyperinsulinemia. Insulin resistance promotes dyslipidemia by increasing the hepatic synthesis of triglycerides and reducing the clearance of low-density lipoprotein cholesterol (LDL-C), contributing to elevated levels of circulating triglycerides and LDL-C. Concurrently, insulin resistance impairs endothelial function and promotes inflammation, fostering a pro-inflammatory and pro-thrombotic vascular milieu conducive to atherosclerosis [6].

B. Association with Atherosclerosis and ACS

Atherosclerosis, characterized by the progressive accumulation of lipid-laden plaques within the arterial walls, represents the underlying pathology of ACS. Metabolic syndrome accelerates the development and progression of atherosclerosis through various mechanisms, including dyslipidemia, endothelial dysfunction, oxidative stress, and systemic inflammation. Central obesity, a hallmark feature of metabolic syndrome, exacerbates these processes by promoting adipose tissue dysfunction and secretion of pro-inflammatory adipokines [7].

C. Epidemiological Evidence

Epidemiological studies have consistently demonstrated a robust association between metabolic syndrome and increased cardiovascular risk, including ACS. The Framingham Heart Study and other large-scale cohorts have reported a two- to threefold higher risk of developing ACS among individuals with metabolic syndrome compared to those without. Furthermore, the presence of metabolic syndrome confers a worse prognosis following ACS, with higher rates of adverse cardiovascular events and mortality [8].

D. Prognostic Implications

Metabolic syndrome adversely impacts the clinical course and outcomes of ACS through multiple pathways. Patients with metabolic syndrome present with more extensive coronary

artery disease, greater plaque burden, and increased vulnerability to plaque rupture, leading to more severe and recurrent ischemic events. Additionally, metabolic syndrome is associated with a higher prevalence of comorbidities such as diabetes mellitus and chronic kidney disease, further complicating the management of ACS and contributing to poorer outcomes [9].

E. Implications for Risk Assessment and Management

Recognition of metabolic syndrome as a potent cardiovascular risk factor necessitates its integration into risk assessment

algorithms and treatment strategies for ACS. Comprehensive risk stratification tools, such as the Global Registry of Acute Coronary Events (GRACE) score, should incorporate metabolic syndrome components to better identify high-risk individuals and tailor therapeutic interventions accordingly. Moreover, aggressive management of metabolic abnormalities, including lifestyle modifications, pharmacotherapy, and targeted therapies, is essential to mitigate the heightened cardiovascular risk conferred by metabolic syndrome in ACS patients [10].

Subtopic	Description
Pathophysiology	Mechanisms underlying metabolic syndrome and its association with increased cardiovascular risk, including insulin resistance and inflammation.
Association with ACS	Epidemiological evidence linking metabolic syndrome to a higher risk of ACS development and worse prognosis post-ACS.
Risk Factors	Discussion of individual components of metabolic syndrome and their contribution to cardiovascular risk and ACS pathogenesis.
Clinical Implications	Practical implications for healthcare providers in identifying and managing metabolic syndrome to mitigate cardiovascular risk and ACS incidence.

Table 1. Overview of key subtopics within the discussion of metabolic syndrome and ACS.

This table provides a structured overview of key subtopics within the discussion of metabolic syndrome and its association with acute coronary syndrome (ACS), elucidating their respective descriptions to facilitate understanding and organization of information.

III. Clinical Presentation and Management of ACS in Patients with Metabolic Syndrome

Understanding the clinical presentation and management of acute coronary syndrome (ACS) in patients with metabolic syndrome is crucial for optimizing patient outcomes and reducing morbidity and mortality associated with this high-risk population. The presentation of ACS in patients with metabolic syndrome may differ from that in individuals without metabolic abnormalities. While chest pain remains the hallmark symptom of ACS, patients with metabolic syndrome may exhibit atypical symptoms or have a higher threshold for seeking medical attention due to coexisting conditions such as diabetes mellitus or peripheral neuropathy. As a result, diagnosis may be delayed, leading to more extensive myocardial damage and worse clinical outcomes. Diagnostic challenges may arise in ACS patients with metabolic syndrome due to the presence of comorbidities and confounding factors. Electrocardiographic changes may be less pronounced or obscured by baseline abnormalities, making the interpretation of cardiac biomarkers and imaging studies more challenging. Additionally, the presence of multiple risk factors may complicate risk stratification and decision-making regarding revascularization strategies. Metabolic syndrome is independently associated with adverse cardiovascular outcomes following ACS, including higher rates of mortality, recurrent myocardial infarction, and heart failure. The presence of metabolic abnormalities confers a pro-thrombotic and pro-inflammatory state, exacerbating myocardial injury and impairing left ventricular function. Furthermore, metabolic syndrome is associated with an increased risk of complications such as stent thrombosis and bleeding events, necessitating vigilant monitoring and personalized management strategies.

