

Research Article

Association of Hypertension, Diabetes Mellitus, Smoking, and Dyslipidemia with Severity of Acute Coronary Syndrome in Emergency Department Patients

Bushra Sahba¹, Muhammad Nouman Akram², Mubeen Azhar³, Dr Kainat Obaid^{4*}, Aqeela Manzoor⁵, Dr Sanjay Kumar⁶

¹Assistant Professor Cardiology, Isra University Hospital Hyderabad.

²Medical Officer General and Paeds Medicine Department, Social Security Hospital Sahiwal.

³SHO Internal Medicine, Naas General Hospital, Dublin.

^{4*}Consultant Family Medicine, General Practice, NHS, UK.

⁵Postgraduate Resident, Anesthesia, Children's Hospital and the Institute of Child Health Multan.

⁶Assistant Professor Cardiology Department, Suleman Roshan Medical College and Hospital, TandoAdam.

Email: ¹fantasyvirgoen@gmail.com, ²Nouman.akram129@gmail.com, ³mubeenazhar220@gmail.com, ^{4*}k.obaid92@gmail.com, ⁵aqeelamanzoor406@gmail.com, ⁶Sanjaykumar2551@gmail.com

Corresponding Author: Dr Kainat Obaid

Consultant Family Medicine, General Practice, NHS, UK.

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ABSTRACT

Objective: To determine the association between severity of acute coronary syndrome (ACS) and modifiable cardiovascular risk factors among patients who presented to the emergency department (ED).

Study Design: Analytical cross-sectional study.

Place and Duration of Study: This study was conducted in Cardiology and Emergency Department, Suleman Roshan Medical College and Hospital, TandoAdam from January 2025 to June 2025.

Methodology: This analytical cross-sectional study included 288 patients diagnosed with ACS, using the WHO formula. Patients were enrolled after meeting inclusion criteria; demographic data, clinical history and modifiable risk factors were obtained. Risk factors evaluated were hypertension, diabetes mellitus, smoking and dyslipidaemia. The severity of ACS was judged on conventional clinical criteria on presentation. The associations of these risk factors with disease severity were analysed statistically.

Results: This was done and the results showed that ACS patients were more likely to suffer from hypertension, diabetes mellitus, smoking and dyslipidaemia. Those who had multiple risk factors were more likely to have severe ACS. Hypertension, diabetes mellitus and smoking were significantly associated with increased disease severity, and dyslipidaemia was associated with poor clinical presentation.

Conclusion: Modifiable risk factors (hypertension, diabetes mellitus, smoking and dyslipidaemia) are highly correlated with the severity of ACS. Identifying and managing these factors early can minimize complications, enhance patient outcomes and facilitate effective emergency care.

Keywords: Acute Coronary Syndrome, Hypertension, Diabetes Mellitus, Smoking, Dyslipidemia, Emergency Department.

INTRODUCTION

Acute coronary syndrome (ACS) is a significant cause of morbidity and mortality in the world and is one of the most serious cardiac emergencies 1. It contains a collection of clinical conditions, which result from abrupt decrease in blood flow to the heart muscle. Unstable angina, non-ST elevation myocardial infarction and ST elevation myocardial infarction are common conditions 2. Patients

with ACS typically have chest pain, shortness of breath, sweating, nausea, palpitations or sudden weakness when they come to the ED 3. Early diagnosis and management in the ED are very important as ACS can quickly lead to life threatening complications.

Acute coronary syndrome is caused by several clinical and lifestyle-related risk factors that determine the severity of this condition. Of these, hypertension, diabetes mellitus, smoking

and dyslipidaemia are regarded as the major modifiable risk factors 4. High blood pressure leads to pressure on the walls of blood vessels, and aids the development of endothelial damage, arterial stiffness and atherosclerosis. Coronary arteries may become narrow and stiff following long-term high blood pressure, which can lead to serious heart-related issues. Those who have hypertension are more prone to complications like myocardial infarction, heart failure and arrhythmias.

Severe ACS is also related to another important risk factor, diabetes mellitus 5. Increased blood sugar levels cause blood vessels to become damaged, which leads to inflammation, oxidative stress and the build-up of plaques in coronary arteries 12. Patients may also present with non-specific symptoms, and this may contribute to delayed presentation and treatment in diabetic patients 6. This means that diabetes is commonly associated with greater coronary artery disease (CAD) severity, and poorer clinical outcomes in ACS patients.

Smoking is directly damaging to the cardiovascular system. It raises blood pressure, platelet aggregation, heart rate and blood CO levels 7. Smoking also affects the walls of the blood vessels and can hasten atherosclerosis. Smokers are thus at higher risk of rupture and clot formation of the plaques and thus have an increased risk of acute blockage of the coronary arteries. Smokers might be at increased risk for a more severe ACS, particularly with other risk factors.

Abnormal lipids (high LDL cholesterol, low HDL cholesterol) are major factors in the formation of atherosclerosis. Too many lipids build up and create plaques in the wall of the arteries 8. These plaques can often close coronary arteries and sometimes burst, leading to thrombosis and acute coronary syndrome 9. Patients with abnormal lipid profiles are at increased risk of having more severe coronary artery disease and more frequent cardiovascular events.

