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Original Article

Impact of Family Size and Income Status on the Occurrence of Acute Coronary Syndrome

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ABSTRACT

Objective: To assess the impact of family size & income status on the occurrence of acute coronary syndrome (ACS).
Study Design: Cross-sectional study.
Place and Duration of Study: Inpatient Department of the National Institute of Cardiovascular Diseases in Karachi, Pakistan from Aug to Oct 2024.
Methodology: All 245 patients diagnosed with ACS who were hospitalized in the inpatient department were included in the research. A pre-designed proforma was used to screen and record the patient's demographic, risk factor, monthly family income, and family size details.
Results: Mean age 48.37±7.24 years, 75.5% of patients were male. Most of the patients had hypertension, diabetes, dyslipidemia, and other risk factors like smoking and family history of heart disease. Out of the total, 36.7% of the studied patients had < PKR 32,000, and 38.8% had between PKR 32,000 and PKR 50,000 and only 24.5% had > PKR 50,000. 56% of ACS patients have large families.
Conclusion: The study finding reveals that most ACS patients had low income level and big family size. It recommends that health officials concentrate on preventing ACS by addressing risk factors such as diabetes, hypertension, dyslipidemia, and smoking. However, patients with low income level and large size of family require additional attention.

Keywords: Monthly income status, Family size, Acute coronary syndrome, ST-Elevation Myocardial Infarction, Unstable angina.

How to Cite This Article: *Muhammad SK, Naeem S, Hameed B, Khan SF, Anees N, Khan KA. Impact of Family Size and Income Status on the Occurrence of Acute Coronary Syndrome. Pak Armed Forces Med J 2026; 76(3): 412-418. DOI: https://doi.org/10.51253/pafmj.v76i3.12886*

INTRODUCTION

Acute Coronary Syndrome (ACS) is a critical cardiac ischemic condition that encompasses a range of heart disorders, including ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina (UA). Despite significant medical advancements, ACS remains one of the leading causes of morbidity and mortality worldwide.[1-3] Over 9 million fatalities worldwide are attributed to acute coronary syndrome (ACS). In high-income countries, ACS is the primary cause of disease burden and the leading cause of mortality. ACS is also the major cause of mortality in the Asia-Pacific region.[4] The Global Burden of Disease study (2019) estimated 918/100,000incidence of CVD in Pakistan and death rate was 357/100,000. CVDs were self-reported by 18.9% of participants in the National Socioeconomic Registry Survey that included demographic, socioeconomic, education, health, and asset profiling of 34 million households across Pakistan.[5]

Associated factors of ACS are older age, male gender, diabetes mellitus, hypertension, hyperlipidemia, smoking, overweight or obese, unhealthy lifestyle, and family history of CVDs.[5,6] Low socioeconomic status may be associated with inequalities in healthcare quality and outcomes in multiple medical conditions. Several previous studies have documented an association between low income status and increased cardiovascular morbidity and mortality. Several factors may potentially mediate this disparity, including a higher prevalence of cardiovascular risk factors, inequalities in access to cardiac investigations, and poorer compliance with medical therapy in patients with low incomes class.[7] In population-based research, adverse cardiovascular outcomes have been consistently associated with lower socioeconomic status.[6,7] According to numerous studies, over forty percent of ACS patients were from lower socioeconomic class. Socioeconomic status in term of monthly family earnings has significant impact on the treatment accessibility and outcomes.[8,9,10]

Pakistan faces a significant burden of cardiovascular diseases, with Acute Coronary Syndrome (ACS) being a leading cause of death. Despite medical advancements, ACS remains highly

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Received: 11 11 2024; revision received: 26 May 2025; accepted: 30 May 2025

prevalent due to a mix of genetic, lifestyle, and socioeconomic factors, including household income. Key factors in the local context—such as family size and income—can impact healthcare access, stress levels, and overall health. Larger families, often linked with lower income, may experience limited resources, reduced healthcare access, and increased exposure to risk factors like poor diet, smoking, obesity, and inactivity. This study examined the relationship between family size, income status, and other demographic and clinical characteristics of ACS patients. The insights gained aim to support the creation of effective public health strategies to lower the cardiovascular disease burden in Pakistan.

