Original Article

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Clinical Characteristics and Outcomes of Acute Coronary Syndrome in a Group of patients in Slemani Cardiac Hospital

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ABSTRACT

Background: Acute coronary syndrome (ACS) is a subcategory of coronary artery disease (CAD) that encompasses a range of thrombotic cardiovascular events and remains a significant cause of morbidity and mortality worldwide. The clinical characteristics and outcomes of ACS patients can vary significantly based on geographical location, healthcare facilities, and population demographics. These variations highlight the importance of region-specific studies to better understand the presentation, management, and outcomes of ACS in diverse populations. **Aim:** This study aimed to evaluate the demographic profile, cardiovascular risk factors, seasonal variations, clinical presentations, and in-hospital outcomes of ACS patients admitted to Slemani Cardiac Hospital. **Methods:** A retrospective cross-sectional study was conducted on 375 ACS patients admitted between June 2021 and January 2022. Data on demographics, comorbidities, lifestyle risk factors, past cardiovascular history, ACS subtype, seasonal variation, management, and complications were collected from medical records and analyzed using SPSS. **Results:** The mean age was 63.3 ± 6.7 years, with a 60% male predominance. Hypertension (57.3%) was the most common risk factor, followed by diabetes mellitus (43.2%), smoking (31.7%), and prior coronary artery disease (29.9%). Unstable angina was the most frequent presentation (51.2%), followed by STEMI (27.7%) and NSTEMI (21.1%). Younger patients (48–57 years) were more likely to present with STEMI, while NSTEMI predominated in older groups (70–78 years). ACS admissions were significantly higher in winter than in summer ($p = 0.030$), with notable seasonal differences in risk factor distribution. Coronary angiography was performed in 24.8% of cases, PCI in 16%, and CABG in 2.9%. The most common complication was heart failure (20%), with STEMI associated with higher rates of arrhythmia, cardiogenic shock, stroke, and in-hospital mortality (25% within the STEMI group). **Conclusions:** ACS in this region predominantly affects older males, with hypertension and diabetes as the leading modifiable risk factors. Seasonal variation influences ACS incidence, with higher rates in winter. Tailored prevention strategies—particularly targeting blood pressure control, diabetes management, and smoking cessation—are essential to reduce the ACS burden.

Keywords: Acute coronary syndrome, coronary artery disease, seasonal variation, Slemani Cardiac Hospital.

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INTRODUCTION

Acute coronary syndrome (ACS) describes a range of conditions related to sudden, reduced blood flow to the heart. These conditions include ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina (UA). ACS is one of the types of coronary heart disease (CHD), which accounts for approximately one-third of all fatalities in individuals aged 35 and above.[1] Coronary artery disease is caused by plaque buildup in the walls of the coronary arteries that supply blood to the heart. Plaque consists of deposits of cholesterol, fatty substances, cellular waste products, fibrin, and calcium. Over time, plaque buildup causes the inside of the arteries to narrow. CHD begins gradually as a fatty streak in the lining of the artery, which then narrows the coronary arteries and decreases myocardial perfusion. This narrowing can result in various clinical manifestations, including chronic stable angina or acute coronary syndromes (ACS).[2] When atherosclerotic plaque ruptures, it leads to thrombosis, causing occlusion of the arteries. In STEMI, there is complete blockage, myocardial necrosis, elevated cardiac biomarkers, and an elevated ST segment on surface electrocardiography (ECG). Transient or permanent ST depression and/or T inversion may occur in the other two syndromes when the blockage is partial or involves a small or minor vessel. Elevation of cardiac biomarkers in NSTEMI or UA may or may not accompany these events.[2] NSTEMI and UA are commonly referred to be NSTE-ACS since they are similar during the initial evaluation and the entity of UA is diminishing as the sensitivity of indicators of myocardial damage rises.[3] Currently, CHD stands as the most common condition impacting the heart. Given its severe clinical manifestations and acute complications, it is the leading cause of mortality worldwide.[4] Coronary artery disease 0.404No causes about 610,000 deaths every year (approximately 1 out of every 4 deaths) and is the primary reason for mortality in the United States. It is the third leading cause of mortality globally, associated with 17.8 million deaths annually.[5] CAD is the foremost single cause of mortality and loss of Disability Adjusted Life Years (DALYs) globally. A significant part of this issue occurs in countries where people don't earn much money, this accounts for nearly 7 million deaths and 129 million DALYs annually, representing a substantial global economic burden.[6] In 2020, the World Health Organization (WHO) reported that CHD resulted in 36,594 deaths in Iraq, constituting 24.98% of total mortality. The age-adjusted death rate is 227.26 per 100,000 population, placing Iraq 23rd globally in this regard.[7] While traditional risk factors such as age, hypertension, diabetes mellitus, dyslipidemia, and smoking have been well studied, growing evidence suggests that seasonal variation also plays a significant role in the incidence and outcomes of ACS. Several studies have found that the incidence of myocardial infarction and other ACS presentations tends to increase during winter months.[8-10] This may be attributed to multiple physiological and environmental factors, including cold-induced vasoconstriction, increased sympathetic activity, elevated blood pressure, changes in coagulation status, and a higher prevalence of respiratory infections during colder months.[9] Furthermore, lifestyle patterns such as reduced physical activity and dietary changes in winter may also contribute to the seasonal trend. A recent study conducted in Iran reported a statistically significant increase in ACS admissions during winter compared to summer, particularly among elderly and hypertensive patients.[10] Much of our current understanding of cardiovascular disease is derived from Western populations. However, increasing awareness of ethnic, geographic, socioeconomic, and cultural differences highlights the need for region-specific data.[2] In Iraq, the healthcare system remains largely reactive rather than preventive in addressing ACS. There is a pressing need for national data on ACS risk factors, incidence, seasonal trends, and outcomes to inform public health strategies, reduce disease burden, and improve patient care. This includes educating the population about modifiable risk factors. This study serves as a preliminary effort to collect local data on ACS patients, including their risk factors, seasonal distribution, complication rates, and clinical outcomes, with the long-term goal of contributing to a nationwide registry and improving cardiovascular healthcare planning in the Kurdistan region and Iraq more broadly.