These are important risk factors to identify in patients in the emergency department, as they may provide a way to stratify and intervene early 10. Some patients with ACS have multiple risk factors, and it is possible for the combination of risk factors to make the disease worse. Knowing the severity of ACS, which is associated with hypertension, diabetes mellitus, smoking and dyslipidaemia, can assist health care practitioners in recognising high-risk individuals, initiate timely intervention, and direct prevention measures. Thus, the purpose of this study is to evaluate the relationship of

these significant cardiovascular risk factors with the severity of acute coronary syndrome in ED patients 11.

Objective

To assess the relationship between acute coronary syndrome severity in patients attending the ED and the association of modifiable cardiovascular risk factors (CVRFs) and hypertension, diabetes mellitus, smoking and dyslipidaemia, and to identify the most important modifiable cardiovascular risk factors that are associated with severe clinical presentation and adverse outcomes.

METHODOLOGY

This analytical cross-sectional study was conducted in Cardiology and Emergency Department, Suleman Roshan Medical College and Hospital, Tando Adam from January 2025 to June 2025. The total sample size of 288 patients was obtained using the formula for sample size designed by the WHO. Patients, who were selected using the criteria for the diagnosis of acute coronary syndrome, were included. Male and female patients that presented with a clinical picture of ACS (chest pain, dyspnea, perspiration, palpitation). Data was collected with a structured proforma after obtaining the informed consent. Data recorded were demographic data, clinical presentation, medical history and cardiovascular risk factors. Hypertension, diabetes mellitus, smoking and dyslipidemia were the primary risk factors evaluated. Severity of the acute coronary syndrome was determined according to clinical diagnosis, electrocardiographic characteristics, cardiac markers and hospital evaluation. Patients were excluded from the study when there were incomplete records, or they refused to participate. The data was taken in and analyzed by statistical software. Categorical data was summarized by frequencies and percentages, and numerical data was summarized by mean and SD. A correlation was made between the risk factors and the severity of ACS by applying appropriate statistical tests and a p value < 0.05 was considered significant.

Inclusion and Exclusion Criteria

Inclusion Criteria

All patients 18 years and older with a confirmed diagnosis of acute coronary syndrome (ACS) who attended the ED were included. Patients with clinical symptoms, electrocardiographic changes and/or elevated cardiac biomarkers were included in both sexes. Patients with a history of hypertension, diabetes mellitus, smoking and dyslipidaemia were also included.

Exclusion Criteria: Patients excluded included those who did not have complete medical records, non-cardiac chest pain, congenital heart disease, chronic kidney disease, severe liver disease, malignancy or previous coronary intervention. Those patients who did not want to take part or who were unable to give a consent were also excluded.

Data Collection

Two hundred eighty-eight patients were recruited from the Emergency Department who were diagnosed with an acute coronary syndrome (ACS). Informed consent was obtained from each patient, and a structured data collection proforma was used to assess each patient. Data on age, sex, complaints, duration of symptoms, past and family medical history and cardiovascular risk factors were collected. Hypertension, diabetes mellitus, smoking and dyslipidemia were confirmed by patient history, previous medical records, current medication and laboratory results, if available. The blood pressure level was measured to determine the hypertensive status. History of diabetes mellitus, use of antidiabetic drugs or increased blood glucose level was used to assess diabetes mellitus. Smoking status was described in terms of smokers and non-smokers. Previous history or lipid profile were used to assess dyslipidaemia. The

electrocardiographic findings, cardiac biomarkers and the physician's assessment were used to make clinical diagnosis and to determine the severity of acute coronary syndrome. On data collection, all the data were checked to see whether they are complete and accurate before entering the data in the analysis sheet. The confidentiality of the patients was preserved when it came to the study.

RESULTS

The total number of patients included in the study was 288 with acute coronary syndrome. Frequently observed among the patients were hypertension, diabetes mellitus, smoking and dyslipidemia. Patients with 1-2 cardiovascular risk factors were more likely to have severe acute coronary syndrome. Strong association between hypertension and diabetes mellitus and the severity of the ACS was observed. Other risk factors that were identified to be associated with severe clinical presentation were smoking and dyslipidemia. The rates of severe ACS were greater among patients with multiple risk factors than those with fewer or no risk factors. The results show that modifiable cardiovascular risk factors could be important to the severity of the disease.

Table 1: Distribution of Patients According To Age

Age Group	Frequency	Percentage
18–30 years	18	6.3%
31–45 years	54	18.8%
46–60 years	126	43.8%
Above 60 years	90	31.3%
Total	288	100%

Patients aged 46-60 years were most of the patients followed by patients above 60 years. This indicates that patients at middle age (40 to

59 years) and elderly (60 years and older) were more prone to acute coronary syndrome.

Table 2: Gender Distribution of Patients

Gender	Frequency	Percentage
Male	178	61.8%
Female	110	38.2%
Total	288	100%

This study showed that male patients were more likely to be affected than female patients. This can be attributed to increased exposure to

the risk factors as smoking, stress, hypertension and dyslipidaemia.