METHODOLOGY

This cross-sectional study was conducted from August to October 2024 at the inpatient Department of the National Institute of Cardiovascular Diseases (NICVD) Karachi. The institution review board granted ethical approval (Reference No: IRB-71/2024). The patients who fulfilled the selection criteria gave written informed consent for the study. Patients with acute coronary syndrome (ACS) presented with the complaint of chest pain and diagnosis confirmed on cardiac troponin >0.4 ng/mL and ECG changes in ≥2 contiguous leads; Transient ST-segment elevations of ≥1 mm, ST-segment depressions of ≥1 mm, New T-wave inversions of ≥1 mm, Pseudo normalization of previously inverted, T waves. New Q waves [1/3rd the height of the R wave or ≥0.04 seconds], New R wave > S wave in lead V1 [posterior myocardial infarction (MI)], New left bundle branch block were enrolled in the study.

The sample size 245 was calculated using the Open EPI a web-based sample size calculator. Taking statistics 40% of ACS patients with lower socioeconomic class10, by taking a confidence interval of 95% and margin of error of 6.2%. Patients were enrolled using a non-probability consecutive sampling technique.

Inclusion Criteria: Patients aged 35-60 years with the diagnosis of acute coronary syndrome (ACS) were included in this study.

Exclusion Criteria: Patients presented with chest pain due to trauma, previously diagnosed patients of ACS and those not willing to participate in the study were excluded from the study.

Detailed demographic details of each patient was obtained including name, age, gender, BMI, marital status, educational status, residence and monthly income. Medical history of each patient was also inquired including diabetes mellitus, hypertension, dyslipidemia, smoking and family history of cardiac disease (On the basis of medical history). Each patient's family size was assessed based on a household of individuals related by blood or marriage including adults and children. It was distributed into a small family size with a family of ≤ 4 members and a large Family Size family with > 4 members. The monthly household income was categorized into three groups as ≤ PKR 32,000, between PKR 32,000 and PKR 50,000 and > PKR 50,000,[11,12] both variables were the study outcomes. All the information was recorded in the pre-designed proforma.

Statistical Package for Social Science (SPSS) software, Version 25 was used for data analysis. Mean and standard deviation were calculated for quantitative variables like age, BMI, etc. Frequency and percentages were calculated for qualitative variables such as gender, marital status, educational status, residence, co-morbidities ACS Type and outcomes (family size and income status). Chi-square test was applied by taking *p*-value ≤ 0.05 as significant.

RESULTS

Out of a total of 245 patients, the mean age of ACS patients was 48.37±7.24 years, mean BMI was 26.53±3.35 kg/m^2. Most of them 185(75.5%) were male, 36(14.7%) patients were obese and 192(78.4%) of the patients were residing in urban areas. Smoking status showed that 70(28.6%) patients were smokers and 24(9.8%) patients had a family history of heart disease. The majority of the patients had co-morbidities. The most common co-morbidity in ACS patients was hypertension 192(78.4%) followed by diabetes mellitus 114(46.5%) and dyslipidemia 30(12.2%). Multiple co-morbidities were also found in these patients. The majority of patients 125(51%) had been diagnosed with NSTEMI, 84(34.3%) patients had STEMI, and 36(14.7%) patients had Unstable angina (Table-I).

Income status of Acute Coronary Syndrome (ACS) patients showed 90(36.7%) of them had < PKR 32,000, 95(38.8%) patients had monthly household income between PKR 32,000 and PKR 50,000 and 60(24.5%) had household monthly income of > PKR 50,000. The findings disclosed that most ACS patients were from the households with low monthly income level (Figure-1). Similarly, the Family size of the majority of the ACS patients 137(56%) was large,

indicating that the size of the family is associated with the prevalence of ACS (Figure-2).

