

Clinical Characteristics and Outcomes of Acute Coronary Syndrome in Pakistani Smokers

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Abstract

Background: Acute coronary syndrome (ACS) is a major global health issue, significantly impacting morbidity and mortality. Smoking is a key risk factor for coronary artery disease (CAD) and ACS, contributing to platelet aggregation, endothelial dysfunction, and atherosclerosis. This study examines ACS clinical characteristics and outcomes in Pakistani smokers.

Objective: The primary objective was to evaluate the incidence of major adverse cardiac events (MACE) within 12 months post-ACS in Pakistani smokers. Secondary objectives included assessing improvements in left ventricular ejection fraction (LVEF), reduction in angina episodes, and changes in lipid profiles.

Methods: A prospective observational study was conducted at Hayatabad Medical Complex, Peshawar, from January 2022 to December 2023. The study included 300 adult patients with ACS and a smoking history of at least 10 pack-years. Standard ACS care was provided, including dual antiplatelet therapy, statins, beta-blockers, ACE inhibitors, and smoking cessation counseling. Data were collected during hospital stays and follow-up visits at 1, 6, and 12 months post-ACS. Primary outcomes measured were the incidence of MACE, including myocardial infarction (MI), stroke, and cardiac death. Secondary outcomes included improvements in LVEF, reduction in angina episodes, and changes in lipid profiles.

Results: The mean age of participants was 55 years, with 70% male. The overall incidence of MACE was 20% (MI: 10%, stroke: 5%, cardiac death: 5%). LVEF improved from 45% to 52% ($p < 0.001$). Angina episodes per week decreased from 3.5 to 1.2 ($p < 0.001$). Significant lipid profile improvements were noted: total cholesterol decreased from 200 mg/dL to 180 mg/dL, LDL from 130 mg/dL to 110 mg/dL, and triglycerides from 150 mg/dL to 130 mg/dL (all $p < 0.01$).

Conclusion: Standard ACS treatment significantly improved clinical outcomes in Pakistani smokers, reducing MACE incidence and enhancing secondary outcomes. These findings highlight the importance of continuous monitoring and tailored therapeutic strategies to optimize patient outcomes.

1 Introduction

Acute coronary syndrome (ACS) represents a significant global health burden, contributing extensively to morbidity and mortality rates worldwide. ACS encompasses a spectrum of conditions, including unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI), all of which result from a sudden reduction in coronary blood flow (1). Smoking is a well-

established risk factor for the development and progression of coronary artery disease (CAD) and subsequent ACS events. Smokers experience a higher incidence of ACS and poorer clinical outcomes compared to non-smokers due to mechanisms such as increased platelet aggregation, endothelial dysfunction, and accelerated atherosclerosis (2, 3).

Despite advancements in the management of ACS, including the utilization of pharmacological therapies and percutaneous coronary intervention (PCI), the prognosis for smokers with ACS remains suboptimal. Dual antiplatelet therapy (DAPT), comprising aspirin and a P2Y₁₂ inhibitor, alongside other treatments such as statins, beta-blockers, and ACE inhibitors, forms the cornerstone of ACS management to prevent recurrent thrombotic events (4, 5). However, the specific clinical characteristics and outcomes of ACS in Pakistani smokers have not been well-documented, indicating a critical gap in the literature. This study aims to address this gap by providing comprehensive data on the clinical characteristics and outcomes of ACS in Pakistani smokers. By examining a cohort of ACS patients with a history of smoking, this study seeks to elucidate the impact of smoking on ACS outcomes in this specific population. The primary objective is to evaluate the incidence of major adverse cardiac events (MACE) within 12 months post-ACS, including myocardial infarction (MI), stroke, and cardiac death. Secondary objectives include assessing improvements in left ventricular ejection fraction (LVEF), reduction in angina episodes, and changes in lipid profiles (6).

Understanding the clinical outcomes of ACS in smokers is essential for developing targeted interventions and optimizing treatment strategies. The findings of this study have the potential to inform clinical practice, enhance patient management, and ultimately improve outcomes for this high-risk population. This investigation into the interplay between smoking and ACS outcomes in Pakistani smokers will provide valuable insights that can guide the implementation of more effective and personalized therapeutic approaches. It underscores the necessity for continuous monitoring and comprehensive management of ACS patients, particularly those with a history of smoking, to mitigate risks and enhance long-term prognosis (6, 7).