Justification: The burden of acute coronary syndrome (ACS) continues to be a global health challenge, with outcomes significantly influenced by regional healthcare systems and population demographics. Slemani Cardiac Hospital (SCH) serves a unique population; however, there is limited data on the clinical characteristics and treatment outcomes of ACS in this setting. Understanding local patterns of ACS presentation and management is essential for developing tailored interventions. Insights from this study may fill important gaps in the literature and guide both clinical practice and regional public health policies. This research has potential implications for improving the quality of care for ACS patients across Iraq.

MATERIALS AND METHODS

Study Design

This is a retrospective cross-sectional study carried out at Slemani Cardiac Hospital. Between June 2021 and January 2022, a total of 375 patients were admitted to Slemani Cardiac Hospital with various clinical presentations. Among them, 225 were male and 150 were Female, aged between 48 and 78 years.

Study Setting and sample size

The study population consisted of 375 patients diagnosed with acute coronary syndrome (ACS) at Slemani Cardiac Hospital over a six-month period (June 2021 to January 2022). The patient population at this hospital primarily includes individuals with various cardiovascular conditions, such as coronary artery disease, myocardial infarction, heart failure, and arrhythmias. Slemani Cardiac Hospital serves both adult and pediatric patients, with a high prevalence of cardiovascular risk factors such as hypertension, diabetes mellitus, and smoking. The hospital staff includes a multidisciplinary team of experienced cardiologists, cardiac surgeons, nurses, and allied health professionals. Many of the cardiologists and cardiac surgeons have received specialized training in advanced cardiac interventions and surgical techniques, ensuring high-quality care for patients with complex cardiac conditions.

Inclusion Criteria and Exclusion Criteria

Patients were included if they had a confirmed diagnosis of acute coronary syndrome (ACS), including non-ST elevation myocardial infarction (NSTEMI), ST elevation myocardial infarction (STEMI), or unstable angina (UA). Only patients admitted to Slemani Cardiac Hospital between June 2021 and January 2022 were eligible for inclusion. Patients with incomplete or missing medical records were excluded to ensure data reliability. Additionally, patients who had been admitted to coronary care units (CCUs) in hospitals other than Slemani Cardiac Hospital were excluded to maintain consistency in data collection and management protocols. These criteria were applied to ensure a focused and standardized study population, allowing for a more precise evaluation of ACS characteristics, risk factors, and outcomes within a single healthcare setting.

Statistical Analysis

Data were analyzed using SPSS version 20. Quantitative variables were presented as mean ± standard deviation (SD), while qualitative variables were expressed as frequencies and percentages. The Chi-square test was used to assess the association between categorical variables and gender. A p-value of less than 0.05 was considered statistically significant, while a p-value of less than 0.001 was considered highly significant. A p-value greater than 0.05 was considered not significant.

Ethical Consideration

This study was conducted in accordance with ethical standards to protect patient rights and confidentiality. Ethical approval was obtained from the Ethical Committee of the College of Medicine at Sulaimani University in the Kurdistan Region of Iraq. Additionally, permission was granted by Slemani Cardiac Hospital to access patient records and conduct the study within the hospital premises. All patient data were handled with strict confidentiality, and no personal identifiers were included in the analysis. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring that all data collection and analysis procedures were carried out responsibly and transparently.