Figure-1: Monthly Household Income Level of Acute Coronary Syndrome Patients (n=245)

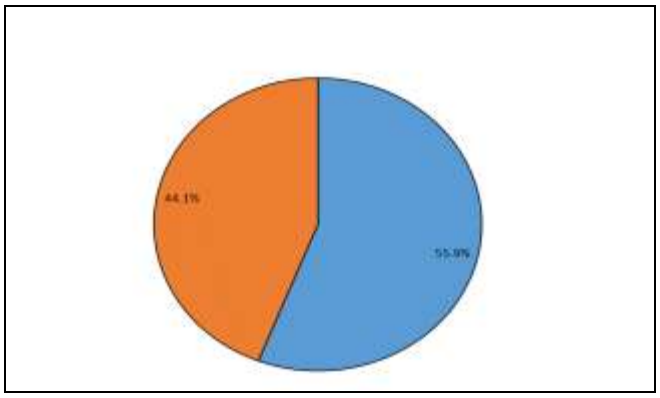

Figure-2: Family size of Acute Coronary Syndrome Patients (n=245)

The association of family size with other associated factors in ACS patients is stated in (Table-II). There was a significant association between family size and age as the majority of the patients with large family size were of age more than 45 years 125(91.2%). Similarly, there were more male patients with large family size 95(69.3%) in comparison to female gender the association was also found to be significant (p<0.05). 137(100%) ACS patients with large family size were married. Educational status, Co-morbidities (Dyslipidemia), multiple co-morbidities, types of ACS, and income status had a significant association with family size (p<0.05).

Associations of monthly household income level with other associated factors in ACS patients were stated in (Table-III). There was significant association between monthly household income level and age as majority of the patients from low and middle class were of age more than 45 years 66(73.3%). Similarly; all the ACS patients from households with low monthly income level had significant association with gender, marital status, educational status, residence, family history of heart disease, co-morbidities, and family size (p<0.05).

DISCUSSION

In this study; 90(36.7%) acute coronary syndrome (ACS) patients had low income level, 95(38.8%) patients were from the middle income class and 60(24.5%) were from the high income class. Out of the total, 3/4th of the ACS patients of the study population belonged to the households with low income level. Over half of the patients had large family size. These findings demonstrated that the both factors income status and the family size are associated with the occurrence of ACS. Low income status has been associated in a previous studies with a higher rate of cardiovascular morbidity and mortality.[7,13] In addition to having a higher burden of CVD, people with lower income class also experience disproportionately poorer outcomes mainly because of the delayed access to the treatment. Low income is associated with a higher short-term death rate in patients with non-communicable diseases such as acute coronary syndrome due to low resources health system and cost burden, there is a need to deal with such disparities by providing easy and cost-effective access to life saving treatment to ACS patients. [5,10,14]

Cardiovascular diseases remain the world's largest cause of death, even with a recent decline in mortality. Unfortunately, not every group in society has been equally impacted by the decrease in cardiac mortality over the last few decades. A current emphasis might be offered by income status which is directly correlated with the size of family.[15] The socioeconomic and family size status of patients with Acute Coronary Syndrome (ACS) was determined by our study. The findings explained the significant impact of lower to middle-income class and large family size on the occurrence of ACS. Both elements were identified as risk factor for ACS. A similar trend also observed in the previous research for SES but not enough data is available on family size.[16,17] The majority of ACS patients belonged to the lower class. As this Bangladeshi study reported that the 80% of the ACS patients admitted in the district level hospital were of lower socioeconomic class and only 1.6% patients were from high class. In low resource countries majority of the high income group patients do not prefer public facilities for treament.[8,18] The

Table-I: Demographic and clinical Characteristics of Acute Coronary Syndrome Patients (n=245)

