

Study on Epidemiological Profile, Clinical Profile, and Angiographic Patterns in Acute Coronary Syndrome Patients in a Tertiary Health Care Center in Haryana

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Abstract

Background: Cardiovascular diseases are the leading cause of death in India, with coronary artery disease (CAD) accounting for a majority of the deaths. There are few large registries on acute coronary syndrome (ACS) from India. Our aim is to study the clinical and epidemiological profile of ACS PATIENTS presenting to our institute, including their angiographic features. **Methods:** This hospital-based observational, single tertiary care center, prospective study was conducted on patients admitted in the Department of Cardiology at a tertiary care center in Haryana. The study included 400 patients aged greater than 18 years who were admitted with the diagnosis of ACS, and it was carried out for 1 year. The epidemiological profile, clinical history, risk factors, electrocardiogram findings, and angiographic pattern were studied and analyzed with appropriate statistical tools. **Results:** The mean age of the study population was 55.12 ± 11.78 years. Male and female ratio was 2.4:1. The majority of the patients came from rural background (80%); 24% of the patients were illiterate. Smoking was the most common risk factor (51.5%) in our study population followed by hypertension (40%) and diabetes (28%). Unstable angina was the most common type of ACS, which was found in 68.25% of patients. Premature CAD was found in 27.8% of patients and obstructive CAD was found in 63% of patients. Coronary angiography revealed that 39% had single vessel disease (SVD), 23.5% had double vessel disease (DVD), and 27.5% had triple vessel disease (TVD). LAD was more commonly involved, followed by RCA and LCX. Within the first 24 hours, 67% of patients sought medical assistance and only 38.5% received definitive treatment, suggesting a delay in seeking definitive treatment in our study population. **Conclusion:** The study suggests that unstable angina is the most common form of ACS in the study

population, which is mostly of rural background with significant delay in seeking medical help. Smoking is the most common risk factor in the study population.

Keywords

Acute Coronary Syndrome, Angiographic Pattern, Unstable Angina

1. Introduction

Acute coronary syndrome (ACS) includes ST elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina. It is accountable for one-third of total mortality in people older than 35 years of age. ACS could be a manifestation of coronary artery disease (CAD) and is typically caused by atherosclerosis and plaque disruption in the coronary arteries. Sometimes, ACS is secondary to vasospasm without underlying atherosclerosis [1]. Prevalence rates of CAD in India have been estimated over the past few decades and have ranged from 1.6% to 7.4% within the rural population and from 1% to 13.2% within the urban population [2].

As per the Treatment and Outcomes of Acute Coronary Syndromes in India (CREATE) registry published in 2008, the mean age of presentation with an ACS was 57.5 years, which is 7 - 11 years younger than reports from the Western literature [3]. There are some large registries on ACS from India, among which the most important are CREATE (20,937 patients; 2001 - 2005) [3] and Kerala ACS registry (25,748 patients; 2007 - 2009) [4], which provide basic insights into the varied spectrum of presentation of ACS patients and their outcomes. The HP-ACS registry (5180 patients; 2012 - 2014) [5] is the only large registry from North India.

In the last three decades, the prevalence of CAD increased from 1.1% to about 7.5% within the urban population and from 2.1% to 3.7% within the rural population in India [6]. Previous studies have shown a high prevalence of CAD in Asian Indians residing within the United States [7]. Over the past two decades, countries such as India have experienced a transition from primarily dealing with infectious diseases to facing a growing burden of atherosclerotic cardiovascular diseases (ASCVDs) [8]. India currently has a significant portion of the burden of ASCVD and also the highest number of deaths from ASCVD on an annual basis as compared to other countries globally [9].

However, there is no robust and contemporary data on CAD among native Indians. In a systematic review of CAD prevalence in India, Ahmed *et al.* commented that none of the studies conformed to the prerequisites of a high-quality epidemiological study [10]. However, there is a scarcity of information addressing the demographic, clinical, and angiographic characteristics of ACS in this region. Therefore, the purpose of this study is to understand the clinical and epidemiological profile of ACS patients presenting at a tertiary care center, together with their angiographic features.