RESULTS

Table 1 presents the demographic and clinical characteristics of the study population. The majority of the patients (68%) fall within the age group of 58 to 69 years, while smaller proportions are aged 48 to 57 years (17.9%) and 70 to 78 years (14.1%). The mean age of patients was 63.32 ± 6.69 years. Regarding gender distribution, males represent a larger portion of the sample (60%) compared to females (40%). In terms of comorbidities, diabetes mellitus (DM) is present in 43.2% of the patients, whereas 56.8% do not have diabetes. Hypertension (HTN) is a more common condition in this population, affecting 57.3% of the patients, while 42.7% are free from HTN. Smoking status is another crucial risk factor examined in this study. Approximately 31.7% of the patients are smokers, while the majority (68.3%) are non-smokers. Coronary artery disease (CAD) is reported in 29.9% of the patients, with 70.1% having no history of CAD. Additionally, only 5.1% of the patients have undergone percutaneous coronary intervention No, while 94.9% have not. A family history of CAD is relatively uncommon in this cohort, with only 4.3% of patients reporting a familial predisposition. These findings highlight a predominantly older male population with a high prevalence of hypertension and diabetes, key risk factors for cardiovascular diseases. The relatively low history of PCI and family history of CAD suggest that lifestyle and other modifiable risk factors may play a significant role in disease development.

Table 2 presents the frequency and association of key risk factors according to gender among the study population. Diabetes mellitus (DM) is present in 43.1% of patients, with a higher prevalence in males (62.3%) compared to females (37.7%), though this difference is not statistically significant (p = 0.419). Similarly, hypertension (HTN) is more common in males (60.5%) than in females (39.5%), but the association with gender is not significant (p = 0.831). Smoking shows a strong gender disparity, with a significantly higher proportion of male smokers (71.4%) compared to females (28.6%). This difference is statistically significant (p = 0.002), highlighting smoking as a major gender-related risk factor in this cohort. The prevalence of coronary artery disease (CAD) is slightly higher in males (58.9%) compared to females (41.1%), but this difference is not statistically significant (p = 0.782). However, a significant gender difference is observed in the history of percutaneous coronary intervention (PCI), with females (73.7%) being more likely to have undergone PCI than males (26.3%) (p = 0.002). Regarding family history of CAD, both genders show equal prevalence (50% each), and no significant association with gender is found (p = 0.404). These findings suggest that while DM, HTN, and CAD affect both genders at comparable rates, smoking is a significantly higher risk factor among males. The higher proportion of females undergoing PCI may indicate differences in disease presentation or healthcare-seeking behavior. These insights are crucial for tailoring gender-specific prevention and treatment strategies for cardiovascular diseases.

Figure 1 illustrates the distribution of different types of acute coronary syndromes (ACS) among the study population. The three primary diagnoses assessed are Non-ST Elevation Myocardial Infarction (N-STEMI), ST Elevation Myocardial Infarction (STEMI), and Unstable Angina (UA). Among the 375 patients included in the study, the majority were diagnosed with UA (n = 192), accounting for the largest proportion of cases. STEMI was the second most common diagnosis, affecting 104 patients. N-STEMI had the lowest frequency, with 79 patients diagnosed. These findings suggest that among ACS presentations, UA is the predominant diagnosis in this study, followed by STEMI and N-STEMI. This distribution may have implications for treatment strategies and risk stratification in clinical practice, highlighting the need for targeted interventions for patients presenting with UA.

Figure 2 illustrates the frequency distribution of the three types of Acute Coronary Syndrome (ACS)—Unstable Angina (UA), Non-ST Elevation Myocardial Infarction (N-STEMI), and ST-Elevation Myocardial Infarction (STEMI)—across different age groups. The data is categorized into three age groups: 48–57 years (n=67), 58–69 years (n=255), and 70–78 years (n=53). A statistically significant difference was observed among the groups (P-value < 0.001). In the 48–57 age group, STEMI was the predominant presentation, accounting for 86.6% of cases, followed by UA at 13.4%, while N-STEMI was absent (0.0%). In the 58–69 age group, UA was the most frequent ACS type (64.3%), followed by N-STEMI (19.2%) and STEMI (16.5%). In the 70–78 age group, N-STEMI became the most common presentation (56.6%), followed by UA (35.8%) and STEMI (7.5%). This trend suggests a shift in ACS presentation with increasing age, where STEMI is more prevalent in younger patients, while N-STEMI becomes the dominant form in older individuals.

Table 3 presents the distribution of various risk factors among patients with Unstable Angina (UA), Non-ST Elevation Myocardial Infarction (N-STEMI), and ST-Elevation Myocardial Infarction (STEMI) in a cohort of 375 individuals. The statistical significance of each risk factor's association with ACS subtypes is indicated by the P-values.