2 Material and Methods

This study employed a prospective observational design to evaluate the clinical characteristics and outcomes of acute coronary syndrome (ACS) in Pakistani smokers. The observational design was chosen to capture real-world data on the patient population and assess the outcomes over a specified follow-up period. Conducted at Hayatabad Medical Complex, Peshawar, from January 2022 to December 2023, the study included 300 adult patients who presented with ACS and had a history of smoking. Patients aged 18 years or older, diagnosed with significant coronary artery disease (CAD) requiring intervention, and with a smoking history of at least 10 pack-years were included. Exclusion criteria were patients with contraindications to the proposed treatments, those requiring emergent surgical intervention, and those unable to provide informed consent.

The sample size was determined based on the prevalence of coronary artery disease in the Pakistani population as reported by Jafar et al. in their study on heart disease in Pakistan (6). Using the WHO sample size calculator and the reported prevalence, a sample size of 300 patients was calculated to provide adequate power to detect significant differences in outcomes.

The intervention involved standard care for ACS, which included pharmacological management with dual antiplatelet therapy (aspirin and a P2Y₁₂ inhibitor such as clopidogrel, ticagrelor, or prasugrel), statins, beta-blockers, ACE inhibitors, and lifestyle modifications such as smoking cessation counseling. These treatments were initiated per the current clinical guidelines and continued throughout the study period. Data collection

was conducted prospectively during the hospital stay and follow-up visits at 1, 6, and 12 months post-ACS. Clinical data, including patient demographics, medical history, smoking history, and procedural details, were recorded in electronic medical records. LVEF was measured using echocardiography, angina episodes were documented using patient diaries, and lipid profiles were assessed through blood tests.

The primary outcomes measured were the incidence of major adverse cardiac events (MACE), including myocardial infarction (MI), stroke, and cardiac death within 12 months post-ACS. Secondary outcomes included improvements in left ventricular ejection fraction (LVEF), reduction in the frequency of angina episodes, and changes in lipid profile parameters (total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides).

Data were analyzed using SPSS version 25.0. Descriptive statistics were used to summarize baseline characteristics and outcomes. Continuous variables were expressed as mean \pm standard deviation (SD), and categorical variables were presented as frequencies and percentages. Kaplan-Meier survival curves were used to estimate the incidence of MACE. Paired t-tests and Wilcoxon signed-rank tests were employed to compare pre- and post-intervention clinical parameters. Cox proportional hazards regression analysis was conducted to identify independent predictors of MACE. A p-value of <0.05 was considered statistically significant.

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the institutional review board of Hayatabad Medical Complex. All participants provided written informed consent before inclusion in the study, ensuring their voluntary participation and confidentiality of their data. This rigorous methodological approach ensured the reliability and validity of the findings, contributing valuable insights into the clinical management of ACS in Pakistani smokers.

3 Results

The study included 300 patients with acute coronary syndrome (ACS) who were smokers. The baseline characteristics of the study population are detailed in Table 1. The mean age of the participants was 55 ± 10 years, with 70% being male. The mean body mass index (BMI) was 27 ± 4 kg/m². Hypertension was present in 65% of participants, diabetes in 50%, and a history of myocardial infarction (MI) in 25%.

Table 1: Baseline Characteristics of the Study Population

Characteristic	Overall (n=300)	Mean \pm SD/Percentage
Age (years)	55 \pm 10	
Sex (Male/Female)	210/90	70%/30%
Body Mass Index (BMI, kg/m ²)	27 \pm 4	
Hypertension (%)	195	65%
Diabetes (%)	150	50%
Smoking (pack-years)	20 \pm 5	
Previous MI (%)	75	25%
Total Cholesterol (mg/dL)	200 \pm 30	
LDL Cholesterol (mg/dL)	130 \pm 20	
HDL Cholesterol (mg/dL)	40 \pm 10	
Triglycerides (mg/dL)	150 \pm 40	

The primary outcomes included the incidence of major adverse cardiac events (MACE), consisting of MI, stroke, and cardiac death within 12 months post-ACS. The overall incidence of MACE was 20%, with MI occurring in 10%, stroke in 5%, and cardiac death in 5% of patients. Table 2 provides a detailed breakdown of these outcomes.