Table 3: Frequency of Cardiovascular Risk Factors

Risk Factor	Frequency	Percentage
Hypertension	174	60.4%
Diabetes Mellitus	132	45.8%

Smoking	118	41.0%
Dyslipidemia	146	50.7%

The most prevalent risk factors in patients with ACS were hypertension, followed by dyslipidemia, diabetes mellitus and smoking.

Results revealed that risk factors that could be modified were highly common among the study population.

Table 4: Severity of Acute Coronary Syndrome

ACS Severity	Frequency	Percentage
Mild	62	21.5%
Moderate	104	36.1%
Severe	122	42.4%
Total	288	100%

The highest number of patients was observed to have severe ACS. This means that multiple

patients come to the ED at a late stage and/or a very serious stage.

Table 5: Association of Risk Factors with Severe ACS

Risk Factor	Severe ACS Present	Severe ACS Absent	Total
Hypertension	86	88	174
Diabetes Mellitus	72	60	132
Smoking	58	60	118
Dyslipidemia	76	70	146

Hypertension, diabetes mellitus, smoking and dyslipidaemia were associated with a higher prevalence of severe ACS. There was a stronger relationship of severe disease with hypertension and diabetes. Severe acute coronary syndrome was more likely to happen in those patients who had more than one risk factor.

DISCUSSION

In the present study, the relationship between the severity of acute coronary syndrome and hypertension, diabetes mellitus, smoking and dyslipidaemia in the emergency department (ED) was evaluated 13. The data revealed that high prevalence of these cardiovascular risk factors were identified among patients with ACS and they were correlated with more severe clinical presentation. These are signs that modifiable risk factors are important not just for the development of ACS, but for the severity of the disease.

One of the most common risk factors among the study participants was found to be hypertension. Chronic hypertension results in sustained stress of the arterial walls which produces endothelial damage, arterial stiffness and atherosclerotic progression. These changes make a person more susceptible to narrowing of the coronary arteries and ruptures of the plaque 14. In this study, severe ACS occurrence was more common in the patients with hypertension. This discovery confirms the relationship between uncontrolled blood

pressure and serious cardiovascular events and adverse outcomes in the emergency department 15.

There was also a strong association between the severity of ACS and diabetes mellitus. Chronic hyperglycaemia, inflammation, oxidative stress and abnormal lipid metabolism are all mechanisms that lead to damage of blood vessels in diabetes. It can also cause diffuse coronary artery disease that can involve several vessels. Patients with diabetes may have vague symptoms and thus not get to the hospital until the disease has progressed and receive treatment late. This study revealed that diabetes is a significant risk factor for severe ACS as many of the patients had severe ACS 16. Another significant risk factor that was detected among ACS patients was smoking. Smoking promotes platelet aggregation, injures the vascular endothelium, and decreases oxygen supply and speeds atherosclerosis. It can also cause a sudden rupture in plaques and the formation of blood clots, causing acute coronary occlusion 17. The results of this study revealed that the smokers were more likely to be more severely affected with the ACS than the non-smokers 18. This underlines the importance of effective counselling and prevention programs for smoking.

The study population also had a high prevalence of dyslipidaemia 19. High LDL and low HDL levels lead to lipids depositing in coronary arteries and plaque building up.

Eventually these plaques can become unstable and break off to cause acute coronary syndrome 20. The present study showed that dyslipidaemia was a significant contributor to the burden of coronary artery disease, with an increase in severity of the ACS.

A significant finding in this study was that those who had more than one risk factor had increased risk for developing severe ACS 21. The synergistic effect of hypertension, diabetes mellitus, smoking and dyslipidaemia leads to greater vascular damage and promotes coronary atherosclerosis. Hence early detection and management of these risk factors is crucial 22. Aim not only of acute treatment but also risk assessment and patient education should be the priority of the emergency departments 23. Prevention measures like blood pressure control, diabetic management, lipid monitoring, lifestyle modification and smoking cessation can limit the severity of ACS and better the outcome of the patient.

CONCLUSION

The study found that hypertension, diabetes mellitus, smoking and dyslipidemia are significant risk factors which were associated with the severity of acute coronary syndrome in ED patients. Patients with these risk factors had significantly more risk of moderate to severe forms of ACS than did patients with fewer or no risk factors. Hypertension and diabetes mellitus were strongly associated with the severity of the disease and smoking, and dyslipidaemia were also important factors associated with poor clinical presentation. The results also indicated that those with more than one cardiovascular risk factor had a higher risk of having a severe acute coronary syndrome. This means that the effects of these risk factors can be modified and that the combined effect of these risk factors adds to the burden of coronary artery disease and affects the outcomes of the emergency. The early identification of high-risk patients is hence vital for the early diagnosis, treatment and prevention of complications. Severity of ACS can be reduced by control of blood pressure, proper treatment of diabetes, monitoring of lipids, smoking cessation, healthy diet and regular physical activity and education. Thus, the need for preventive measures should be increased at both hospital and community level to promote cardiovascular health and decrease the morbidity and mortality associated with ACS.

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