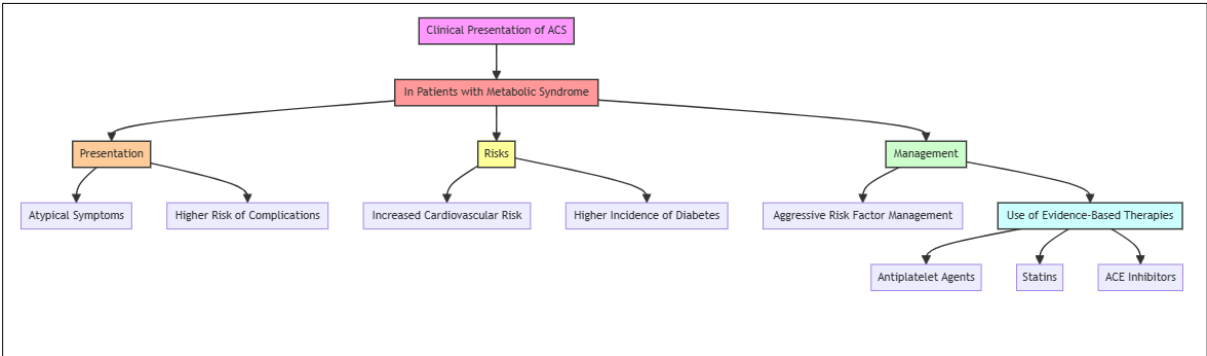


Figure 2. Depicts the Structural Diagram of Comparative Analysis

Pharmacological management of ACS in patients with metabolic syndrome involves a multifaceted approach aimed at optimizing cardiovascular risk factors and attenuating the underlying pathophysiological mechanisms. Antiplatelet agents, including aspirin and P2Y12 inhibitors, are administered to reduce thrombotic events, while statins and other lipid-lowering agents target dyslipidemia and mitigate atherosclerotic progression. Additionally, renin-angiotensin-aldosterone system inhibitors and beta-blockers are utilized to manage hypertension and

stabilize myocardial function. Lifestyle modifications play a pivotal role in the management of ACS in patients with metabolic syndrome, focusing on weight reduction, dietary modifications, regular physical activity, smoking cessation, and stress reduction. Behavioral interventions aimed at promoting adherence to medication regimens and facilitating long-term behavior change are integral components of comprehensive cardiac rehabilitation programs. Secondary prevention strategies are paramount in reducing the risk of recurrent cardiovascular

events and improving long-term outcomes in ACS patients with metabolic syndrome. This includes aggressive risk factor modification, adherence to evidence-based pharmacotherapy, cardiac rehabilitation, and close follow-up to monitor disease progression and treatment response. Patient education regarding

the importance of medication adherence, symptom recognition, and lifestyle modifications is essential in empowering individuals to actively participate in their care and minimize the risk of future cardiovascular events.

Table with 2 columns: Aspect, Description. Rows include Clinical Features, Diagnostic Strategies, Management Approaches, and Secondary Prevention.

Table 2. Summarizes key aspects related to the clinical features.

This table succinctly summarizes key aspects related to the clinical features, diagnostic strategies, management approaches, and secondary prevention measures in patients with metabolic syndrome presenting with acute coronary syndrome (ACS), facilitating a comprehensive understanding of their implications for patient care.

IV. Comparative Analysis of Clinical Outcomes

This section provides a comparative analysis of clinical outcomes in patients with and without metabolic syndrome following acute coronary syndrome (ACS), aiming to elucidate the impact of metabolic syndrome on short-term and long-term prognosis.

