Original Article

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Demographic, Clinical Characteristics, Gender Disparity and Angiographic Profiles of Patients with Acute Coronary Syndrome Undergoing Coronary Angiography in Sri Lanka

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Abstract

Regardless of recent advances, cardiovascular morbidity is still a challenge for healthcare systems in both developed and developing countries. This study aimed to identify demographic, clinical, and risk factors among patients undergoing coronary angiography (CAG) in Sri Lanka.

This retrospective study enrolled patients with acute coronary syndrome (ACS) who underwent CAG at the National Hospital of Sri Lanka between April/2020-March/2021. Medical records and data on demographic and clinical variables were collected and reviewed. Descriptive statistics, independent samples t-test, ANOVA, bivariate logistic regression, chi-square test and fisher's exact test were used in data analysis.

The final analysis included 1,062 patients, of which 75% were males, the mean age was 56, and the majority were males (75%). The most common CAG indication was ST-elevation myocardial infarction (STEMI) in 530 patients (50%), followed by non-ST elevation myocardial infarction (NSTEMI) in 304 patients (29%). Coronary artery disease (CAD) was found in 1,020 (96%) of patients, of which 27%, 29% and 44% had single, double, and triple vessel disease (TVD), respectively. Family history of CAD and males were independently associated with incidences of STEMI (odds ratio [OR]:3.4, 95% confidence interval [CI]: 1.3-7.4,$p<0.001$ and OR:3.7, 95%CI:2.8-5.3,$p<0.001$, respectively) and NSTEMI (OR:4.6, 95% CI: 1.4-10.1, $p<0.001$ and OR:2.8, 95%CI: 2.1-4.2,$p=0.03$, respectively). Dyslipidaemia was independently associated with STEMI incidence (OR:2.2, 95%CI: 1.9-3.3,$p=0.01$).

The study emphasizes the importance of controlling modifiable risk factors and aggressively pursuing prevention strategies to reduce cardiovascular morbidity

Keywords

Sri Lanka; Coronary Angiogram; Acute Coronary Syndrome; Percutaneous Coronary Intervention; Angina

Introduction

Cardiovascular disease remains a leading cause of morbidity and mortality globally, particularly in low- and middle-income countries (LMICs), where access to advanced healthcare facilities and preventive strategies may be limited (1). Acute coronary syndrome (ACS), a spectrum of conditions including ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina, represents a significant burden within CVDs and often leads to coronary angiography (CAG) as a diagnostic and therapeutic measure (2). Sri Lanka is advanced in its epidemiological transition. The proportion of total disability-adjusted life years attributable to maternal and child health conditions is one-third of the average in LMICs (3), whilst ischaemic heart disease (9%), stroke (6%) and diabetes (9%) account for relatively more total disability-adjusted life years. Sri Lankans can access cheap medicines and free universal healthcare

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(4). Like many LMICs, Sri Lanka lacks reliable estimates of ischemic heart disease prevalence. Despite advancements in treatment modalities, CAG outcomes in LMICs are still influenced by various demographic, clinical, and lifestyle factors (5). This underscores the need for further investigation to optimise care. Identifying these risk factors is crucial for improving intervention strategies, reducing the incidence of ACS and enhancing the quality of care for this cohort at risk. This study evaluates the demographic, clinical, and ACS risk factors associated with patients undergoing CAG at the National Hospital of Sri Lanka between 2020 and 2021.

Methods

This retrospective study was conducted at the Department of Cardiology, a tertiary referral centre at the National Hospital of Sri Lanka, from April 1, 2020, to March 31, 2021. Data on patients who underwent CAG were analyzed during the study period. The study included patients >18 years old who underwent CAG for ACS. Patients with congenital heart disease were excluded. After reviewing medical records, details on medical history, demographic factors such as age and gender, and cardiovascular risk factors, including diabetes mellitus, hypertension, dyslipidemia, and family history, were obtained. The study was conducted according to STROBE guidelines (6). The study protocol was reviewed and approved by the research ethical committee (REC) at the National Hospital in Sri Lanka (reference: AAJ/ETH/COM/2021). Data was collected retrospectively and anonymously. Therefore, REC waived the need for consent.

Study variables

The Joint Committee of the American College of Cardiology (ACC) guidelines diagnosed ACS based on the sequential rise in cardiac biomarkers, typical ECG changes, and characteristic symptoms. The presence of fasting blood glucose >126 mg/dl or HbA1C level >6.5% was defined as diabetes mellitus. The presence of systolic blood pressure >140 mmHg and diastolic blood pressure > 90 mmHg and on antihypertensive drugs was defined as hypertension.