2. Materials and Methods

2.1. Study Design and Population

This was a single-center, prospective observational study, and the data were collected for a period of 12 months, between November 2022 and November 2023. Patients aged ≥ 18 years and presenting with ACS were studied. Patients with valvular heart disease, cardiomyopathy, previous left bundle branch block, myocarditis (diagnosed clinically by history of viral prodrome, history of fever preceding for days to weeks, atypical or non-anginal chest pain, and global hypokinesia on echocardiography), chronic stable angina, acute or chronic liver disease, renal impairment (eGFR < 60 mL/kg/1.732m²), and secondary conditions that could precipitate angina (anemia, arrhythmias, and fever) were excluded. Out of 800 patients who were diagnosed with ACS and admitted to the department in the previous year, a sample of 400 patients was considered after excluding those who did not give consent and other factors

2.2. Procedure

All the consecutive patients included in the study were thoroughly evaluated. The patient history was documented in detail, and focused clinical examination was performed. Acute myocardial infarction was diagnosed according to the Fourth Universal Definition of Myocardial Infarction [11]. Non-ST segment elevation myocardial infarction (NSTEMI) or unstable angina (USA) was defined as per the 2014 American Heart Association (AHA)/American College of Cardiology (ACC) non-ST elevation-acute coronary syndrome (NSTEMI-ACS) guidelines [12]. The occupation of the patients was used to determine the physical activity status (metabolic equivalent) as light activity with less than 3 metabolic equivalents (METs), moderate activity with 3 - 6 METs, and vigorous activity with more than 6 METs [13].

CAD risk factor profiles collected and definitions:

- Current cigarette/bidi/hookah smoking history (current smoking was defined as a personal history of smoking for the past 12 months)
- Diabetes mellitus was defined as random plasma glucose concentration ≥ 200 mg/dL (11.1 mmol/L) with classic symptoms of hyperglycemia or hyperglycemic crisis, fasting plasma glucose ≥ 126 mg/dL (7.0 mmol/L), or 2-hour plasma glucose level ≥ 200 mg/dL (11.1 mmol/L) and hemoglobin A1c (HbA_{1c}) level of 6.5% (48 mmol/mol) or higher as per ADA diagnosis criteria [14].
- Hypertension was defined as systolic blood pressure ≥ 130 mmHg and/or diastolic blood pressure ≥ 80 mmHg and/or on anti-hypertensive treatment as per the ACC/AHA guidelines 2017 [15].
- Family history of premature CAD (first-degree relatives before the age of 55 years in men and 65 years in women) [16].
- Premature CAD is defined when CAD occurs in males younger than 45 years and females younger than 55 years [17].

- Obesity was defined using the body mass index (BMI) with a value >30. BMI was calculated using Quetelet's formula (weight in kg/height in m²). BMI is classified as underweight: <18.5; normal weight: 18.5 - 24.9; overweight: 25 - 29.9; obesity class I: 30 - 34.9; obesity class II: 35 - 39.9; obesity class III: >40 [18].
- The chain of events from symptom onset to arrival in the emergency room was serially recorded.
- Socioeconomic status categorization was done according to the updated B. G. Prasad socioeconomic classification 2022 [19]. It classifies the social class based on the per capita income (in INR) as per modified classification for May 2022 as, Social Class I: Rs. ≥8480; Social Class II: Rs. 4240 - 8479; Social Class III: Rs. 2544 - 4239; Social Class IV: Rs. 1272 - 2543; Social Class V: Rs. <1272.
- The education status of patients was classified as illiterate, primary (Class I to V), upper primary (Class VI to VIII), secondary (Class IX and X), senior secondary (XI to XII), undergraduate, and postgraduate, as per the Indian Standard Classification of Education (InSCED) [20].
- KILLIP Classification [21]:
 - Class I: No evidence of heart failure.
 - Class II: Mild-to-moderate heart failure (S3 gallop, lung rales less than one-half way up the posterior lung fields, or jugular venous distension).
 - Class III: Overt pulmonary edema.
 - Class IV: Cardiogenic shock.

Two-dimensional echocardiography was performed on all of the study subjects before thrombolysis or percutaneous coronary intervention (PCI) using the Philips Affiniti 50 machine. Invasive coronary angiography (CAG) via radial arterial access was performed in most of the patients either as a part of primary/rescue PCI or before discharge (within 48 - 72 hours of the index event) if the patient has already been thrombolysed or managed conservatively. Data regarding thrombolysis in myocardial infarction (TIMI) flow characteristics, the presence of calcium, and the presence of a thrombus was recorded. Expert opinion on coronary angiography was taken by two cardiologists.

Stenoses was defined as minimal if the narrowing was visually less than 50%; moderate, if it is between 50% and 70%, and severe, if it is 70% or more [22]. Significant left main stenosis was defined as luminal diameter reduction of >50% [23]. Obstructive CAD was considered to be present if ≥70% diameter stenosis was present on visual assessment in one of the major epicardial coronary arteries. Multi-vessel disease was defined as ≥50% stenosis of ≥2 major epicardial coronary arteries.

