

Original Article

Pattern of Coronary Artery Disease in Young Patients with Acute Coronary Syndrome

Mujeeb ur Rehman^{1*}, Iftikhar Ahmed¹, Faiza Alam², Muhammad Wajid Sadiq¹, Attiya Mustafa², Zahid Hussain¹, Muhammad Saad Mukhtar¹, Muhammad Ali Jafar¹

¹Armed Forces Institute of Cardiology & National Institute of Heart Diseases (AFIC-NIHD) Rawalpindi.

²Bolan University of Medical and Health Sciences Quetta.

*Corresponding Author: Mujeeb ur Rehman; Resident Cardiology; Email: mujeebkhan3768@gmail.com

Conflict of Interest: None.

Rehman MU., et al. (2023). 3(2): DOI: <https://doi.org/10.61919/jhrr.v3i2.296>

ABSTRACT

Background: Coronary artery disease (CAD), historically considered a malady of the elderly, has increasingly emerged as a significant health concern among young adults, including individuals in their third or fourth decade of life.

Objective: The primary aim of the study is to identify the pattern of coronary artery disease in young patients with acute coronary syndrome (ACS).

Methods: This retrospective observational study was conducted at a tertiary cardiac care center in Rawalpindi from July 2023 to November 2023. The study included a cohort of 180 young patients aged less than 45 years who were diagnosed with ACS. These patients were identified from medical records and databases over a defined time period. Detailed demographic data, including age, gender, and pertinent medical history, were extracted from the medical records of each patient. This information facilitated a comprehensive understanding of the patient population under investigation.

Results: Data were collected from 180 patients. The analysis of clinical profiles and demographics revealed a diverse patient population. The study cohort comprised individuals with a mean age of 39 years. Male patients predominated, constituting approximately 65% of the cohort. Among the study participants, 40% had a documented history of smoking, while 20% reported a family history of CAD. Hypertension was the most prevalent risk factor, affecting nearly 50% of the patients, followed by hyperlipidemia (30%) and diabetes (20%).

Conclusion: It is concluded that coronary artery disease (CAD) is not confined to older age groups but can significantly impact young individuals aged less than 45 years presenting with acute coronary syndrome (ACS). The prevalence of traditional risk factors and genetic predisposition among these patients underscores the multifactorial nature of CAD in this demographic.

Keywords: Coronary Artery Disease, Patients, Young, Population, Acute Coronary Syndrome, Demographics

INTRODUCTION

Coronary artery disease (CAD), traditionally seen as an ailment of the elderly, has increasingly become a significant health concern among young adults, including those in their third or fourth decade of life. CAD, once primarily associated with older individuals with established risk factors, has seen a dramatic shift in its demographic profile (1). The emergence of CAD in younger patients, especially those with acute coronary syndrome (ACS), presents unique challenges and requires a thorough understanding of its patterns and underlying factors (2). Historically, CAD in the young was often linked to congenital anomalies or rare genetic disorders. Recent data, however, indicate a complex mix of genetic predisposition, lifestyle factors, and environmental influences, leading to a notable increase in CAD incidence in younger populations. The impact of CAD in the young is extensive, affecting not just individual health but also imposing societal and economic burdens (3).

In the past few decades, there has been a significant transformation in the profile of patients with ACS. ACS, once mostly found in the elderly due to long-term exposure to risk factors like hypertension, hyperlipidemia, and diabetes (4), is now increasingly seen in younger patients (5). This demographic shift prompts important questions about the distinct causes and characteristics of CAD in the young (6). The change in CAD's prevalence has been influenced by a variety of factors. Sedentary lifestyles, unhealthy dietary habits, and a global increase in obesity have altered the traditional pattern of CAD, now affecting people in their prime. Additionally,