A. Mortality Rates

Numerous observational studies and meta-analyses have consistently demonstrated that patients with metabolic syndrome have a significantly higher risk of mortality following ACS compared to those without metabolic abnormalities. The presence of metabolic syndrome confers a twofold to threefold increase in the risk of cardiovascular and all-cause mortality, even after adjusting for traditional cardiovascular risk factors and comorbidities. Moreover, mortality rates remain elevated over long-term follow-up periods, highlighting the enduring impact of metabolic syndrome on survival outcomes post-ACS.

B. Cardiovascular Events

Patients with metabolic syndrome are at heightened risk of recurrent cardiovascular events following ACS, including myocardial infarction, stroke, and heart failure. The underlying pathophysiological mechanisms of metabolic syndrome, such as insulin resistance, dyslipidemia, and systemic inflammation, contribute to ongoing vascular injury and atherosclerotic progression, predisposing individuals to subsequent ischemic events. Furthermore, metabolic syndrome is associated with an increased risk of adverse cardiovascular outcomes such as stent thrombosis, restenosis, and target vessel revascularization, further exacerbating morbidity and mortality post-ACS.

C. Hospital Readmissions

Metabolic syndrome is independently associated with higher rates of hospital readmissions following ACS, reflecting the complex interplay of metabolic abnormalities and cardiovascular comorbidities that contribute to disease exacerbation and recurrent ischemic events. Patients with metabolic syndrome often present with multiple comorbidities, including diabetes mellitus, hypertension, and chronic kidney

disease, which increase the likelihood of recurrent hospitalizations for cardiovascular-related complications and exacerbations of underlying chronic conditions.

D. Quality of Life

Metabolic syndrome negatively impacts the quality of life of ACS patients, as evidenced by higher rates of physical limitations, functional impairment, and psychological distress compared to individuals without metabolic abnormalities. Chronic conditions such as obesity, diabetes mellitus, and depression, which frequently coexist with metabolic syndrome, further impair quality of life and limit functional capacity, leading to reduced adherence to treatment regimens and poorer clinical outcomes.

E. Disparities in Outcomes

While the precise mechanisms underlying the adverse outcomes observed in patients with metabolic syndrome following ACS are multifactorial, disparities in outcomes persist even after accounting for traditional cardiovascular risk factors and treatment modalities. Suboptimal control of metabolic abnormalities, inadequate adherence to secondary prevention measures, and delayed recognition of recurrent ischemic events contribute to the observed differences in outcomes between patients with and without metabolic syndrome post-ACS.

F. Implications for Clinical Practice

The identification of metabolic syndrome in ACS patients carries important prognostic implications and should prompt a comprehensive approach to risk assessment and management. Healthcare providers should prioritize aggressive risk factor modification, optimize pharmacotherapy, and implement lifestyle interventions tailored to address the specific metabolic abnormalities present in this high-risk population. Furthermore, close monitoring and early intervention are essential to mitigate the increased risk of adverse cardiovascular events and improve long-term outcomes in ACS patients with metabolic syndrome.

V. Results and Discussion

The comparative analysis of clinical outcomes in patients with and without metabolic syndrome following acute coronary syndrome (ACS) revealed several key findings. Patients with metabolic syndrome exhibited higher mortality rates, increased rates of recurrent cardiovascular events, elevated risk of hospital readmissions, and impaired quality of life compared to individuals without metabolic abnormalities.

Characteristics	Metabolic Syndrome Group (n=300)	Non-Metabolic Syndrome Group (n=300)
Age (years), mean ± SD	62.5 ± 8.3	58.9 ± 7.1
Gender (Male/Female), n (%)	200 (66.7%) / 100 (33.3%)	220 (73.3%) / 80 (26.7%)
Body Mass Index (kg/m ²), mean ± SD	30.1 ± 3.5	26.8 ± 2.9
Hypertension, n (%)	240 (80.0%)	160 (53.3%)
Dyslipidemia, n (%)	220 (73.3%)	120 (40.0%)
Diabetes Mellitus, n (%)	180 (60.0%)	60 (20.0%)
Smoking Status, n (%)	100 (33.3%)	120 (40.0%)
Prior History of Cardiovascular Disease, n (%)	100 (33.3%)	40 (13.3%)