The Gensini score was used to quantify the severity of CAD, where a zero score suggests the absence of CAD. The Gensini score accounts for the degree of coronary artery narrowing as well as the location of the narrowing. Points will be given for narrowing as follows: 1 point: 25% stenosis, 2 points: 26% - 50% stenosis, 4

points: 51% - 75% stenosis, 8 points: 76% - 90% stenosis, 16 points: 91% - 99% stenosis, and 32 points: total occlusion (100%). After that, each lesion was multiplied by a factor that accounts for the importance of the lesion's position in coronary circulation: 5 for the left main coronary artery; 2.5 for proximal LAD and LCX; 1.5 for mid LAD; 1.0 for the RCA, distal segment of LAD, posterolateral artery, and obtuse marginal; and 0.5 for other segments. In left dominant circulation, a factor of 3.5 for proximal LCX and 2 for distal LCX. The Gensini score was derived by adding the individual coronary segment scores. Patients were divided into three groups based on their Gensini score: the first tertile (Gensini score <11 points), the second tertile (Gensini score 11 - 38 points), and the third tertile (Gensini score >38 points) [24] [25].

Patients were treated according to the latest MI management guidelines [26]. Routine blood investigations were performed at the time of admission. Informed consent was obtained from all subjects as per the existing norms of the institutional ethics committee.

2.3. Statistical Analysis

The results are reported as the mean \pm standard deviation for the quantitative variables and percentages for the categorical variables. The groups are compared using the student's t-test for the continuous variables and the Chi-square test for the dichotomous variables, and $p < 0.05$ are considered statistically significant. All the statistical analyses are carried out via Statistical Package for Social Sciences version 20 (SPSS, IL, Chicago Inc., USA).

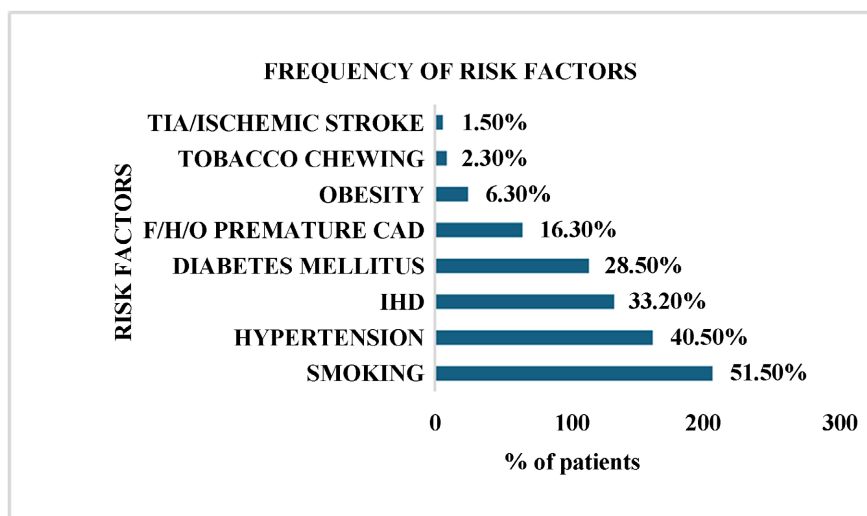
2.4. Results

Sample size of the study was 400 patients. The mean age of the study population was 55 ± 11.78 years. The most common age groups presenting with ACS were 51 - 60 years, 41 - 50 years, and 61 - 70 years, with 114 (28.5%), 105 (26.3%), and 103 (25.8%) cases, respectively. Male and female ratio was 2.4:1. Out of 400 patients, 111 (27.8%) were found to have premature coronary disease. The majority of the patients (80%) were from a rural background and 24% of patients were illiterate. The demographic profile of patients is shown in **Table 1**.

Smoking was the most common risk factor seen in the study population, which was present in 206 (51.5%) patients, and 162 (40.5%) patients had hypertension, as shown in **Figure 1**. Out of 400 patients, 133 (33.2%) had a history of ischemic heart disease (IHD), and only 6 (1.5%) had a previous episode of stroke. Diabetes was present in 114 (28.5%) patients. A family history of premature CAD and obesity was present in 65 (16.3%) patients and 25 (6.3%) patients, respectively.