Males constituted 60% of total ACS patients, while females made up 40%. The distribution of gender across ACS subtypes was not statistically significant (p=0.348). Diabetes Mellitus (DM) present in 43.2% of cases overall. DM was significantly associated with ACS subtypes (p=0.035), with higher prevalence in UA patients (49.5%). Hypertension (HTN) present in 57.3% of patients, showing a highly significant association with ACS subtypes (p<0.001). HTN was most frequent among UA patients (66.7%). Smoking found in 31.7% of patients, significantly associated with ACS subtypes (p=0.013). Smoking was more common among NSTEMI patients (44.3%). History of CAD present in 29.9% of cases, with a highly significant association (p<0.001). It was most common among UA patients (44.3%). Family history of CAD present in only 4.3% of patients, with no significant association (p=0.918). History of PCI present in 5.1% of patients, significantly associated with ACS subtypes (p=0.045). N-STEMI patients had the highest proportion (8.9%).

Significant associations were observed for DM, HTN, smoking, history of CAD, and history of PCI with different ACS types. HTN and history of CAD showed highly significant associations (p<0.001). Gender and family history of CAD were not significantly associated with ACS subtypes. Seasonal variation in ACS presentation was observed (Figure 3). A significantly higher proportion of patients were admitted with ACS during the winter season compared to the summer (p = 0.030).

Among the ACS subtypes: Unstable angina (UA) was the most common in both seasons but markedly higher in winter (31.2%) vs. summer (20.0%). STEMI occurred more in winter (20.53%) than in summer (7.20%). N-STEMI cases were also higher in winter (15.47%) vs. summer (5.60%). This seasonal difference reached statistical significance, suggesting a possible association between colder months and increased ACS incidence.

Table 4 demonstrates the invasive procedures performed for ACS patients with complications. Coronary angiography (CAG) was performed in 24.8% of total cases, with the highest rate in STEMI (36.5%). PCI was done in 16% of all cases, primarily in STEMI (28.8%), while CABG was performed in only 2.9% of patients, reflecting its role in severe or refractory cases.

Among the 375 ACS patients, the most common complication was heart failure (20%), followed by arrhythmia (13%), cardiogenic shock (6.6%), death (6.9%), and stroke (3.2%). A statistically significant association was observed between the type of ACS and several complications:

Arrhythmia was most frequent in STEMI (29%), compared to NSTEMI (11.4%) and UA (4.7%) ($p < 0.001$). Cardiogenic shock was reported in (14.4%) of STEMI, (2.5%) of NSTEMI, and (4.2%) of UA patients (p = 0.001). Stroke occurred in (7.7%) of STEMI patients, but was rare in NSTEMI (1.3%) and UA (1.6%) (p = 0.009). Mortality was observed exclusively in STEMI patients (25% of STEMI group, $p < 0.001$). Heart failure was the most common complication overall but showed no statistically significant difference between the ACS subtypes (p = 0.655).

Table 1: Characteristics and risk factors of patients

Characteristics and risk factors		Frequency (%)
Age groups (Years)	48 to 57 58 to 69 70 to 78	67 (17.9%) 255 (68%) 53 (14.1%)
Gender	Male Female	225 (60%) 150 (40%)
Number of Patients with DM	With DM No DM	162 (43.2%) 213 (56.8%)
Number of Patients with HTN	With HTN No HTN	215 (57.3%) 160 (42.7%)
Number of Patients who are smokers	Smoker Non-smoker	119 (31.7%) 256 (68.3%)
Number of patients with a history of (CAD)	Yes No	112 (29.9%) 263 (70.1%)
Number of patients with a history of (PCI)	Yes No	19 (5.1%) 356 (94.9%)
Number of patients with a family history of CAD	Yes No	16 (4.3%) 359 (95.7%)

DM: diabetes mellitus, HTN: hypertension, CAD: coronary artery disease, PCI: percutaneous coronary intervention.

Table 2: Gender-based distribution of risk factors

Variables	Gender		Total N=375	P-value
	Male	female		
DM	101(62.3%)	61(37.7%)	162(43.1%)	0.419
HTN	130(60.5%)	85(39.5%)	215(57.3%)	0.831
Smoking	85(71.4%)	34(28.6%)	119(31.7%)	0.002
History of CAD	66(58.9%)	46(41.1%)	112(29.9%)	0.782
History of PCI	5(26.3%)	14(73.7%)	19(5.1%)	0.002
Family history of CAD	8(50%)	8(50%)	16(4.3%)	0.404

No significant difference (p>0.05), significant difference (p<0.05), highly significant difference (p<0.001).