substance abuse, particularly of tobacco and illicit drugs, has exacerbated the risk. Genetic factors, often overlooked in favor of more traditional risk factors, are gaining recognition for their significant role (7). Psychosocial stressors, such as job pressures and socioeconomic disparities, are also becoming prominent contributors to CAD in young people. Understanding the distinct characteristics of CAD in young ACS patients is vital. These patients may exhibit atypical symptoms, posing challenges in early diagnosis and treatment. Moreover, the coronary involvement pattern may differ from older adults, often showing more diffuse and distal lesions (8). Such variances call for customized approaches in diagnosis, management, and risk assessment. Beyond the health consequences for individuals, the rise of CAD in younger populations brings substantial societal and economic implications (9). The potential loss of young, productive lives and the increased burden on healthcare resources call for a reassessment of healthcare policies and preventive strategies (10).

This study aims to explore the complexities of CAD in young patients with ACS. By analyzing its patterns, identifying risk factors, and examining clinical and anatomical features, we seek to provide a thorough understanding of this evolving health challenge. Furthermore, this research could lay the groundwork for developing targeted preventive measures, early intervention strategies, and public health policies to counter the increasing prevalence of CAD in younger individuals. The primary goal of the study is to elucidate the pattern of coronary artery disease in young patients with acute coronary syndrome.

MATERIAL AND METHODS

This retrospective observational study was conducted at a tertiary cardiac care center in Rawalpindi from July 2023 to November 2023. It included a cohort of 180 young patients, aged less than 45 years, who were diagnosed with acute coronary syndrome (ACS). These patients were identified through a comprehensive review of medical records and databases over the specified time period.

Inclusion criteria for the study were specific. Patients had to be under 45 years of age and must have had a documented diagnosis of ACS. This diagnosis encompassed unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), or ST-segment elevation myocardial infarction (STEMI), based on clinical, electrocardiographic, and biochemical criteria.

Conversely, certain exclusion criteria were set. Patients with incomplete or insufficient medical records, angiographic data, or clinical information that precluded comprehensive analysis were excluded. Additionally, patients whose ACS was attributed to secondary causes, such as postoperative complications, trauma, or non-cardiac illnesses, were not included in the study. Those with a documented history of coronary artery disease (CAD) or previous revascularization procedures (coronary artery bypass grafting or percutaneous coronary intervention) were also excluded.

Data collection was thorough and meticulous. Detailed demographic data, including age, gender, and pertinent medical history, were extracted from each patient's medical records. This process provided a comprehensive understanding of the patient population under investigation. Key clinical characteristics, such as the presence of risk factors like hypertension, diabetes, hyperlipidemia, smoking history, and substance abuse, were documented. Any family history of CAD was also noted.

Coronary angiography reports were carefully reviewed to assess the anatomical characteristics of CAD in each patient. The focus was on identifying the location, extent, and severity of coronary artery lesions. Details regarding the number of vessels involved and the presence of complications, such as thrombosis, were systematically recorded. This angiographic data was crucial in characterizing the patterns of coronary artery disease within the study cohort.

Lifestyle-related risk factors, including smoking history and substance abuse, were thoroughly documented. Additionally, the study investigated the potential influence of genetic predisposition by assessing family histories of CAD among the study participants. This dual approach allowed for a comprehensive exploration of the various factors contributing to CAD in young ACS patients.

Statistical analysis was conducted using SPSS version 29.0. Descriptive statistics were employed to summarize patient demographics, clinical profiles, risk factors, angiographic findings, and clinical outcomes. This methodical approach ensured that the study was both comprehensive and robust in its analysis of CAD patterns in young patients with ACS.

RESULTS

Data was collected from 180 patients. The analysis of clinical profiles and demographics revealed a diverse patient population. The cohort had a mean age of 39 years. Male patients predominated, constituting approximately 65% of the cohort. Among the study participants, 40% had a documented history of smoking, and 20% reported a family history of CAD. Hypertension was the most prevalent risk factor, affecting nearly 50% of the patients, followed by hyperlipidemia at 30% and diabetes at 20%.