The most common symptom at the time of presentation was chest pain, found in 86.5% of patients, followed by dyspnea in 5.8%. Chest heaviness, left arm pain, palpitation, uneasiness (ghabrahat), throat pain, and sweating are less commonly reported complaints, each accounting for 3.5%, 1.0%, 1.0%, 0.8%, 0.5%, and 0.5% of the cases, respectively, as shown in **Table 2**. Cardiac markers were positive in

25% of the patients and negative in 75% of patients. Clinical profiles of the patients are shown in **Table 2**.



F/H/O: Family history of; IHD: Ischemic heart disease; TIA: Transient ischemic attack.

Figure 1. Frequency of risk factors.

Table 1. Demographic profile of patients.

Demographics	Patients (N = 400) (mean ± SD) or N (%)
Age (years) (mean ± SD)	55 ± 11.78
Female	117 (29.25)
Male	283 (70.75)
Premature CAD	111 (27.8)
Risk factors	
Smoking	206 (51.5)
Hypertension	162 (40.5)
IHD	133 (33.2)
Diabetes mellitus	114 (28.5)
F/H/O premature CAD	65 (16.3)
Obesity	25 (6.3)
Tobacco chewing	9 (2.3)
TIA/ischemic stroke	6 (1.5)
Physical activity status	
Light	170 (42.5)
Moderate	125 (31.3)
Vigorous	105 (26.3)
Rural	320 (80)
Urban	80 (20)

Continued

Socioeconomic status (modified B. G. Prasad)	
Social Class I	117 (29.3)
Social Class II	85 (21.3)
Social Class III	124 (3)
Social Class IV	66 (16.5)
Social Class V	8 (2)
Education	
Illiterate	96 (24)
Primary	60 (15)
Upper primary	64 (16)
Secondary	88 (22)
Senior secondary	35 (8.8)
Undergraduate	53 (13.3)
Postgraduate	4 (1)

CAD: Coronary artery disease; IHD: Ischemic heart disease; SD: Standard deviation; TIA: Transient ischemic attack.

Table 2. Clinical parameters of patients.

Clinical parameters	Patients (N = 400), N (%)
Cardiac marker positive	100 (25)
Diagnosis	
AWMI	34 (8.5)
IWMI	36 (9)
LWMI	6 (1.5)
NSTEMI	51 (12.75)
USA	273 (68.25)
Main symptoms	
Chest pain	346 (86.5)
Dyspnea	23 (5.8)
Chest heaviness	14 (3.5)
Uneasiness	3 (0.8)
Jaw pain	1 (0.3)
Left arm pain	4 (1)
Palpitation	4 (1)
Shoulder pain	1 (0.3)
Sweating	2 (0.5)
Throat pain	2 (0.5)

Continued

Intensity of preceding activity	
No physical activity	67 (16.8)
Light physical activity	247 (61.8)
Moderate physical activity	5 (1.3)
Vigorous physical activity	81 (20.3)
Killip class	
	(N = 76)
Class I	55 (13.75)
Class II	17 (4.25)
Class III	1 (0.25)
Class IV	3 (0.75)

AWMI: Anterior wall myocardial infarction; IWMI: Inferior wall myocardial infarction; LWMI: Lateral wall myocardial infarction; NSTEMI: Non-ST-elevation myocardial infarction; USA: Unstable angina.

In majority of the cases, the patients were performing light physical activity before developing ACS (61.8%), followed by vigorous physical activity (20.3%) and no physical activity (16.8%). Out of 76 patients with STEMI, 55 patients belong to Killip I and 17 patients belong to Killip II. Only 1 patient was in Killip III and 3 patients were in Killip IV.