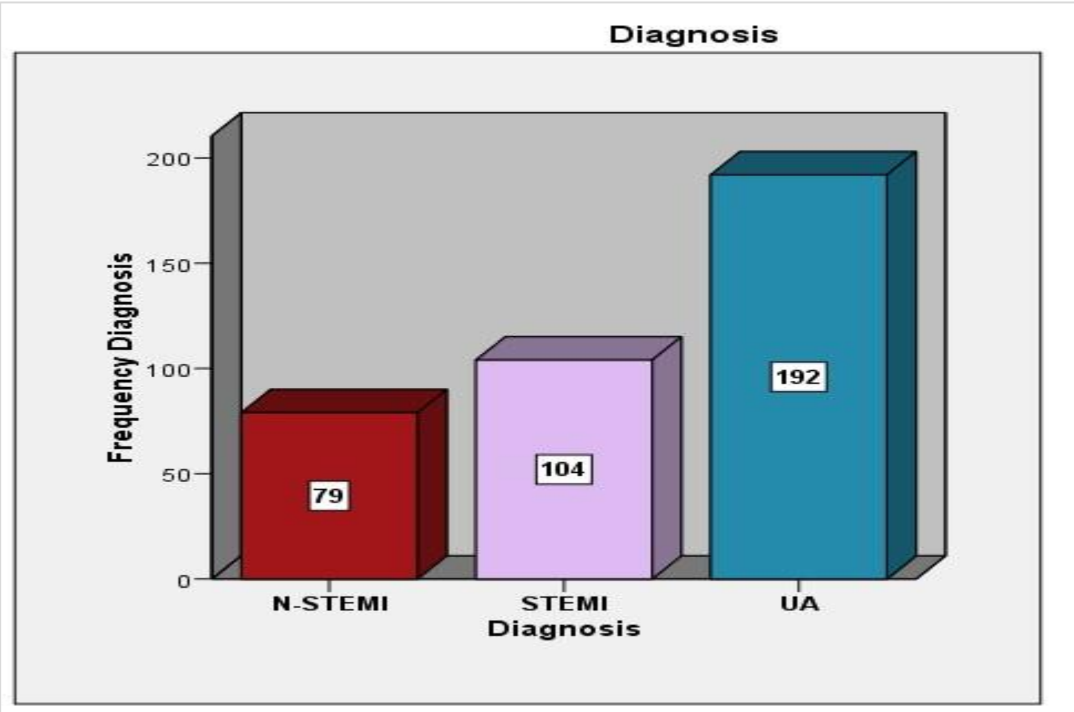

Figure 1: Distribution of diagnosis among patients

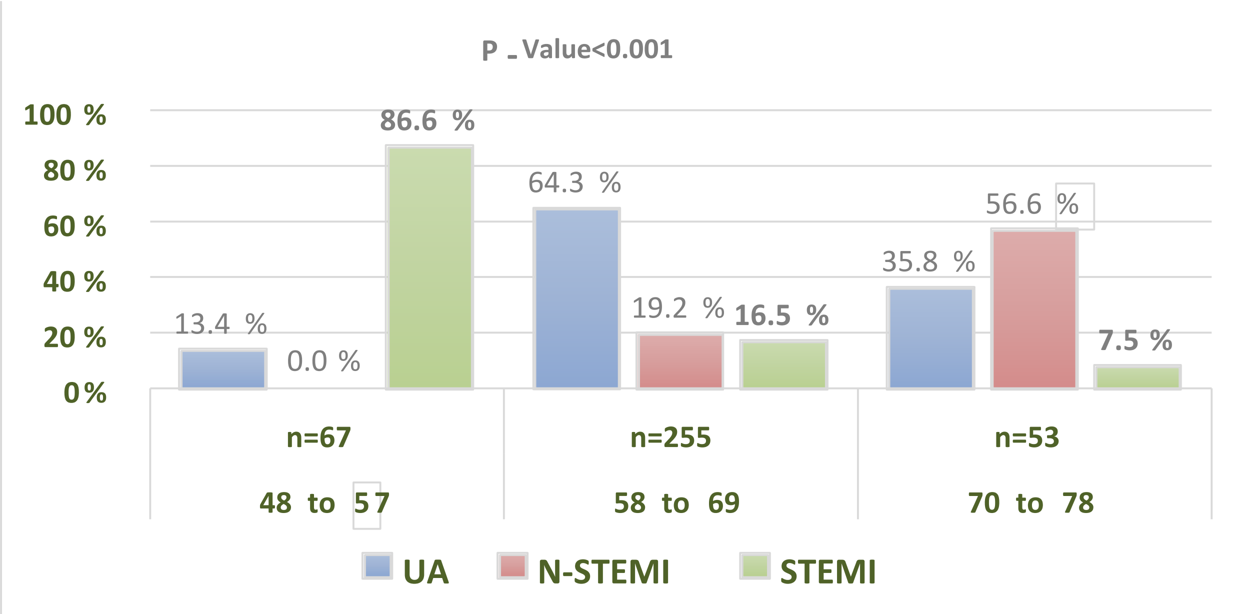

Figure 2: Distribution of Acute Coronary Syndrome (ACS) subtypes across different age groups

Table 3: Association of risk factors with different types of Acute Coronary Syndrome (ACS)