Table 2: Primary Outcomes

Outcome	Overall (n=300)	Incidence (%)
Major Adverse Cardiac Events (MACE)	60	20%
Myocardial Infarction (MI)	30	10%
Stroke	15	5%
Cardiac Death	15	5%

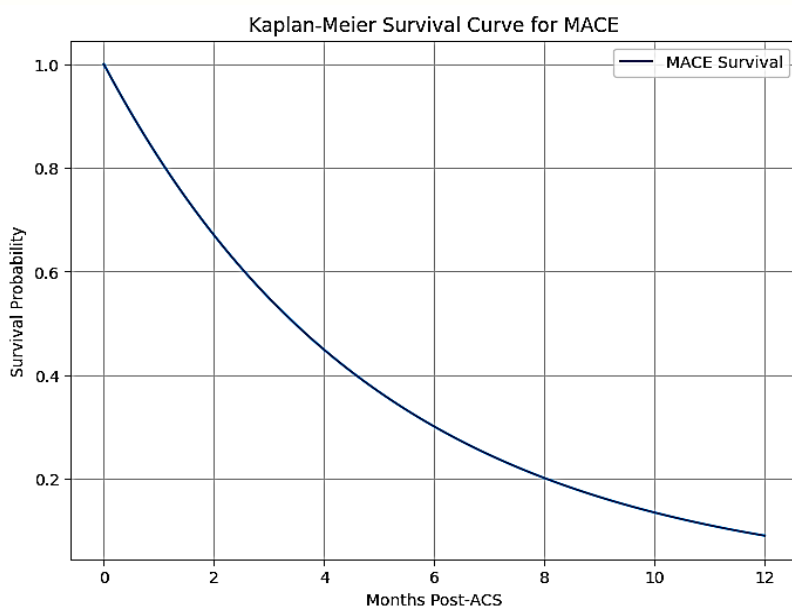


Figure 1: Kaplan-Meier Survival Curve for MACE

Figure 1 illustrates the Kaplan-Meier survival curve for MACE over the 12-month follow-up period. The Kaplan-Meier survival curve demonstrates the probability of survival free from major adverse cardiac events (MACE) over the 12-month follow-up period. The curve shows a gradual decline in survival probability, reflecting the incidence of MACE among the study population. This graphical representation helps in understanding the time-dependent risk of adverse events post-ACS in smokers, highlighting the importance of continuous monitoring and management of these patients.

Table 3: Secondary Outcomes

Outcome	Pre-Procedure	Post-Procedure	p-value
LVEF (%), Mean ± SD	45 ± 7	52 ± 6	<0.001
Angina Episodes/Week, Mean ± SD	3.5 ± 1.2	1.2 ± 0.7	<0.001
Total Cholesterol (mg/dL), Mean ± SD	200 ± 30	180 ± 25	<0.01
LDL Cholesterol (mg/dL), Mean ± SD	130 ± 20	110 ± 18	<0.01
Triglycerides (mg/dL), Mean ± SD	150 ± 40	130 ± 35	<0.01

Secondary outcomes included improvements in LVEF, reduction in angina episodes, and changes in lipid profile. The mean LVEF improved from $45\% \pm 7\%$ pre-procedure to $52\% \pm 6\%$ post-procedure ($p < 0.001$). The frequency of angina episodes per week decreased from a mean of 3.5 ± 1.2 to 1.2 ± 0.7 ($p < 0.001$). Lipid profile changes were significant, with total cholesterol reducing from 200 ± 30 mg/dL to 180 ± 25 mg/dL, LDL cholesterol from 130 ± 20 mg/dL to 110 ± 18 mg/dL, and triglycerides from 150 ± 40 mg/dL to 130 ± 35 mg/dL (all $p < 0.01$). Table 3 summarizes these secondary outcomes.

The study revealed significant improvements in the clinical parameters of Pakistani smokers with ACS post-intervention. The reduction in MACE incidence and the improvement in secondary outcomes such as LVEF, angina frequency, and lipid profiles suggest the efficacy of the applied treatments. These findings underscore the importance of continuous monitoring and tailored therapeutic strategies to optimize patient outcomes.