Table 01: Demographic data of patients

Variable	Mean (\pm SD) or Percentage
Age (years)	39.0 \pm 3.5
Gender (Male)	65%
Smoking History	40%
Family History of CAD	20%
Hypertension	50%
Hyperlipidemia	30%
Diabetes	20%
Substance Abuse	15%

Table 02: Clinical data of patients

Laboratory Parameter	Mean (\pm SD) or Percentage
Troponin Level (ng/mL)	4.2 \pm 1.1
Creatine Kinase (U/L)	215 \pm 30
Total Cholesterol (mg/dL)	175 \pm 20
LDL Cholesterol (mg/dL)	110 \pm 15
HDL Cholesterol (mg/dL)	45 \pm 5
Hemoglobin (g/dL)	14.2 \pm 1.0
White Blood Cell Count ($\times 10^3/\mu\text{L}$)	7.6 \pm 1.2
Platelet Count ($\times 10^3/\mu\text{L}$)	250 \pm 30
Glucose (mg/dL)	120 \pm 15

The angiographic data analysis offered crucial insights into the anatomical characteristics of coronary artery disease (CAD) in this young patient group. The left anterior descending artery (LAD) was the most commonly affected, observed in 60% of the patients. This was followed by the right coronary artery (RCA) in 35% of the cases and the left circumflex artery (LCx) in 25% of the cases. Furthermore, 20% of the patients had multi-vessel disease, indicating that CAD in young ACS patients often presents with complex lesions affecting multiple coronary arteries.

Table 03: Pattern of CAD

Coronary Artery	Percentage of Affected Patients
Left Anterior Descending (LAD)	60%
Right Coronary Artery (RCA)	35%
Left Circumflex (LCx)	25%
Multi-Vessel Disease	20%
Colitis	5%

The study confirmed a significant association between coronary artery disease (CAD) in young individuals aged less than 45 years and lifestyle-related risk factors. Smoking and substance abuse were notably prevalent among this population, with 40% reporting a history of smoking and 15% disclosing substance abuse. Additionally, family history emerged as a substantial contributor to CAD, with 20% of the patients reporting a positive family history of the disease.

Table 04: Risk factors for CAD

Risk Factor	Percentage of Affected Patients
Smoking	40%
Hypertension	50%
Hyperlipidemia	30%
Diabetes	20%
Family History of CAD	20%
Substance Abuse	15%

The analysis of clinical outcomes underscored the impact of coronary artery disease (CAD) in young patients with acute coronary syndrome (ACS). The in-hospital mortality rate stood at 4%, while 15% of the patients experienced major adverse cardiovascular events (MACE) during the study period. A significant proportion of the cohort, 25%, required revascularization procedures, highlighting the severity and complexity of CAD in this demographic.

Table 05: Clinical outcomes of patients

Clinical Outcome	Percentage of Patients
In-Hospital Mortality	4%
Major Adverse Cardiovascular Events (MACE)	15%
Revascularization Procedures	25%

DISCUSSION

The study established that coronary artery disease (CAD) is not confined to older individuals and can significantly affect young patients, underscoring the importance of early detection and intervention. The prevalence of CAD in this age group highlights the need for heightened awareness and preventive measures among younger individuals (11-13). The high incidence of traditional risk factors such as smoking, hypertension, hyperlipidemia, and diabetes in young ACS patients is alarming (14). These risk factors, in conjunction with a family history of CAD, underscore the multifaceted nature of CAD in this demographic. Although less prevalent, substance abuse remains a significant concern and requires diligent attention (15).

Angiographic data indicated that the left anterior descending artery (LAD) was the most commonly affected, followed by the right coronary artery (RCA) and the left circumflex artery (LCx) (16-18). The presence of multi-vessel disease in 20% of patients indicates that CAD in young ACS patients often presents as complex lesions affecting multiple coronary arteries, a factor that can guide treatment strategies (19). The in-hospital mortality rate of 4% and the occurrence of major adverse cardiovascular events (MACE) in 15% of patients highlight the severity and clinical significance of CAD in this population. The necessity for revascularization procedures in a considerable portion of the cohort further emphasizes the complexity of CAD in young ACS patients (20-22).

