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Assessment of risk factors among female patients with various Acute Coronary Syndrome types presenting to Cardiology unit DHQ Kohat, Pakistan.

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Abstract

Background: There is limited literature regarding the risk factors associated with acute coronary syndrome among female patients of the region, while none was previously reported from Kohat, Pakistan. Therefore, the present study aims to assess the risk factors among female patients with various types of Acute Coronary Syndrome (ACS).

Methodology: A descriptive cross-sectional study was conducted from June 2021 to February 2022. A total of 500 female patients with ACS admitted to the Cardiology Unit at DHQ Kohat were enrolled, and data were collected using a structured questionnaire. The risk factors were determined with respect to ACS types. The patient's electrocardiography (ECG) and cardiac biomarkers were assessed, and blood samples were obtained to estimate lipid parameters.

Results: The mean age of enrolled ACS females was 54.20 ± 9.20 years. Of the total, 74.6% were diagnosed with non-ST segment elevation myocardial infarction (NSTEMI), ST-segment elevation myocardial infarction (STEMI) was present among 6.0% of the enrolled cases, and 19.4% had unstable angina. Hypertension was the most prevalent risk factor (53.2%), followed by diabetes (51.4%). The studied risk factors mean age, blood pressure, body mass index (BMI), past medical history, and family history of ACS were significantly different among the different ACS types ($p<0.05$).

Conclusion: In conclusion, age, blood pressure, BMI, past medical history (presence of diabetes and hypertension), and family history of ACS among female patients are significantly associated with various ACS types.

Keywords

Acute Coronary Syndrome, Myocardial Infarction, Electrocardiography, Risk Factors.

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Introduction

ACS refers to a spectrum of clinical symptoms, primarily associated with an atherosclerotic plaque rupture in a coronary artery, subsequently leading to restricted or complete thrombosis[1]. In 2019, approximately 17.9 million deaths occurred due to cardiovascular diseases (CVDs), depicting 32% of total deaths globally. Of these, 7.5 million fatalities resulted from Ischemic Heart Disease (IHD)[2]. At the same time, 1.8 million deaths occurred annually due to acute coronary syndromes (ACS)[3]. South Asian countries, including Pakistan, account for over a quarter of the world's population and bear the most significant burden of cardiovascular diseases (CVD) compared to the other regions, universally[4,5].

Additionally, the case fatality rates among young women with ACS are interestingly high. In contrast, the reported mortality rate associated with coronary artery disease (CAD) is relatively low among younger men, as per recent studies[6-9]. Regardless of the evidence drawn on the gender differences concerning coronary biology, symptomatic presentation, risk factors, presence of comorbid conditions, treatment efficacy, and outcomes, these disparities remain unexplored[9,10].

Unstable Angina (UA), STEMI, and NSTEMI are the clinical types of ACS[11]. Although UA and NSTEMI have similar pathogenesis, the two are distinguished by the severity of symptoms and certain specific prognostic biomarkers. Furthermore, the release of biomarkers of myocardial necrosis, specifically cardiac-specific troponins T or I and Creatine kinase-MB (CK-MB), has been observed among the patients with NSTEMI after a few hours of the onset of chest pain but not in UA patients[12].

Several modifiable risk factors of ACS, primarily genetic, physiological, behavioral, and environmental components, are known to initiate most cardiovascular diseases. Diabetes, smoking, hyperlipidemia, hypertension, physical inactivity, poor diet, and family obesity are the most prevalent modifiable risk factors. While among the non-modifiable risk factors are age, gender, and genetic predisposition[13-15]. Accurate, early diagnosis and risk stratification have prognostic significance and allow suitable treatment for ACS patients. Moreover, the plasma markers of inflammation like C-reactive protein (CRP) and white blood cell (WBC) count are now in focus as the risk predictors of ACS[12].

Spreading awareness about lifestyle changes and informing people of healthy living options, including regular physical activity, dietary modifications, and smoking cessation, are all main aspects of handling the disease[16]. There is limited literature regarding the risk factors associated with acute coronary syndrome among female patients of the region, while none was previously reported from Kohat, Pakistan. Therefore, the present study aims to assess risk factors for Acute Coronary Syndrome in female patients admitted to the Cardiology Unit of DHQ, Kohat.

Methodology

This descriptive cross-sectional study was conducted at the Cardiology Unit, DHQ Kohat, from June 2021 to February 2022. Consecutive sampling method was used and a total of 500 female patients diagnosed with ACS admitted to the study site were enrolled in this study. While patients with pericarditis, endocarditis, or myocarditis, and those with a pre-existing abnormality of connective tissues, heart disease, and pregnant females, were excluded from the study. The ethical approval was obtained from the ethical review board of KIMS (Reference no: ERC/KIMS/2021/03), and written informed consent was obtained from patients before inclusion.