Study Variables		n(%)
Age Group	45 or less	66(26.9%)
	More than 45	179(73.1%)
Gender	Female	60(24.5%)
	Male	185(75.5%)
Obesity	Yes	36(14.7%)
	No	209(85.3%)
Marital status	Married	233(95.1%)
	Single	12(4.9%)
Educational Status	Illiterate	6(2.4%)
	Primary	71(29.0%)
	Intermediate	54(22.0%)
	Matriculation	84(34.3%)
	Graduation	24(9.8%)
	Post Graduation	6(2.4%)
Residence	Rural	53(21.6%)
	Urban	192(78.4%)
Smoking	Yes	70(28.6%)
	No	175(71.4%)
Family Hx of HD	Yes	24(9.8%)
	No	221(90.2%)
Co-morbidities	Dyslipidemia	30(12.2%)
	Hypertension	192(78.4%)
	Diabetes Mellitus	114(46.5%)
	DM+HTN	90(36.7%)
	DM+HTN+Dys	24(9.8%)
Type of ACS	NSTEMI	125(51%)
	STEMI	84(34.3%)
	UA	36(14.7%)

Abbreviations: DM= Diabetes Mellitus; HTN= Hypertension; Dys= Dyslipidemia; HD= Heart Disease; ACS= Acute Coronary syndrome; NSTEMI= Non-ST-elevation myocardial infarction; UA= Unstable angina; Family Hx= Family history

Table-II: Association of family size of Acute Coronary Syndrome Patients with Demographic and Clinical Factors (n=245)

Study Variables		Family Size		*p*-value
		Large	Small	
		137	108	
Age Group	45 or less	12(8.8%)	54(50.0%)	< 0.001
	More than 45	125(91.2%)	54(50.0%)	
Gender	Female	42(30.7%)	18(16.7%)	0.011
	Male	95(69.3%)	90(83.3%)	
Obesity	Yes	36(26.3%)	0(0%)	< 0.001
	No	101(73.7%)	108(100.0%)	
Marital status	Married	137(100.0%)	96(88.9%)	< 0.001
	Single	0(0%)	12(11.1%)	
Educational Status	Illiterate	0(0%)	6(5.6%)	0.003
	Primary	41(29.9%)	30(27.8%)	
	Intermediate	24(17.5%)	30(27.8%)	
	Matriculation	54(39.4%)	30(27.8%)	
	Graduation	12(8.8%)	12(11.1%)	
	Post-graduation	6(4.4%)	0(0%)	
Residence	Rural	29(21.2%)	24(22.2%)	0.842
	Urban	108(78.8%)	84(77.8%)	
Smoking	Yes	40(29.2%)	30(27.8%)	0.807
	No	97(70.8%)	78(72.2%)	
Family Hx of HD	Yes	12(8.8%)	12(11.1%)	0.539
	No	125(91.2%)	96(88.9%)	
Co-morbidities	Dyslipidemia	24(17.5%)	6(5.6%)	0.005
	Hypertension	108(78.8%)	84(77.8%)	0.842
	Diabetes Mellitus	66(48.2%)	48(44.4%)	0.561
	DM+HTN	48(35%)	42(38.9%)	0.535
	DM+HTN+Dys	18(13.1%)	6(5.6%)	0.047
Type of ACS	NSTEMI	53(38.7%)	72(66.7%)	< 0.001
	STEMI	54(39.4%)	30(27.8%)	
	UA	30(21.9%)	6(5.6%)	
Monthly Household Income (PKR)	> 50,000	42(30.7%)	18(16.7%)	0.003
	32,000 to 50,000	41(29.9%)	54(50.0%)	
	< 32,000	54(39.4%)	36(33.3%)	

Abbreviations: DM= Diabetes Mellitus; HTN= Hypertension; Dys= Dyslipidemia; HD= Heart Disease; ACS= Acute Coronary syndrome; NSTEMI= Non-ST-elevation myocardial infarction; UA= Unstable angina; Family Hx= Family history. Chi-square test applied; P-value<0.05(significant)

majority of ACS patients were found to have more comorbidities and were from lower socioeconomic levels in both studies. The current study have found higher rate of comorbidities among patients from the middle and upper classes, though. In the lower classes, NSTEMI was more common, whereas in the higher classes, unstable angina was more common. Also, disparities based on sex have been shown in