Risk Factors		Diagnosis			Total	P-value
		UA N=192	N-STEMI N=79	STEMI N=104	N=375	
Gender	Male	109(56.8%)	48(60.8%)	68(65.4%)	225(60%)	0.348
	Female	83(43.2%)	31(39.2%)	36(34.6%)	150(40%)	
DM	YES	95(49.5%)	31(39.2%)	36(34.6%)	162(43.2%)	0.035
	NO	97(50.5%)	48(60.8%)	68(65.4%)	213(56.8%)	
HTN	YES	128(66.7%)	48(60.8%)	39(37.5%)	215(57.3%)	<0.001
	NO	64(33.3%)	31(39.2%)	65(62.5%)	160(42.7%)	
Smoking	YES	59(30.7%)	35(44.3%)	25(24%)	119(31.7%)	0.013
	NO	133(69.3%)	44(55.7%)	79(76%)	256(68.3%)	
History of CAD	YES	85(44.3%)	15(19%)	12(11.5%)	112(29.9%)	<0.001
	NO	107(55.7%)	64(81%)	92(88.5%)	263(70.1%)	
Family History of CAD	YES	9(4.7%)	3(3.8%)	4(3.8%)	16(4.3%)	0.918
	NO	183(95.3%)	76(96.2%)	100(96.2%)	359(95.7%)	
History of PCI	YES	11(5.7%)	7(8.9%)	1(0.96%)	19(5.1%)	0.045
	NO	181(94.3%)	72(91%)	103(99%)	356(94.9%)	

No significant difference (p>0.05), significant difference (p<0.05), highly significant difference (p<0.001).

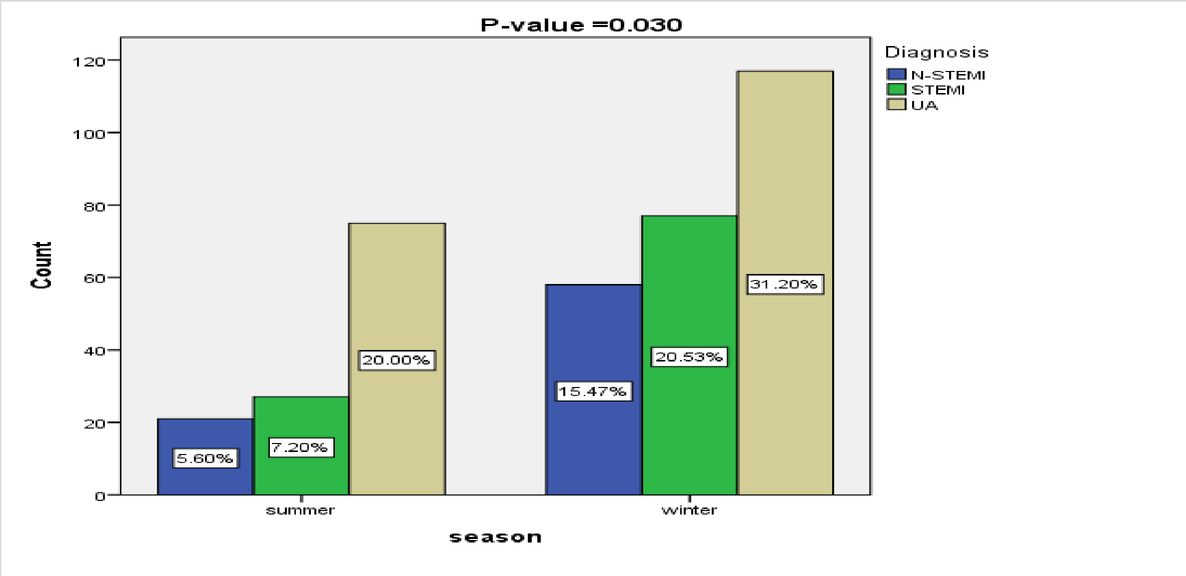

Figure 3: Distribution of ACS types across seasons.

Table 4: Invasive management

Procedure	Types of ACS			Total N=375
	STEMI N=104	NSTEMI N=79	UA N=192	
CAG	38 (%36.5)	20 (%25.3)	35 (%18.2)	93 (%24.8)
PCI	30 (%28.8)	12 (%15.2)	18 (%9.3)	60 (%16)
CABG	5 (%4.8)	4 (%5.1)	2 (%1)	11 (%2.9)

STEMI: ST elevation myocardial infarction, NSTEMI: non-ST elevation myocardial infarction, UA: unstable angina, CAG: coronary angiography, PCI: percutaneous coronary intervention, CABG: coronary artery bypass grafting.