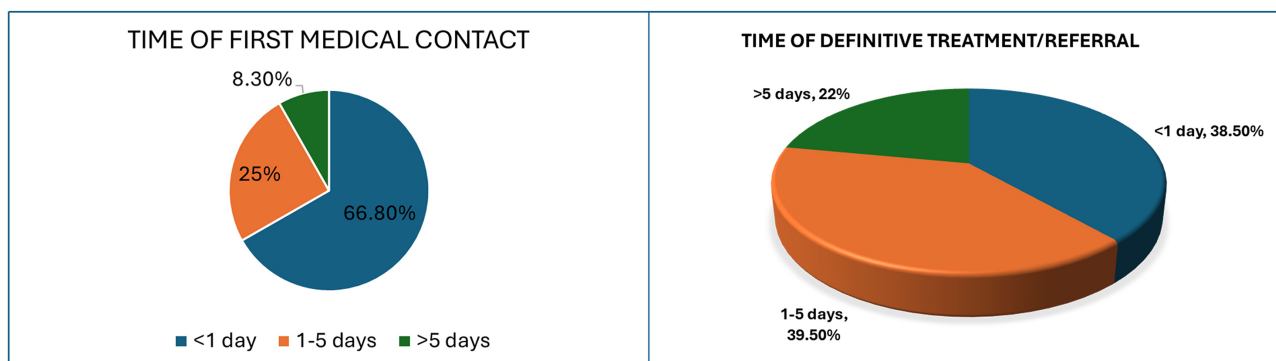


Figure 2. Time taken by patients to seek medical help.

There was considerable variability in the time taken by patients to seek medical attention after experiencing symptoms. As shown in **Figure 2**, within the first 24 hours, 66.8% of the patients sought medical assistance and only 38.5% of the patients received definitive treatment, suggesting of significant delay in treatment. Unstable angina is the most common type of ACS (68%), followed by STEMI (19%) and NSTEMI (12.75%). Out of 19% of STEMI patients, IWMI (9%) is the most common, followed by AWMI (8.5%) and LWMI (1.5%).

Coronary angiography revealed that 39% of patients had single vessel disease (SVD), 23.5% had double vessel disease (DVD), and 27.5% had triple vessel disease (TVD) as shown in **Table 3**.

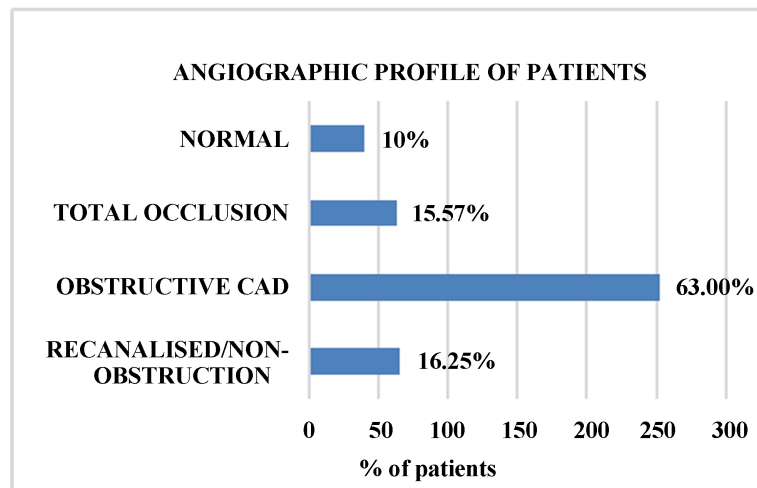


Figure 3. Graph showing angiographic profile of patients.

Table 3. Angiographic profile of patients.

Angiographic Profile	Patients (N = 400). N (%)
Angiographic findings	
Recanalized/non-obstructive	65 (16.25)
Obstructive CAD	252 (63)
Total occlusion	63 (15.75)
Normal	40 (10)
Coronary artery involved	
LAD	317 (79.2)
LCX	150 (37.5)
RCA	223 (55.7)
Left main	55 (14)
Number of people with coronary arteries diseased	
Normal	40 (10)
SVD	156 (39)
DVD	94 (23.5)
TVD	110 (27.5)

CAD: Coronary artery disease; DVD: Double vessel disease; LAD: Left anterior descending; LCX: Left circumflex; RCA: Right coronary artery; SVD: Single vessel disease; TVD: Triple vessel disease.

Obstructive CAD was the most prevalent, affecting 63% of the patients, and recanalized/non-obstruction was observed in 16.25% of patients. Total occlusion was found in 15.75% of patients and normal coronary arteries were found in 10% of participants. **Figure 3** depicts the angiographic profile of patients.

LAD was the most commonly affected vessel in the study population (317 [79.2%]). The right coronary artery (RCA) was affected in 223 patients (55.7%),

LCX was affected in 150 patients (37.5%), and the left main coronary artery was affected in 55 patients (14%).

Descriptive data regarding the angiographic pattern seen in various coronary arteries shown in **Figure 4**.