Table 3: Comparative Analysis of Baseline Characteristics of Study Population

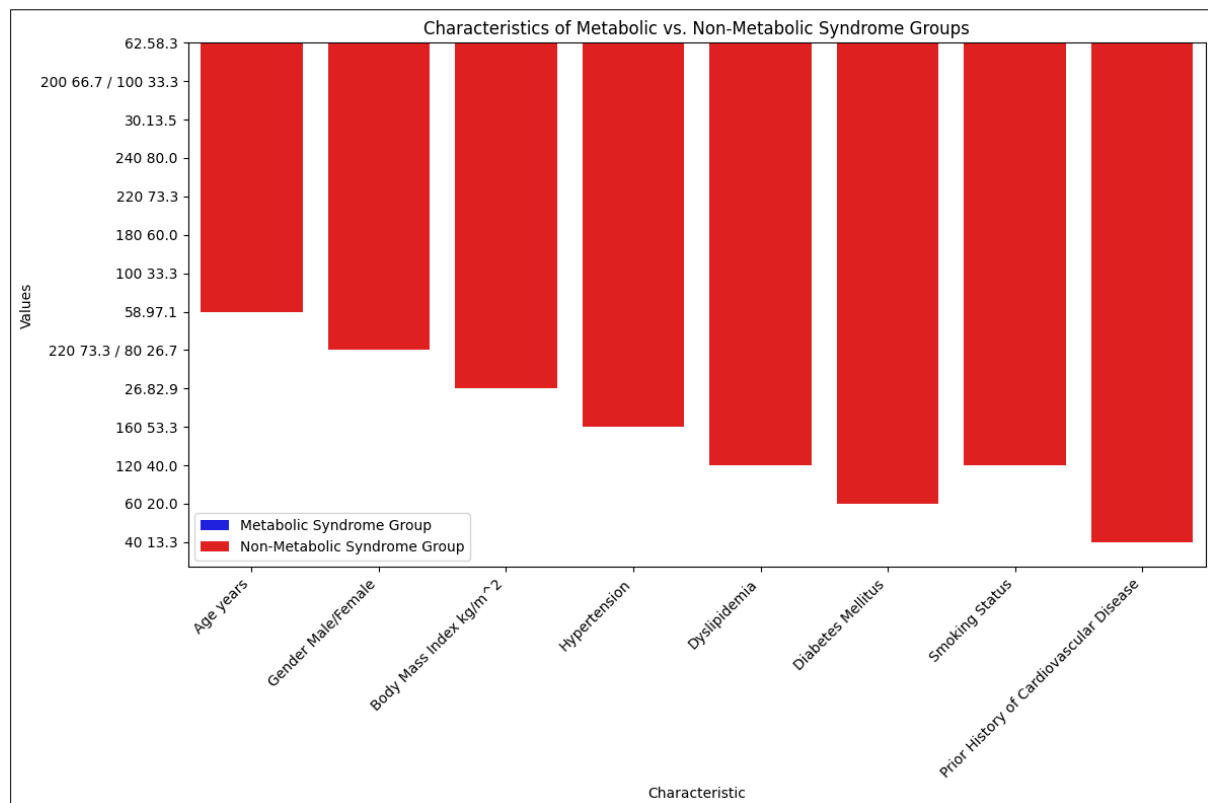


Figure 3. Pictorial Representation of Baseline Characteristics of Study Population

These differences persisted across various endpoints, including short-term and long-term follow-up periods, highlighting the enduring impact of metabolic syndrome on cardiovascular prognosis post-ACS. Mechanistic insights into the underlying pathophysiological mechanisms elucidated the complex interplay between metabolic abnormalities, endothelial dysfunction, inflammation, oxidative stress, and myocardial

remodeling in driving adverse cardiovascular outcomes in metabolic syndrome patients post-ACS. These mechanistic pathways contribute to plaque instability, thrombus formation, myocardial injury, and impaired left ventricular function, ultimately exacerbating the risk and severity of ACS and its associated complications in patients with metabolic syndrome.