Table 5: In-hospital outcomes in medical city complex

Complications	STEMI N=104	N-STEMI N=79	UA N=192	TOTAL N=375	P-value
Arrhythmia	30 (%29)	9 (%11.4)	9 (%4.7)	48 (%13)	<0.001
Heart Failure	24 (%23.1)	15 (%19)	36 (%18.8)	75 (%20)	0.655
Cardiogenic Shock	15 (%14.4)	2 (%2.5)	8 (%4.2)	25 (%6.6)	0.001
Stroke	8 (%7.7)	1 (%1.3)	3 (%1.6)	12 (%3.2)	0.009
Death	26 (%25)	0 (%0)	0 (%0)	26 (%6.9)	<0.001

No significant difference (p>0.05), significant difference (p<0.05), highly significant difference (p<0.001)

DISCUSSION

Acute coronary syndrome (ACS) refers to the combination of unstable angina, non-ST-segment elevation myocardial infarction, and ST-segment elevation myocardial infarction, which are the clinical manifestations of myocardial ischemia. ACS, defined as any condition exhibiting signs and symptoms of sudden myocardial ischemia—a sudden decrease in the heart's blood supply—can result from coronary artery disease. CAD mostly affects the elderly, although the illness process can start in youth. Despite myocardial infarction (MI) registries estimating that between 2% and 6% of all infarctions involve people under 45,[8] fifty percent of young persons under 34 who had autopsies had intimal atherosclerosis.[9] According to the ACCESS group of investigators, 54% of ACS in underdeveloped nations are NSTEMI/UA and 46% are STEMI.[10] In Sri Lanka, 33.6% of ACS cases are STEMI, according to Rajapakse et al. in

2010.[11] Conversely, Medagama et al. (2012) found that 32.8% of ACS cases were STEMI.[12] Our study showed that 27.7% were STEMI, 21.1% NSTEMI, and 51.2% UA. Compared to individuals in other nations (mean age 58.8 years), South Asians have a higher rate of MI at a younger age (mean age 53 years). This is likely because, when age-stratified, South Asians have larger risk factors at ages under 60.[13] Additionally, Sharma et al. demonstrated that South Asians experience ACS ten years earlier than the Western population.[14] However, our study indicated a mean age of presentation of ACS in Sulaymaniyah to be around 63.32 years. Therefore, our patients develop ACS later in life compared to other South Asians. Our study showed that the mean age for females with ACS (63.87 years) was slightly higher compared to males (62.9 years). According to studies, women typically develop cardiovascular disease seven to ten years after men.[15] It is believed that exposure to endogenous estrogens during the premenopausal stage could delay the onset of atherosclerotic disease in females. This is likely because estrogens regulate lipid levels, inflammatory markers, the coagulant system, and directly promote vasodilation by activating α and β receptors in vessel walls.[16,17] Our study indicated that the highest proportion of UA occurred in the age group of 58–69, while the highest proportion of N-STEMI was in the age group of 70–78, and the highest proportion of STEMI was in the age group of 48–57, with a statistically significant difference in age distribution among the types of ACS. Medagama et al. showed no significant difference in age distribution among all groups of ACS, with the majority being between 51 and 70 years of age.[12] This may be due to dietary habits, including higher consumption of cholesterol-rich foods, lack of exercise, and elevated stress levels. Nine risk variables are described in the INTERHEART study, which explain more than 95% of acute MI cases. Alcohol consumption had a weaker association ($p = 0.03$) with MI than the eight risk factors, which included dyslipidemia, smoking, hypertension, DM, abdominal obesity, psychosocial factors, and lack of consumption of fruits and vegetables and regular physical activity. All eight risk factors were significantly associated with MI ($p < 0.0001$).[18] In our study, hypertension was the most common risk factor, with {215 (%57.3), (P< 0.001)} patients being hypertensive and developing ACS. Similarly, another study showed that hypertension is the most common risk factor, with 134 (44.7%) patients being hypertensive and causing ACS.[19] Hypertension was significantly more common in NSTEMI and UA patients than in STEMI patients in our study. Additionally, Medagama et al. found that HTN was more prevalent in NSTEMI/UA patients.[12] Furthermore, Sharma et al. demonstrated a strong correlation between HT and NSTEMI.[14] The increased risk of thrombosis, myocardial spasm, and sudden mortality in HTN is attributed to sympathetic hyperactivity. Left ventricular hypertrophy caused by chronic HTN raises oxygen demand, which in turn causes collaterals to develop. Partial thickness infarction results from these collaterals' greater effectiveness in the sub-epicardial layer compared to the subendocardial layer. Ischemia is caused by a decrease in diastolic blood flow but not by complete vascular blockage.[18] These factors could explain why HTN is more likely to be a risk for NSTEMI and UA than for STEMI. Another common risk factor in our study was a history of CAD (P=<0.001), with a high rate in UA (85 (75.9%)). According to a different study, patients with a history of CAD are more likely to develop ACS because the underlying atherosclerotic process that causes CAD also puts them at risk for plaque instability and rupture.[20] In our study, out of 375 patients, 119 (31.7%) were regular smokers, making this the second most common risk factor. Our study further showed that smoking (p= 0.013) was more significantly associated with NSTE-ACS rather than STEMI. Similarly, another study found that 127 individuals, or 42.3% of the 300 patients, smoked regularly, making this the second most common risk factor for developing ACS.[19] In our study, out of 375 patients, 162 (43.2%) were associated with DM. Our study further showed that DM (p= 0.035) was more significantly associated with UA; similarly, another study showed that DM is another important risk factor found in 29.3% of the population.[19] Hyperglycemia enhances the production of vasoconstrictors like endothelin-1 and decreases the production of vasodilators like nitric oxide. The liver produces more cholesterol esters and Very Low-Density Lipoprotein (VLDL) when there is a decrease in insulin-mediated skeletal muscle absorption of free fatty acids. Raised triglyceride and low HDL cholesterol levels are more common in diabetic patients with ACS than raised total and LDL cholesterol levels, often resulting in multi-vessel coronary artery atherosclerosis. Additional ways that diabetes mellitus (DM) increases the risk of ACS include pro-coagulability, impaired fibrinolysis, and the production of advanced glycation end products.[21] Our study showed that a family history of CAD was not significantly associated with types of ACS (P= 0.918).