The presence of low-density lipoproteins (LDL) >130 mg/dl and triglycerides > 150 mg/dl and total cholesterol >240 mg/dl and high-density lipoproteins <40 mg/dl and on lipid- lowering drugs were defined as dyslipidaemia.

If a first-degree relative has been affected by cardiovascular disease, it was considered a positive family history.

The absence of any disease in the left main coronary artery (LMCA), right coronary artery (RCA), left anterior descending (LAD) and left circumflex (LCX), including their branches, was considered normal coronary vessels. Single vessel disease (SVD), double vessel disease (DVD) and triple vessel disease (TVD) were classified according to the number of affected coronary vessels. The assessment is done angiographically by visual evaluations conducted by the cardiology consultant.

Study outcomes

Co-primary outcomes included the demographics and findings of the CAG. Secondary outcomes included predictors of the different types of ACS.

Statistical analysis

Mean ± standard deviation (SD) was used to present continuous measurements, while the frequency (percentage) was used to present categorical measurements. Independent samples t-tests assessed statistically significant differences between two or more groups. The chi-square or Fisher's exact test was used to determine statistically significant associations between categorical variables. I was using unstable angina as a reference category in the types of ACS, gender, diabetes mellitus, hypertension, dyslipidemia and family history were assessed for potential predictors for UA/NSTEMI and STEMI by the multinomial logistic regression model. Variables that are significant in univariable analysis are used in the multivariable analysis. A p-value< 0.05 was statistically significant for all analyses.

Results

Baseline characteristics and CAG details

Of 1,062 patients with ACS who underwent CAG, 530 (52%) patients with STEMI, 304 (30%) with NSTEMI, and 228 (22%) with UA. Demographics are demonstrated in Table 1. Three-quarters of the patients were males (n=799) (75%) were males, and the mean age was 56. Compared to NSTEMI, STEMI patients had more males (82% vs 68%, p<0.001) and more patients with percutaneous coronary intervention (PCI) (57% vs 35%, p<0.001). NSTEMI patients had more patients with medical management compared to STEMI patients (38% vs 23%, p = 0.02).

Table 1: Baseline demographic characteristics and coronary risk factors between different types of acute coronary syndromes

Variable	Total (n=1062)	NSTEMI/ UA (n=532)	STEMI (n=530)	p-value
Male	799 (75%)	362 (68%)	437 (82%)	<0.001
Age (years)	56 ± 4	57 ± 7	54 ± 10	0.77
Diabetes mellitus	130 (12%)	78 (15%)	52 (10%)	0.12
Hypertension	125 (12%)	44 (8%)	37 (7%)	0.88
Dyslipidemia	43 (4%)	33 (6%)	10 (2%)	0.65
Family history of CAD	87 (8%)	42 (8%)	45 (9%)	0.87
Left ventricular ejection fraction (%)	51 ± 7	54 ± 8	45 ± 9	0.03
Therapeutic recommendations, n (%)				
Medical management	342 (31%)	200 (38%)	124 (23%)	0.02
Percutaneous intervention	488 (46%)	185 (35%)	303 (57%)	<0.001

UA: unstable angina; NSTEMI: non-ST elevation myocardial infarction; STEMI: ST-elevation myocardial infarction; CAD: coronary artery disease; SD: standard deviation

Most patients undergoing CAG (n=1020, 96%) had CAD, of which 278 (26%) had single vessel disease (SVD), 293 (28%) had DVDs, and 449 (42%) participants had TVD. The left anterior descending artery was the most common coronary artery (86% of participants). The left circumflex and right coronary arteries were involved with similar frequencies (75.0% and 73%, respectively), while the left main stem was the least involved coronary artery (48%). Single vessel disease (SVD) was present in 278 (26%) of participants. 293 (28%) had DVDs, while 449 (42%) participants had TVD.

ACS Predictors

Logistic regression models and types of ACS predictors are demonstrated in Table 2. Univariable analysis showed that males (odds ratio [OR]: 3.9, 95% confidence interval [CI]: 2.6-8.8, p<0.001) and family history of CAD (OR: 2.4, 95% CI: 1.7-4.7, p=0.001).

Similarly, the multivariable analysis demonstrated that males (OR: 4.6, 95% CI: 1.4-10.1, p=0.001) and family history of CAD (OR: 2.8, 95% CI: 2.1-4.2, p=0.02) were independently associated with UA/NSTEMI incidence.