Table-III: Association of Monthly Household Income Level of Acute Coronary Syndrome Patients with Demographic and Clinical Factors (n=245)

Study Variables		Monthly Household Income (PKR)			*p*-value
		< 32,000	32,000 to 50,000	> 50,000	
		90	95	60	
Age Group	45 or less	24(26.7%)	36(37.9%)	6(10.0%)	< 0.001
	More than 45	66(73.3%)	59(62.1%)	54(90.0%)	
Gender	Female	6(6.7%)	30(31.6%)	24(40.0%)	< 0.001
	Male	84(93.3%)	65(68.4%)	36(60.0%)	
Obesity	Yes	6(6.7%)	18(18.9%)	12(20.0%)	0.025
	No	84(93.3%)	77(81.1%)	48(80.0%)	
Marital status	Married	84(93.3%)	89(93.7%)	60(100.0%)	0.128
	Single	6(6.7%)	6(6.3%)	0(0%)	
Educational Status	Illiterate	6(6.7%)	0(0%)	0(0%)	< 0.001
	Primary	54(60.0%)	11(11.6%)	6(10.0%)	
	Intermediate	6(6.7%)	42(44.2%)	6(10.0%)	
	Matriculation	24(26.7%)	42(44.2%)	18(30.0%)	
	Graduation	0(0%)	0(0%)	24(40.0%)	
	Post-graduation	0(0%)	0(0%)	6(10%)	
Residence	Rural	30(33.3%)	23(24.2%)	0(0%)	< 0.001
	Urban	60(66.7%)	72(75.8%)	60(100.0%)	
Smoking	Yes	23(25.6%)	35(36.8%)	12(20.0%)	0.057
	No	67(74.4%)	60(63.2%)	48(80.0%)	
Family Hx of HD	Yes	6(6.7%)	18(18.9%)	0(0%)	< 0.001
	No	84(93.3%)	77(81.1%)	60(100.0%)	
Co-morbidities	Dyslipidemia	6(6.7%)	18(18.9%)	6(10.0%)	0.032
	Hypertension	84(93.3%)	54(56.8%)	54(90.0%)	< 0.001
	Diabetes Mellitus	18(20.0%)	60(63.8%)	36(60.0%)	< 0.001
	DM+HTN	18(20.0%)	42(44.2%)	30(50.0%)	< 0.001
	DM+HTN+Dys	0(0%)	18(18.9%)	6(10.0%)	< 0.001
Type of ACS	NSTEMI	54(60.0%)	53(55.8%)	18(30.0%)	< 0.001
	STEMI	36(40.0%)	30(31.6%)	18(30.0%)	
	UA	0(0%)	12(12.6%)	24(40.0%)	

Abbreviations: DM= Diabetes Mellitus; HTN= Hypertension; Dys= Dyslipidemia; HD= Heart Disease; ACS= Acute Coronary syndrome; NSTEMI= Non-ST-elevation myocardial infarction; UA= Unstable angina; Family Hx= Family history
Chi-square test applied; P-value<0.05(significant)

several studies. In lower income group over 90% ACS patients were male.

The patients in this research had a mean age of 48.37±7.24 years, were 14.7% obese, 78.4% had hypertension, 46.5% had diabetes mellitus, 12.2% had dyslipidemia, and 24.5% were female. The majority of patients with low income status were younger, male, obese, and more frequently had diabetes, hypertension, or dyslipidemia (P<0.05). Patients with higher income had more co-morbidities. There was a significant correlation between the type of ACS and income status. Compared to higher SES, NSTEMI was more common in low monthly household income group (P<0.001). Family size is also associated with low monthly household income (P<0.001). Tizón-Marcos, Helena, *et al*., and Ahmed et al. reported that the major risk factor of ACS were smoking, hypertension, diabetes mellitus, dyslipidemia and family history of CVDs while mean age of the patients was 65±13 years, 25% were women. Patients of low SES were younger, hypertensive, diabetic, and dyslipidemic, similar to those in the current research ($p < 0.05$).[6,8]