Acute Coronary Syndrome was diagnosed based on the patient's history, physical examination, electrocardiography, radiologic tests, and cardiac biomarker estimations, which were further categorized into UA, NSTEMI, and STEMI. Data regarding demographic characteristics (age and blood pressure), positive family history of ACS, frequency of diabetes mellitus, hypertension, and smoking status were obtained and recorded using a structured questionnaire designed for the study. Lipid profile (Serum Cholesterol, LDL Cholesterol,

HDL Cholesterol, and TG), Random Blood sugar (RBS), and HbA1c were performed, and body mass index (BMI) was calculated.

The statistical analysis was performed on SPSS version 16.0. Frequency and percentages were used to display all the categorical variables, while continuous variables were given as mean ± SD. Pearson Chi-square test and one-way ANOVA were used to determine the differences in the patient's characteristics according to the types of ACS, whereas the p-value ≤ 0.05 was considered significant.

Results

The data of 500 female patients diagnosed with ACS was investigated during the study. It was observed that their mean age was 54.20 ± 9.20 years. Of the total, 74.6% were diagnosed with NSTEMI, 19.4% had UA, and 6.0% had STEMI. 51.4% of the enrolled patients had diabetes, and 53.2% had hypertension (Table 1).

Table 1: Patient's baseline demographic and clinical characteristics.

Variables		(n=500)
Age (years)		54.20±9.20
SBP (mmHg)		131.27±16.56
DBP (mmHg)		83.71±10.29
BMI (kg/m^2)		23.88±3.07
HbA1c (%)		6.54±1.86
Serum Cholesterol (mg/dL)		233.39±53.59
LDL Cholesterol (mg/dL)		109.14±39.37
HDL Cholesterol (mg/dL)		51.73±6.68
TG (mg/dL)		181.04±102.96
Duration of Hypertension		3.38±4.32
Hypertension		266(53.2)
Duration of Diabetes Mellitus		3.83±4.46
Diabetes Mellitus		257(51.4)
Positive Family History of ACS		9(1.8)
Diagnosis	NSTEMI	373(74.6)
	STEMI	30(6.0)
	UA	97(19.4)
HTN Medication	Yes	216(43.2)
	No	284(56.8)
DM Treatment	Not Reported	1(0.2)
	Insulin	95(19.0)
	None	264(52.8)
	Oral Medication	140(28.0)
Smoking Status	Non-smokers	495(99.0)
	Smokers	5(1.0)

*Values are given as mean ± SD or n(%); SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; BMI – Body Mass Index; Hba1c - Hemoglobin A1c; LDL – Low-Density Lipoprotein; HDL - High-Density Lipoprotein; TG – Triglycerides; NSTEMI - Non-ST-Elevation Myocardial Infarction; STEMI - ST-Elevation Myocardial Infarction; UA – Unstable Angina; HTN – Hypertension; ACS - Acute Coronary Syndromes

There is a significant difference in the mean age, blood pressure, BMI, past medical history (presence of diabetes and hypertension), and family history of ACS among the patients with different types of ACS ($p<0.05$).

Table 2: Risk factors with respect to the type of ACS.

Variables		STEMI (n=373)	NSTEMI (n=30)	UA (n=97)	p-value
Age (years)		53.55±8.72	56.67±14.74	55.94±8.56	0.024*
SBP (mmHg)		132.45±14.55	120.83±29.82	129.95±17.19	0.001*
DBP (mmHg)		84.30±9.37	77.17±17.50	83.45±10.13	0.001*
BMI (kg/m^2)		24.26±2.98	20.50±2.72	23.47±2.83	<0.01*
Laboratory Investigations	HbA1c (%)	6.47±1.79	7.08±2.50	6.63±1.87	0.204
	Serum Cholesterol (mg/dL)	235.41±51.64	217.73±57.07	230.49±59.20	0.185
	LDL Cholesterol (mg/dL)	111.10±40.37	99.73±22.41	104.55±39.12	0.139
	HDL Cholesterol (mg/dL)	51.80±6.60	49.50±6.94	52.14±6.84	0.154
	TG (mg/dL)	181.95±86.10	197.20±278.93	172.58±51.81	0.492
Past Medical History	Hypertension	208(55.8)	10(33.3)	48(49.5)	0.043*
	Duration of HTN	3.59±4.37	1.70±3.60	3.07±4.22	0.051*
	Diabetes Mellitus	185(49.6)	11(36.7)	61(62.9)	0.016*
	Duration of DM	3.74±4.43	3.27±5.06	4.31±4.37	0.421
Family history of ACS	Not reported	326(87.4)	-	74(76.3)	<0.01*
	No	42(11.3)	27(90.0)	22(22.7)	
	Yes	5(1.3)	3(10.0)	1(1.0)	