However, another study indicated that a family history of CAD was significantly associated with types of ACS.[22] This discrepancy could be due to the westernization of our population. We observed a significant seasonal variation in the distribution of ACS subtypes (p = 0.030), with a higher incidence during winter across all types. Unstable angina (UA) was the most common presentation in both seasons but increased notably in winter (31.2% vs. 20.0%). STEMI cases were nearly three times more frequent in winter (20.53%) compared to summer (7.2%), and NSTEMI followed a similar trend (15.47% vs. 5.6%). These results support prior evidence that cold weather triggers sympathetic activation, vasoconstriction, elevated blood pressure, and respiratory infections—factors that can precipitate myocardial ischemia and infarction.[26-29] In this study, invasive management among ACS patients showed that coronary angiography (CAG) was performed in 24.8%, percutaneous coronary intervention (PCI) in 16%, and coronary artery bypass grafting (CABG) in 2.9%. STEMI patients had the highest intervention rates—CAG (36.5%) and PCI (28.8%)—followed by NSTEMI (25.3%, 15.2%) and unstable angina (18.2%, 9.3%). This pattern aligns with international guidelines emphasizing early reperfusion for STEMI and a risk-based invasive strategy for NSTEMI and unstable angina.[30] The lower PCI rate in our STEMI patients compared with large regional registries such as Gulf RACE (44%) may reflect limited catheterization resources and delayed presentation.[31] Similarly, the low CABG frequency (2.9%) corresponds with regional studies and reflects clinical preference for PCI when feasible.[32] Improving early referral and expanding interventional capacity could enhance ACS outcomes in our setting. In this study, in-hospital complications were most frequent among STEMI patients, with arrhythmia (29%), heart failure (23.1%), cardiogenic shock (14.4%), stroke (7.7%), and mortality (25%). In contrast, NSTEMI and UA groups had notably lower complication and mortality rates, showing significant differences (p<0.001 for arrhythmia and death). These findings align with global data indicating that STEMI patients experience higher rates of electrical and hemodynamic instability due to larger infarct size and full coronary occlusion.[30] The mortality rate in our STEMI cohort (25%) was higher than that reported in the GRACE registry (≈6–10%).[33] possibly reflecting delayed presentation and limited access to immediate reperfusion therapy. Cardiogenic shock (6.6% overall) also showed a significant association with STEMI, consistent with prior studies emphasizing its prognostic impact.[34] These findings highlight the need for rapid reperfusion and intensive in-hospital monitoring to improve outcomes. They reinforce the prognostic gravity of STEMI and underline the need for timely revascularization and vigilant monitoring of complications.

CONCLUSIONS

This study highlights the burden of ACS in Slemani, especially among older males. Hypertension, diabetes, smoking, and prior coronary disease were the most common risk factors. Unstable angina was the most frequent subtype, with a notable rise in cases during winter. STEMI carried higher rates of complications and mortality, underscoring the importance of early detection and timely intervention. As most risk factors are modifiable, targeted public health measures could significantly reduce ACS incidence and improve outcomes.

Limitations:

Despite the valuable findings presented, this study has several limitations that should be acknowledged. First, it was conducted at a single cardiac center in Slemani, which may limit the generalizability of the results to other regions or populations. The retrospective design also carries inherent biases, including missing or incomplete data and the inability to establish causal relationships between risk factors and ACS subtypes. Additionally, while seasonal variation was analyzed, environmental factors such as temperature, air pollution, and viral infections—which may influence seasonal cardiovascular events—were not measured. The lack of follow-up data also limited the assessment of long-term outcomes and recurrence. Furthermore, not all patients underwent the same diagnostic or therapeutic procedures, which may have introduced variability in the complication and management data. Finally, some of the subgroup analyses (e.g., age- and sex-stratified data) were limited by small sample sizes, potentially affecting statistical power. Future multicenter prospective studies are needed to confirm and expand upon these findings.

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