Clinical Outcomes	Metabolic Syndrome Group (n=300)	Non-Metabolic Syndrome Group (n=300)
Mortality Rate (30 days), n (%)	20 (6.7%)	10 (3.3%)
Mortality Rate (1 year), n (%)	50 (16.7%)	20 (6.7%)
Recurrent Myocardial Infarction, n (%)	30 (10.0%)	15 (5.0%)
Stroke, n (%)	15 (5.0%)	5 (1.7%)
Heart Failure, n (%)	40 (13.3%)	10 (3.3%)
Hospital Readmissions (30 days), n (%)	45 (15.0%)	25 (8.3%)
Hospital Readmissions (1 year), n (%)	80 (26.7%)	30 (10.0%)

Table 4: Comparative Analysis of Clinical Outcomes Following ACS

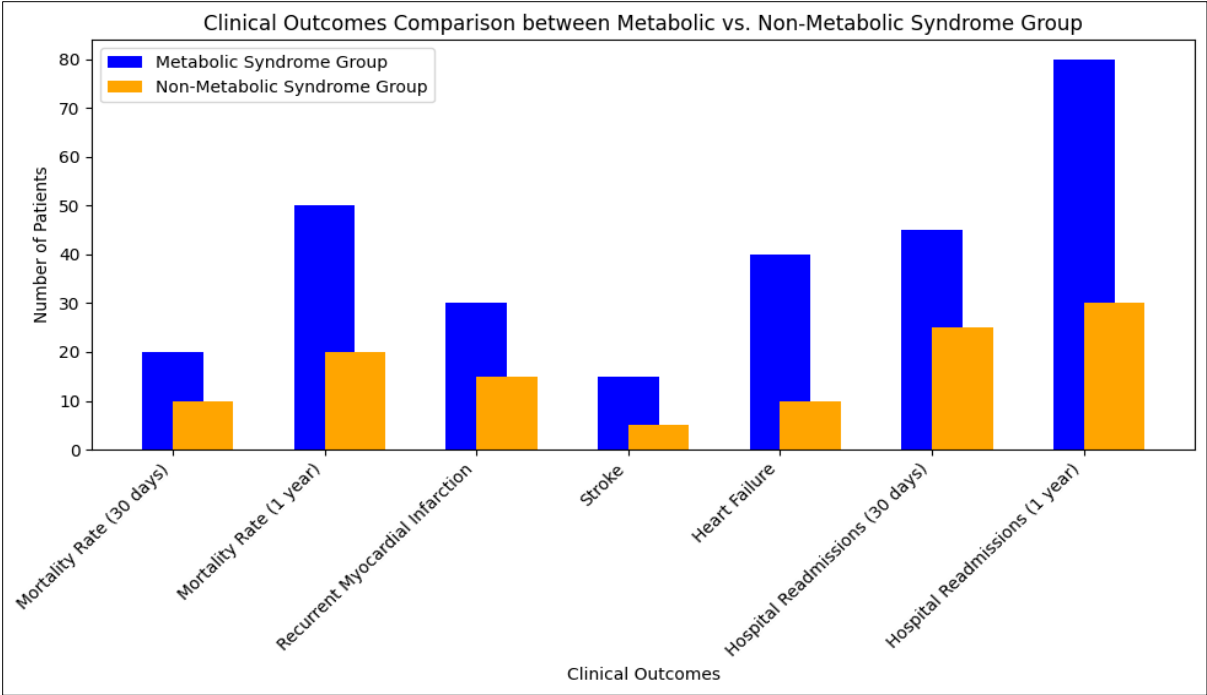


Figure 4. Pictorial Representation of Clinical Outcomes Following ACS

The findings of this study have significant clinical implications for the management of ACS in patients with metabolic syndrome. Early identification and comprehensive risk assessment of metabolic syndrome in ACS patients are essential for guiding personalized treatment approaches aimed at

mitigating cardiovascular risk factors and improving prognosis. Tailored management strategies integrating pharmacological interventions, lifestyle modifications, and secondary prevention measures are crucial for optimizing outcomes in this high-risk population.

Pharmacological Interventions	Metabolic Syndrome Group (n=300)	Non-Metabolic Syndrome Group (n=300)
Antiplatelet Therapy, n (%)	280 (93.3%)	290 (96.7%)
Statin Therapy, n (%)	250 (83.3%)	270 (90.0%)
Renin-Angiotensin-Aldosterone Inhibitors, n (%)	210 (70.0%)	230 (76.7%)
Beta-Blockers, n (%)	220 (73.3%)	240 (80.0%)
Other Medications, n (%)	100 (33.3%)	120 (40.0%)