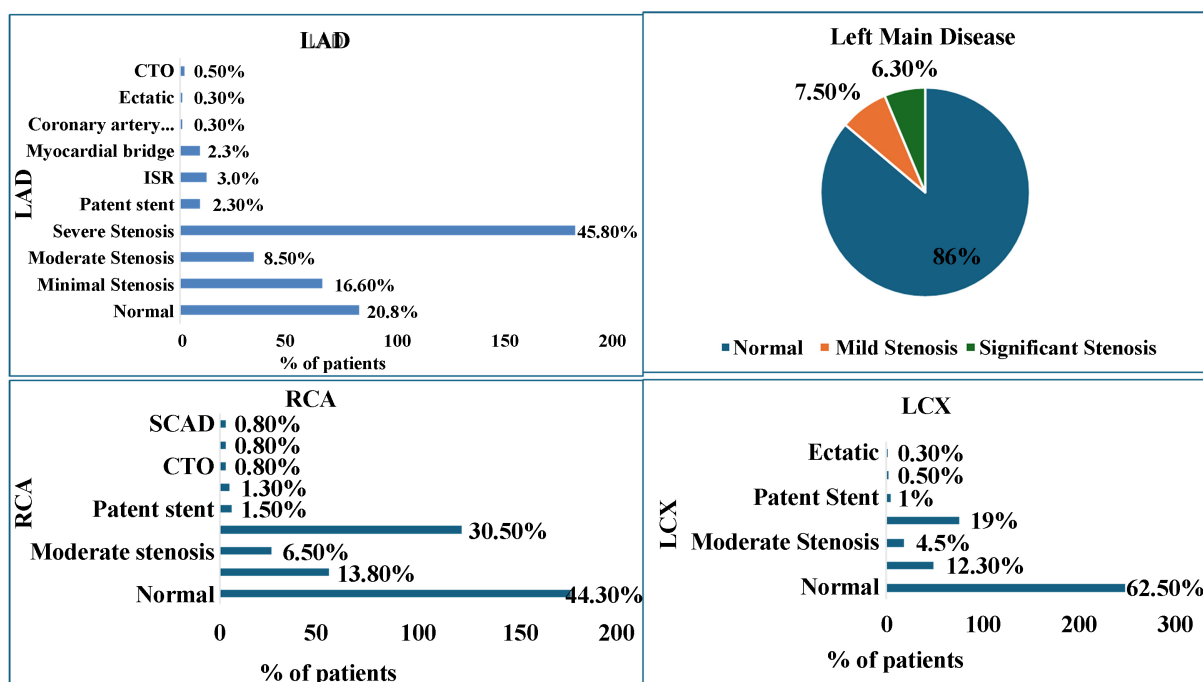


Figure 4. Graphic representation of angiographic pattern seen in coronary arteries.

Mean Gensini score is 33.24 ± 34.67 (0.00 - 152.00). Patients were divided into three groups based on their Gensini score: the first tertile (Gensini score <11 points), the second tertile (Gensini score 11 - 38 points), and the third tertile (Gensini score >38 points). **Figure 5** shows that 33.2% of patients belong to Group I, 34.2% belong to Group II, and 32.5% belong to Group III.

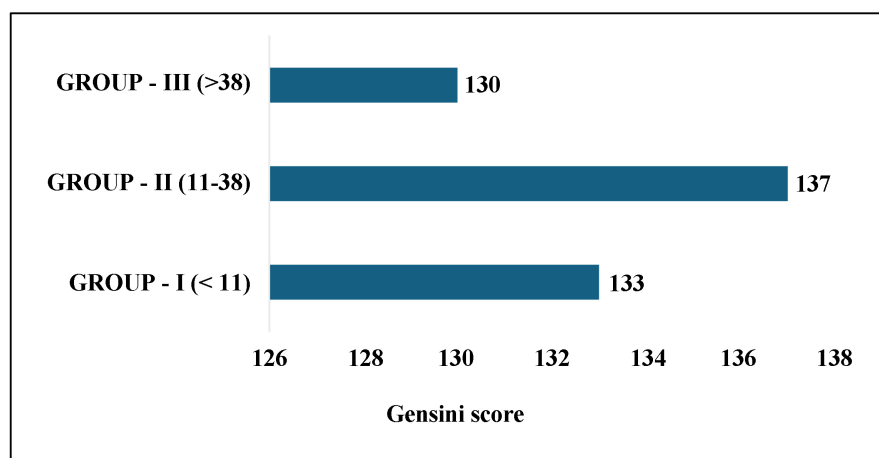


Figure 5. Distribution of Gensini score in patients' arteries.