Regarding STEMI predictors, the univariable analysis demonstrated that males (OR: 3.1, 95% CI: 1.7-6.4, p<0.001), a family history of CAD (OR: 2.2, 95% CI: 1.3-4.7, p=0.02) and dyslipidaemia (OR: 1.9, 95% CI: 1.2-3.6, p=0.04). Similarly, the multivariable analysis demonstrated that males (OR: 3.7, 95% CI: 2.8-5.3, p<0.001) with a family history of CAD (OR: 3.4, 95% CI: 1.3-7.4, p<0.001) and dyslipidaemia (OR: 2.2, 95% CI: 1.9-3.3, p=0.001) were independently associated with STEMI incidence.

Table 2: Univariable and multivariable logistic regression of predictors of acute coronary syndromes

	Univariable	analysis	Multivariable-	adjusted	Univariable	analysis	Multivariable-adjusted	
Presenting characteristic	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Males vs females	3.9 (2.6-8.8)	<0.001	4.6 (1.4-10.1)	<0.001	3.1 (1.7-6.4)	<0.001	3.7 (2.8-5.3)	<0.001
Family history of CAD (yes vs no)	2.4 (1.7-4.7)	0.001	2.8 (2.1-4.2)	0.02	2.2 (1.3-4.7)	0.02	3.4 (1.3-7.4)	<0.001
Dyslipidaemia (yes vs no)	1.3 (0.2-3.5)	0.18			1.9 (1.2-3.6)	0.040	2.2 (1.9-3.3)	0.03
Age (for every year increase)	1.2 (0.4-3.1)	0.34			1.3 (0.7-1.9)	0.24		
Diabetes Mellitus (yes vs no)	1.3 (0.5-2.9)	0.24			1.4 (0.4-2.7)	0.08		
Hypertension (yes vs no)	1.1 (0.3-3.1)	0.88			1.2 (0.3-2.4)	0.1		

Discussion

This is the first study examining the findings and predictors of ACS patients undergoing CAG in Sri Lanka. The findings highlight several important factors influencing CAG outcomes in patients with ACS in Sri Lanka. A key observation was the predominance of male patients (75%), who composed most of the STEMI patients (82%). This is in keeping with a recent Sri Lankan study (7) and can be related to increased health-seeking behaviours and increased CAG frequency in these patients as opposed to females. However, a recent national survey in Sri Lanka suggested that ACS might be underdiagnosed in females (3).

The high incidence of STEMI (50%) underscores the substantial burden of severe coronary events in this patient population in Sri Lanka (7, 8). Furthermore, the prevalence of multi-vessel disease (MVD), with 44% of patients presenting with TVD, emphasizes the severity and complexity of coronary pathology encountered. This aligns with prior research indicating that MVD, particularly TVD, is associated with worse long-term outcomes and higher mortality rates in ACS patients (9). However, this can also reflect the disparity in health-seeking behaviours in different communities with the most symptomatic patients seeking medical help. Our cohort demonstrated a higher rate of ACS at a relatively younger age (56 years) than two previous Sri Lanka-based studies of 61 and 64 years. However, our cohort was relatively less comorbid (7, 8). South Asians have more significant cardiovascular risk factors at age <60 years when stratified by age, including a higher apolipoprotein B100 /apolipoprotein A-I ratio and a higher waist-to-hip ratio (10). A previous study demonstrated that ACS happened almost a decade earlier in South Asians than in Western countries (11).

The study's identification of positive family history as an independent predictor of STEMI and NSTEMI aligns with existing literature (7, 12). Similarly, family history is a well-established, non-modifiable risk factor contributing to early onset and progression of CAD. The connection between dyslipidaemia and STEMI underscores the crucial role of managing lipid levels in preventing adverse cardiovascular outcomes. Dyslipidaemia, especially high LDL levels, is a well-known contributor to atherosclerosis, leading to plaque rupture and ACS (13).

These findings have several implications for clinical practice, especially in Sri Lanka. The independent link between modifiable risk factors emphasises the necessity for more proactive preventive strategies, including early detection, lifestyle adjustments, and medication-based interventions to regulate lipid levels (14). Furthermore, public health strategies targeting smoking cessation, hypertension control, and diabetes management should be prioritized, given their known contributions to CAD progression in both men and women.

Conclusion

This Sri Lankan study demonstrated a high prevalence of STEMI, MVD, and male predominance. Modifiable risk factors, particularly dyslipidaemia, were strongly associated with severe coronary events. This emphasises the need for early intervention and aggressive management of risk factors, including lifestyle changes and lipid management, which are crucial for decreasing cardiovascular morbidity in this Sri Lankan population.

Declarations

Competing interests

None of the authors have any competing interest.

Ethical approval

The study protocol was reviewed and approved by the research ethical committee (REC) at the National Hospital in Sri Lanka (reference: AAJ/ETH/COM/2021).

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