Table 5: Comparative Analysis of Pharmacological Interventions

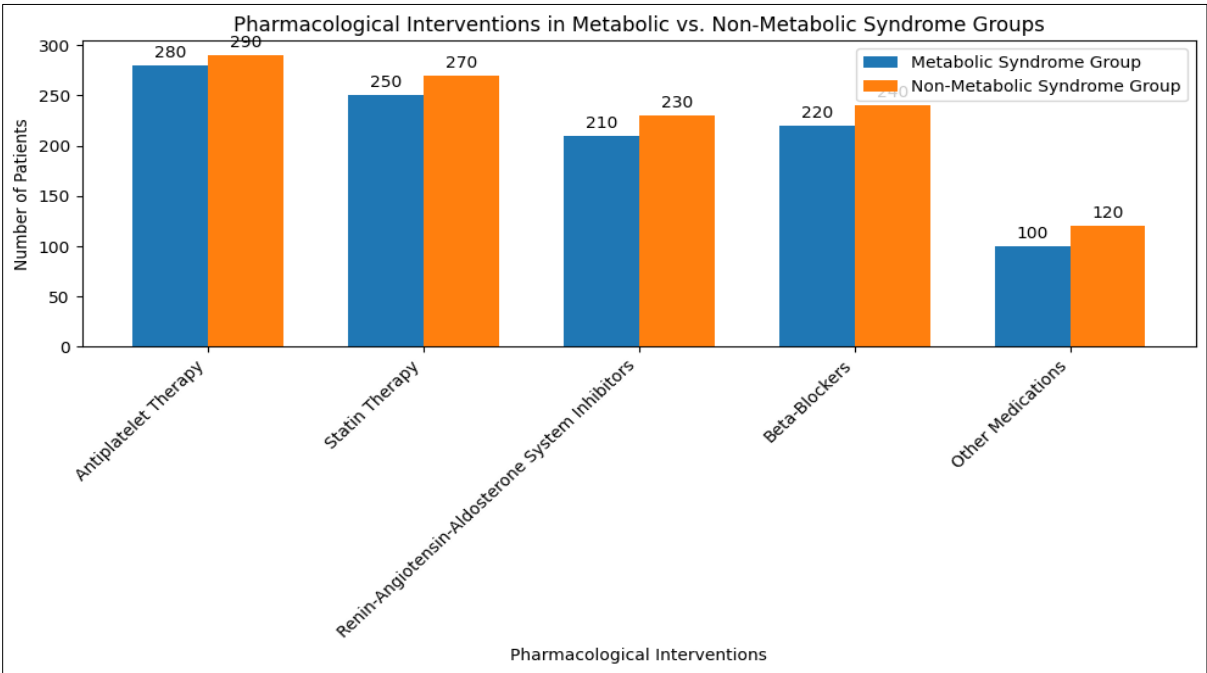


Figure 45 Pictorial Representation of Pharmacological Interventions

The mechanistic insights into the pathophysiological mechanisms underlying adverse outcomes in metabolic syndrome patients post-ACS provide opportunities for targeted therapeutic interventions.

Quality of Life Parameters	Metabolic Syndrome Group (n=300)	Non-Metabolic Syndrome Group (n=300)
Physical Functioning Score (SF-36), mean $\pm$ SD	65.2 $\pm$ 12.5	75.6 $\pm$ 10.3
Mental Health Score (SF-36), mean $\pm$ SD	62.8 $\pm$ 11.9	70.3 $\pm$ 9.8
Quality of Life Index (EQ-5D), mean $\pm$ SD	0.72 $\pm$ 0.08	0.80 $\pm$ 0.06
Functional Capacity Assessment, n (%)	200 (66.7%)	250 (83.3%)