These findings carry crucial clinical implications. Early screening for CAD risk factors and genetic predisposition is essential in young patients, along with implementing targeted preventive measures. The patterns of CAD should prompt physicians to conduct comprehensive angiographic assessments and develop tailored treatment approaches. Furthermore, the study reinforces the need to address lifestyle-related risk factors and promote healthier behaviors in young individuals.

The limitations of this study, including its retrospective design and the potential for selection bias, must be acknowledged. Future research with larger, prospective cohorts is necessary to validate these findings. Despite these limitations, the study provides valuable insights into the patterns and impact of CAD in younger patients, a growing concern in contemporary cardiology.

CONCLUSION

It is concluded that coronary artery disease (CAD) is not confined to older age groups but can significantly impact young individuals under 45 years presenting with acute coronary syndrome (ACS). The prevalence of traditional risk factors and genetic predisposition among these patients underscores the multifactorial nature of CAD in this demographic. The predominant involvement of the left anterior descending artery (LAD) and the occurrence of multi-vessel disease emphasize the complex patterns of CAD. Clinical outcomes, including in-hospital mortality and major adverse cardiovascular events, highlight the severity of CAD in this population.

REFERENCES

1. Khan F, Abdul W, et al. Angiographic Patterns of Coronary Artery Disease in Young Patients Presenting at a Tertiary Cardiac Center. *Pakistan J Med Sci.* 2022;38(8):2107-11. Available from: <https://doi.org/10.12669/pjms.38.8.6162>.
2. Murugan J, et al. Characteristics and Treatment Analysis of Young Acute Coronary Syndrome Patients in a Tertiary Care Hospital: A Cross-Sectional Retrospective Study. *Health Sci Rep.* 2023;6(3). Available from: <https://doi.org/10.1002/hsr2.1141>.
3. Balouch IJ, Ahmed I, Farooq F, Raza SA, Soomro NA, Khan MN, Sial JA, Karim M. Pattern of Coronary Artery Diseases in Patients Under 40 Years of Age with Acute Coronary Syndrome. *Pak Heart J.* 2021 Jun 24;54(2):144-7. Available from: <https://pakheartjournal.com/index.php/pk/article/view/2089>
4. Faisal AWK, Habib G, Yasmin S, Latif W, Ahmed S. Angiographic patterns of coronary artery disease in young patients presenting at a tertiary cardiac center. *Pak J Med Sci.* 2022;38(8):2107-11. doi: <https://doi.org/10.12669/pjms.38.8.6162>.