According to research by Biswas S. *et al*., patients with lower socioeconomic status had somewhat higher co-morbidities, but their treatment was generally comparable. Regardless of SES, clinical results were comparable despite these variations.[7] Poor economic conditions can delay revascularization procedures and restrict access to them, even in high-income nations. This can lead to larger infarcts, less adherence to secondary prevention medications, and generally poor use and adherence to specialized, advanced cardiac treatments.[6,19,20] In all types of socioeconomic contexts, the use of standardized and coordinated treatment networks for acute coronary syndrome improves detection, shortens treatment durations, and improves survival.[21] Deprivation and illiteracy also affect the ability to make decisions about better lifestyle choices.[22,23] This is perhaps because older people are more prone to have established risk factors. There were noticeable socioeconomic differences, with lower

socioeconomic groups having lower levels of education and lower living standards.

Our study emphasizes how crucial it is to use economic status and other socio-demographic characteristics as a combined aim to prevent the onset of ACS, particularly in a susceptible group like young and middle-aged individuals.[23,24] Education level is similarly related to ACS patients' income status in our study; patients with low monthly household income had lower levels of education than those with higher monthly household income (P<0.001). Regarding the ACS, income and educational attainment appeared to be the most significant economic indicator variables. NSTEMI admissions were more common among those with lower socioeconomic status. Among lower monthly household income, the relationship between monthly household income and NSTEMI was more stable. Patients with NSTEMI/STEMI who were hospitalized showed a significant influence from low monthly household income. Local research revealed a similar conclusion.[18] Another study showed that patients with ACS were divided into three categories: those with unstable angina (35.7%), NSTEMI (10.3%), and STEMI (53.8%). Although the majority of NSTEMI patients were from low-SES backgrounds, socioeconomic status had no impact on the type of ACS presentation (P>0.05). 25 Contrary to the findings of this study, unstable angina was more common in the high-income group, and NSTEMI showed comparable trends.

According to several researches including the current study, patients with lower to middle income status had a greater burden of ACS. It has been demonstrated that decreased involvement in screening programs and routine monitoring for several medical disorders, including cardiovascular risk factors, are associated with economic deprivation. Furthermore, lifestyle factors including smoking and poor physical fitness have been linked to low-community economic status.[7,14,25] Therefore, to reduce the burden of ACS in the future, public health initiatives that raise awareness of primary prevention and enhance access to primary care services must be put into place, especially in areas with significant economic deprivation.

LIMITATIONS OF STUDY

Our study has several limitations. First, the study is observational, single-centered, and has not large enough patient population. Large-scale, multi-center research is needed to learn more about how patients' family size and income status relate to ACS. Nonetheless, because the study was observational in nature and all data were gathered prospectively, the findings are representative of standard clinical practice. Second, since we employed the monthly households' income as a surrogate marker of socioeconomic status of patients, however, there can be number of factors that may influence the socioeconomic status including education level, household belongings, etc. such factors need to be explored in further studies and additionally, more validated socio economic classifications tools relevant to the local population need to be adopted in future researches to explore the role of socioeconomic status in ACS patients.

CONCLUSION

We discovered that the majority of ACS patients who were from large families and low monthly household income. Health authorities may find these data helpful in focusing their attention on those from lower to middle economic strata. To reduce significant risk factors, such as such as diabetes, hypertension, dyslipidemia, and smoking. However, patients with low monthly household income and large size of family require additional attention. Our findings have implications for initiatives and targeted health programs aimed at high-risk populations with large families and low incomes to maximize health equity. Reducing the death rate from ACS-related poor events and enhancing cardiac health.

Conflict of Interest: None.

Funding Source: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

SKM & SN: Data acquisition, critical review, approval of the final version to be published.

BH & SFK: Conception, study design, drafting the manuscript, approval of the final version to be published.

NA & KAK: Data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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