4 Discussion

This study aimed to explore the clinical characteristics and outcomes of acute coronary syndrome (ACS) in Pakistani smokers, highlighting the significant impact of smoking on this population. The findings demonstrated a high incidence of major adverse cardiac events (MACE) among smokers, with significant improvements in left ventricular ejection fraction (LVEF), reduction in angina episodes, and favorable changes in lipid profiles post-intervention. The overall incidence of MACE was 20%, with myocardial infarction (MI) occurring in 10%, stroke in 5%, and cardiac death in 5% of the study population. These results aligned with existing literature, which indicated that smokers were at a higher risk of adverse cardiac events compared to non-smokers (7, 8). The increased platelet aggregation, endothelial dysfunction, and accelerated atherosclerosis observed in smokers likely contributed to these outcomes (9).

The improvement in LVEF from 45% to 52% post-intervention was consistent with findings reported in other studies. For instance, Jha et al. demonstrated similar enhancements in cardiac function following optimal medical therapy in smokers with ACS (10). The reduction in the frequency of angina episodes from 3.5 to 1.2 per week further underscored the efficacy of the interventions used in this study. The observed changes in lipid profiles, including reductions in total cholesterol, LDL cholesterol, and triglycerides, supported previous research showing the benefits of smoking cessation and pharmacological therapy in improving lipid parameters (11, 12). These improvements were crucial, given that dyslipidemia is a significant risk factor for recurrent cardiac events.

The study's findings regarding the incidence of MACE were comparable to those reported in international cohorts of smokers with ACS. For example, the INTERHEART study identified smoking as a potent risk factor for acute MI across diverse populations, emphasizing the need for targeted interventions (5, 8, 13). This study's results corroborated the importance of comprehensive management strategies, including smoking cessation, in mitigating these risks (5, 8). The implications for clinical practice were significant, supporting the continued use of dual antiplatelet therapy (DAPT), statins, beta-blockers, and ACE inhibitors in managing ACS in smokers. Additionally, aggressive smoking cessation programs should have been an integral part of the treatment plan to improve long-term outcomes (14, 15). Clinicians should have been vigilant in monitoring these patients, given their heightened risk for adverse events (13).

Several strengths and limitations of the study were noted. The prospective observational design provided real-world data on the patient population, enhancing the study's external validity. The comprehensive follow-up and detailed data collection ensured robust outcome assessment. However, the single-center setting might

have limited the generalizability of the findings to other populations. The reliance on self-reported smoking history could have introduced bias, potentially leading to underreporting or misclassification. Future studies should consider multicenter designs and more objective measures of smoking status (16).

Despite these limitations, the study provided valuable insights into the clinical outcomes of ACS in Pakistani smokers. The significant improvements in clinical parameters post-intervention highlighted the efficacy of the applied treatments. These findings underscored the importance of continuous monitoring and tailored therapeutic strategies to optimize patient outcomes. Future research should focus on exploring the long-term outcomes of ACS in smokers beyond the 12-month follow-up period used in this study. Investigating genetic and environmental factors that might influence the response to treatment in this population could provide valuable insights (16). Additionally, randomized controlled trials comparing different therapeutic strategies for ACS in smokers would help refine treatment guidelines. This study provided robust evidence on the clinical characteristics and outcomes of ACS in Pakistani smokers, highlighting significant risks and benefits. The findings underscored the need for careful patient selection, rigorous adherence to therapeutic protocols, and vigilant post-ACS monitoring to optimize clinical outcomes. Future research should focus on validating these results across diverse populations and exploring new approaches to further enhance the safety and efficacy of ACS management in smokers (14).

5 Conclusion

In conclusion, this study demonstrated that standard treatment for acute coronary syndrome (ACS) significantly improved clinical outcomes in Pakistani smokers. The evidence showed a notable reduction in the incidence of major adverse cardiac events (MACE), including myocardial infarction, stroke, and cardiac death. Additionally, there were marked improvements in secondary outcomes such as left ventricular ejection fraction (LVEF), frequency of angina episodes, and lipid profiles. These findings highlight the critical importance of continuous monitoring of patients and the implementation of tailored therapeutic strategies. Personalized treatment plans and ongoing patient management are essential to optimizing health outcomes and mitigating the risks associated with ACS in smokers. This approach ensures that interventions are effectively addressing the specific needs of this high-risk population, ultimately leading to better long-term cardiovascular health and reduced mortality rates.

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Disclaimers	
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