5. Iragavarapu T, Radhakrishna T, Babu KJ, Sanghamitra R. Acute coronary syndrome in young-A tertiary care centre experience with reference to coronary angiogram. *J Pract Cardiovasc Sci.* 2019;5(1):18-25.
6. Sahi R, Shah R, Gajurel RM, Khanal RR, Poudel CM, Pathak S, Yadav V. Cardiovascular risk factors and clinical pattern in young Nepalese population with acute coronary syndrome presenting to a tertiary care center of Nepal. *J Cardiovasc Med Cardiol.* 2020;7(3):235-41.
7. Ralapanawa U, Sivakanesan R. Epidemiology and the magnitude of coronary artery disease and acute coronary syndrome: a narrative review. *J Epidemiol Glob Health.* 2021;11(2):169.
8. Wojtkowska A, Zapolski T, Wysokińska-Miszczuk J, Wysokiński AP. The inflammation link between periodontal disease and coronary atherosclerosis in patients with acute coronary syndromes: case-control study. *BMC Oral Health.* 2021;21(1):1-17.
9. Li L, Zhou X, Jin Z, Geru A, Sun P, Wang Z, et al. Clinical characteristics and in-hospital management strategies in patients with acute coronary syndrome: results from 2,096 accredited Chest Pain Centers in China from 2016 to 2021. *Cardiol Plus.* 2022;7(4):192-99.
10. Usova E, Malishevskii L, Alieva M, Yakovlev A, Alieva A, Konradi A. Phenotype of familial hypercholesterolemia patients with acute coronary syndrome-Data from the prospective observational registry study (PRIMA-ACS). *Atherosclerosis.* 2023;379:S111-2.
11. Waterbury TM, Tarantini G, Vogel B, Mehran R, Gersh BJ, Gulati R. Non-atherosclerotic causes of acute coronary syndromes. *Nat Rev Cardiol.* 2020;17(4):229-41.
12. Bergmark BA, Mathenge N, Merlini PA, Lawrence-Wright MB, Giugliano RP. Acute coronary syndromes. *Lancet.* 2022;399(10332):1347-58.
13. Haider A, Bengs S, Luu J, Osto E, Siller-Matula JM, Muka T, Gebhard C. Sex and gender in cardiovascular medicine: presentation and outcomes of acute coronary syndrome. *Eur Heart J.* 2020;41(13):1328-36.
14. Vidal-Perez R, Casas CAJ, Agra-Bermejo RM, Alvarez-Alvarez B, Grapsa J, Fontes-Carvalho R, et al. Myocardial infarction with non-obstructive coronary arteries: A comprehensive review and future research directions. *World J Cardiol.* 2019;11(12):305.
15. Shoji S, Kuno T, Fujisaki T, Takagi H, Briasoulis A, Deharo P, et al. De-escalation of dual antiplatelet therapy in patients with acute coronary syndromes. *J Am Coll Cardiol.* 2021;78(8):763-77.
16. Johnson TW, Räber L, Di Mario C, Bourantas C, Jia H, Mattesini A, et al. Clinical use of intracoronary imaging. Part 2: Acute coronary syndromes, ambiguous coronary angiography findings, and guiding interventional decision-making: An expert consensus document of the European Association of Percutaneous Cardiovascular Interventions. *Eur Heart J.* 2019;40(31):2566-84.
17. Bueno H, Rossello X, Pocock SJ, Van de Werf F, Chin CT, Danchin N, et al. In-hospital coronary revascularization rates and post-discharge mortality risk in non-ST-segment elevation acute coronary syndrome. *J Am Coll Cardiol.* 2019;74(11):1454-61.
18. Kimura K, Kimura T, Ishihara M, Nakagawa Y, Nakao K, Miyauchi K, et al. JCS 2018 guideline on diagnosis and treatment of acute coronary syndrome. *Circ J.* 2019;83(5):1085-1196.
19. Ralapanawa U, Kumarasiri PVR, Jayawickreme KP, Kumarihamy P, Wijeratne Y, Ekanayake M, Dissanayake C. Epidemiology and risk factors of patients with types of acute coronary syndrome presenting to a tertiary care hospital in Sri Lanka. *BMC Cardiovasc Disord.* 2019;19(1):1-9.
20. Hendren NS, Grodin JL, Drazner MH. Unique patterns of cardiovascular involvement in coronavirus disease-2019. *J Card Fail.* 2020;26(6):466-69.
21. Lv S, Liu W, Zhou Y, Liu Y, Shi D, Zhao Y, et al. Hyperuricemia and severity of coronary artery disease: An observational study in adults 35 years of age and younger with acute coronary syndrome. *Cardiol J.* 2019;26(3):275-82.
22. Meikle PJ, Formosa MF, Mellett NA, Jayawardana KS, Giles C, Bertovic DA, et al. HDL phospholipids, but not cholesterol distinguish acute coronary syndrome from stable coronary artery disease. *J Am Heart Assoc.* 2019;8(11):e011792.