Values are given as mean ± SD or n(%). *p≤0.05 is considered statistically significant.
SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; BMI – Body Mass Index; Hba1c - Hemoglobin A1c; LDL – Low-Density Lipoprotein; HDL - High-Density Lipoprotein; TG – Triglycerides; NSTEMI - Non-ST-Elevation Myocardial Infarction; STEMI - ST-Elevation Myocardial Infarction; UA – Unstable Angina; HTN – Hypertension; DM – Diabetes Mellitus; ACS - Acute Coronary Syndromes

Discussion

Epidemiological research in South Asian nations has yielded significant findings on the frequency, nature of the presentation, and management of ACS in this region[17,18]. These studies also revealed spatial disparities and diversities in patient care and associated death rate across Asia.

According to the ACCESS investigators group, STEMI accounts for 46% of all ACS cases in developing countries, while NSTEMI/UA accounts for 54%[19]. The rate of MI incidence is comparatively higher in the South Asian population, i.e., the mean age of 53 years, than in other nations (58 years). This is most likely because when stratified for age, South Asians have more risk variables, such as a greater apoB100 / apoA-I ratio and abnormal body fat districation[20]. Sharma et al. also discovered that ACS struck South Asians a decade earlier than it did in the Western people[21]. However, in our research, the average age of ACS presentation was around 54.20 ± 9.20 years. According to various studies, women develop cardiovascular diseases 7-10 years later than men[22]. Endogenous estrogens are thought to delay the onset of atherosclerotic disease in women during the pre-menopausal period, involved in subsequent regulation of lipids, inflammatory markers, and coagulants. It also regulates that vessel wall receptors producing a direct vasodilatory effect[23,24].

Moreover, the mean age of NTEMI, STEMI, and UA patients was significantly different ($p=0.024$), i.e., 56.67 years, 53.55 years, and 55.94 years, respectively. In contrast, a study revealed no age-associated variation among patients with various ACS types, with the highest proportion between 51-70 years of age[18]. Similar to our findings, a study displayed the highest mean age among NSTEMI

patients, i.e., 60.07 ± 10.47 years, compared to STEMI patients, i.e., 57.76 ± 11.44 years. However, there was no significant difference between the two groups (p=0.103)[17].

A high prevalence of hypertension and diabetes was observed among enrolled ACS patients (53.2% and 51.4%, respectively). Additionally, hypertension was more prevalent in STEMI than in NSTEMI and UA patients. On the contrary, Medagama and colleagues also reported hypertension is more prevalent in patients with NSTEMI than that with STEMI[18]. Another study reported similar results[21]. It is known that chronic hypertension produces left ventricular hypertrophy, which increases oxygen demand and leads to collateral development, resulting in infarction associated with partial thickness and subsequent ischemia due to the diastolic blood flow decrement without total vascular closure[25].

In the West, many studies on risk factors for ACS have been conducted, and most care and prevention strategies have been implemented. Like others, including the South Asians, this study demonstrated that the ACS risk factors are different from those in the Western world. As a result, lifestyle adjustments for ACS prevention and management should be modified and implemented in Pakistan. The impact and occurrence of specific risk factors vary depending on the kind of ACS. STEMI has a greater fatality rate than NSTEMI/UA, according to research[19]. According to the present data, age, blood pressure, BMI, past medical history (presence of diabetes and hypertension), and family history of ACS were the risk factors that significantly varied among the enrolled ACS female patients. A study by Alhassan and colleagues reported that age, gender, hypertension, ischemic heart disease, smoking, DM, and dyslipidemia were the most common factors associated with various ACS categories[26]. The present study included only female patients; hence the outcomes cannot be generalized.

To the best of our knowledge, this is the first attempt from Kohat to determine the risk factors of ACS in the female gender only. However, there are certain limitations; specifically, the present study focused on the female patients of a single-center only, which affected the generalizability of the outcomes-driven. Further studies are recommended to better understand the pathophysiology of each of the modifiable and no-modifiable risk factors associated with STEMI, NSTEMI, and UA so that the therapeutic approach could be focused on targeting and treating the disease for each risk factor rather than treating the predisposing factors only.

Conclusion

It is concluded from the study results that blood pressure, BMI, past medical history of diabetes, and hypertension were the common modifiable risk factors that significantly varied among the ACS categories. At the same time, age and family history of ACS were among the non-modifiable risk factors. Further research is recommended to better understand the presentation, epidemiology, and predisposing factors of ACS, particularly at the regional level. This knowledge would aid in implementing preventive measures such as lifestyle changes and pharmacological treatment to reduce the risk factors.

Conflicts of Interest

The authors have declared that no competing interests exist.

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