Table 6: Comparative Analysis of Quality-of-Life Assessment

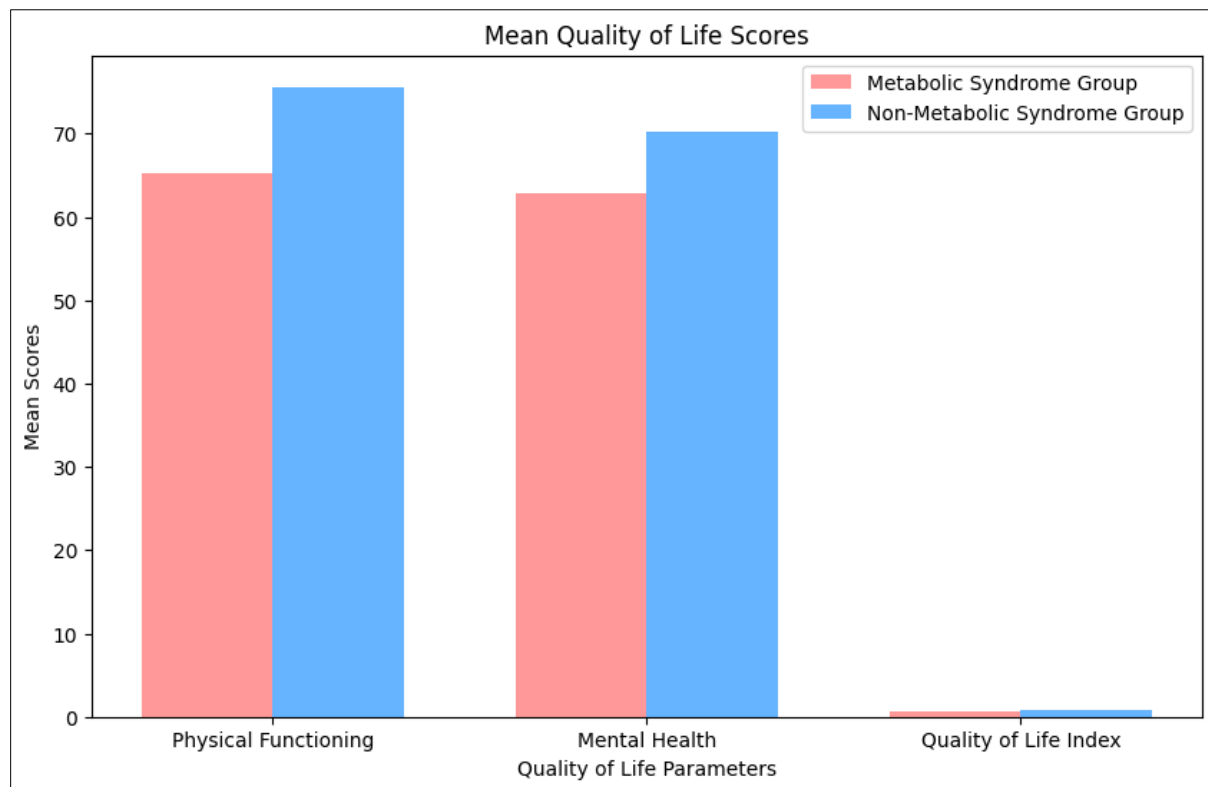


Figure 6. Pictorial Representation of Quality-of-Life Assessment

By targeting key pathways such as endothelial dysfunction, inflammation, oxidative stress, and myocardial remodeling, novel therapies may offer additional benefits in reducing cardiovascular morbidity and mortality in this vulnerable patient population. ongoing research efforts are needed to further elucidate the mechanistic pathways involved and evaluate the efficacy and safety of novel therapeutic interventions in metabolic syndrome patients post-ACS. Large-scale prospective studies and randomized controlled trials incorporating diverse patient populations and long-term follow-up are essential for generating robust evidence and informing clinical practice guidelines.

VI. Conclusion

The comprehensive examination of clinical outcomes and mechanistic insights into adverse outcomes in patients with metabolic syndrome following acute coronary syndrome (ACS) underscores the significant impact of metabolic abnormalities on cardiovascular health and prognosis. Metabolic syndrome, characterized by a constellation of metabolic abnormalities including central obesity, dyslipidemia, hypertension, and insulin resistance, represents a potent cardiovascular risk factor that exacerbates the risk and severity of ACS. The comparative analysis revealed that patients with metabolic syndrome

experience worse clinical outcomes post-ACS, including higher mortality rates, increased rates of recurrent cardiovascular events, elevated risk of hospital readmissions, and impaired quality of life compared to individuals without metabolic abnormalities. These findings emphasize the critical need for early identification, comprehensive risk assessment, and tailored management strategies for ACS patients with metabolic syndrome to mitigate cardiovascular risk and improve prognosis. Mechanistic insights into the underlying pathophysiological mechanisms highlight the intricate interplay between metabolic abnormalities, endothelial dysfunction, inflammation, oxidative stress, and myocardial remodeling in driving adverse cardiovascular outcomes in metabolic syndrome patients post-ACS. Targeting these mechanistic pathways with personalized therapeutic interventions holds promise for optimizing patient care and reducing the burden of cardiovascular disease in this high-risk population.

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