Discussion: This prospective study, which was carried out in the state of Har- yana, is the first of its kind to investigate the demographic, clinical, and coronary angiographic profiles of patients diagnosed with ACS. The mean age of the study population was 55 ± 11.78 years. The most common age groups presenting with ACS were 51 - 60 years, 41 - 50 years, and 61 - 70 years, with 114 (28.5%), 105 (26.3%), and 103 (25.8%) cases, respectively. Similar observations were reported by the CREATE registry (2008) [3], the Kerala ACS registry (2009) [4], Sharma *et al.* (2017) [27], Bansal *et al.* (2016) [28], Nayak *et al.* (2022) [29], and Adil *et al.* (2023) [30]. In the study conducted by Ahsan *et al.*, the mean age of the partici- pants was 47.74 ± 12.23 years [31].

In the present study, out of 400 cases of ACS studied, 283 (70.75%) were males and 117 (29.25%) were females, with a male and female ratio of 2.4:1. Similar to our study, various other authors, such as the CREATE registry (2008) [3], the Ker- ala ACS registry (2009) [4], Deshmukh *et al.* (2019) [32], and Mohamed *et al.* (2019) [33], had shown male predominance. The number of female participants was smaller, which is in line with the records from earlier studies. One potential reason for this is the variation not just in gender inequalities across different global locations, but also in a variety of aspects, including accessibility to healthcare, local practices, and the availability of resources. Culture, economy, and the provision of healthcare are the areas in which there are major differences across the world.

Premature CAD (males <45 years; females <55 years) was found in 111 patients (27.8%), whereas Khan HU *et al.* (2014) [34] found 12% of patients aged <40 years having CAD.

The majority of the study population in the present study belonged to rural areas (80%) and was illiterate (24%) similar to the study conducted by Sharma YP *et al.* (2021) [35]. However, the study conducted by Gupta *et al.* (2020) [36] in- cluded the majority of the study population from urban and semi-urban regions. In the present study, 43% of patients had occupations with light physical activity based on metabolic equivalents, which is consistent with the data from the study conducted by Nayak *et al.* [29].

In the present study, the largest proportion of participants relates to Grade III of the Modified B. G. Prasad socioeconomic scale, comprising 31.0% of the cohort. Similar to our observation, Gupta *et al.* (2020) [36] had a majority of patients be- longing to the middle-class group, whereas the majority of the patients in studies from Sidhu *et al.* (2020) [37] and Ahsan *et al.* (2023) [31] belonged to lower soci- oeconomic backgrounds.

Risk factors such as a family history of CAD, dyslipidemia, hypertension, dia- betes mellitus (DM), smoking, and obesity play a role in the development of CAD. In the current study, 16% of patients had a positive family history of CAD, whereas a study by Mirza *et al.* (2018) found that 24% of patients had such a his- tory [38]. There is a similarity in the results, and an easy comparison can be made between them. Results of the current study showed that 28% of the patients had

diabetes, 40% had hypertension, 51% were smokers, and 6% were obese. The present study showed that a family history of CAD at an early stage and smoking are two of the most significant risk factors for ACS. As per a study conducted by Ahsan *et al.* (2023) [31], patients diagnosed with CAD tended to have high rates of both diabetes and hypertension as risk factors. Similar to our observation, smoking was found to be an important risk factor in the studies conducted by Mohamed *et al.* (2019) [33], Deshmukh *et al.* (2019) [32], and Gupta *et al.* (2020) [36]. There is a correlation between smoking and increased risk of developing CAD.

One of the most important factors that determine the treatment, outcomes, and prognosis of patients experiencing ACS is the timing of their initial contact with medical professionals [39]. When it comes to cases of ACS, fast access to medical care is absolutely necessary [40]. This is especially true in the case of STEMI, where prompt reperfusion therapy has the potential to significantly improve survival rates and reduce mortality. Within the first 24 hours, around 67% of the patients sought medical assistance, but only 38.5% of the patients got definitive treatment, which was statistically significant in relation to the diagnosis of ACS, as demonstrated by the findings of the current study. This can be attributed to illiteracy, misinterpretation of symptoms, lack of rapid transport modalities like ambulances, lack of hospitals equipped with percutaneous coronary intervention/coronary artery bypass grafting, and inadequacy of financial resources. Similarly, in the study conducted by Revaiah *et al.* [41], the median time to first medical contact and revascularization was 5 hours and 48 hours, respectively, whereas in the CREATE registry (2008) [3], the median time from symptoms to hospital was 6 hours, with 50 (25 - 68) minutes from hospital to thrombolysis. Sharma YP *et al.* (2021) [35] conducted a study and found that the median time to hospital admission was 10 hours for STEMI patients.

The most common symptom at the time of presentation was chest pain, found in 86.5% of patients, followed by dyspnea, found in 5.8% of patients, which is similar to a study by Bansal *et al.* [28] As per the Kerala ACS registry (2009) [4], Sharma *et al.* (2014) [6], Gupta *et al.* (2020) [36], and Revaiah *et al.* [41], STEMI was the most common kind of ACS. However, as per the present study, the most prevalent form of ACS was found to be USA, which accounted for 68% of all cases, followed by STEMI (19%) and NSTEMI (12.75%). Similarly, USA was found to be the most prevalent presentation in the study conducted by Ahsan *et al.* (2023) [31].

Out of 19% of STEMI patients, IWMI (9%) was the most common, followed by AWTMI (8.5%) and LWMI (1.5%). In contrast to the results of the present study, AWTMI was the most common STEMI in studies conducted by Deshmukh *et al.* (2019) [32] and Gupta *et al.* (2020) [36]. Revaiah *et al.* [41] observed that the most common diagnosis was AWTMI (58%), followed by IWMI (23%) and NSTEMI-ACS (18%). Killip I was the most common class as per the present study, showing concordance with earlier studies, namely Sharma *et al.* (2017) [27].

Coronary angiography revealed that 10% of patients had normal coronary

arteries. Non-obstructive CAD was present in 16.25% of patients, while 63% were diagnosed with obstructive CAD, which is comparable to other studies like Deshmukh *et al.* (2019) [32] and Raju *et al.* (2023) [42] where obstructive CAD was found in 61% and 70.3%, respectively. Normal coronary arteries were reported in 22.25% and 35% of patients in a study by Adil *et al.* (2023) [30] and Ahsan *et al.* (2023) [31], respectively.

Coronary angiography revealed that 39% of patients had SVD, 23.5% had DVD, and 27.5% had TVD. SVD was found to be dominant in other studies as well, such as studies by Sidhu *et al.* (2020) [37] and Sharma YP *et al.* (2021) [35]. DVD was found to be most common in the study by Adil *et al.* (2023) [30].

Our study revealed LAD as the most commonly involved vessel in 317 patients (79.2%), followed by RCA in 223 patients (55.7%), LCX in 150 patients (37.5%), and the left main (LM) in 55 patients (14%). Results similar to the current study were seen in various studies, namely Bansal *et al.* (2016) [28], Sharma *et al.* (2017) [27], and Khan *et al.* (2020) [34].

3. Limitations

The findings cannot be extended to the entire population because the study was carried out for a short duration at a single facility, which is one of the characteristics that limit its applicability. To understand the outcomes of the patients, medical treatment, interventions, and complications, long-term follow-up is required. The study lacks long-term follow-up of patients, limiting insights into treatment outcomes, complications, and mortality. Without outcome data, the study's clinical significance was diminished, as it primarily focused on baseline characteristics and angiographic findings.

4. Conclusion

The purpose of this study is to provide a comprehensive analysis of the demographic, clinical, and coronary angiographic characteristics of patients who have ACS. This is the first study that has been conducted on the population of Haryana. According to our research, patients with ACS are typically men from rural areas. Unstable angina is the most common presentation, with a predominance of SVD, and LAD is the most common artery involved. Our research findings indicate that smoking is the most significant modifiable risk factor. It is of utmost importance to make efforts to modify these risk factors by educating people.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Zègre-Hemsey, J.K., Asafu-Adjei, J., Fernandez, A. and Brice, J. (2019) Characteristics of Prehospital Electrocardiogram Use in North Carolina Using a Novel Linkage of Emergency Medical Services and Emergency Department Data. *Prehospital*

- Emergency Care*, **23**, 772-779. <https://doi.org/10.1080/10903127.2019.1597230>
- [2] Huffman, M.D., Prabhakaran, D., Osmond, C., Fall, C.H.D., Tandon, N., Lakshmy, R., et al. (2011) Incidence of Cardiovascular Risk Factors in an Indian Urban Cohort. *Journal of the American College of Cardiology*, **57**, 1765-1774. <https://doi.org/10.1016/j.jacc.2010.09.083>
- [3] Xavier, D., Pais, P., Devereaux, P., Xie, C., Prabhakaran, D., Reddy, K.S., et al. (2008) Treatment and Outcomes of Acute Coronary Syndromes in India (CREATE): A Prospective Analysis of Registry Data. *The Lancet*, **371**, 1435-1442. [https://doi.org/10.1016/s0140-6736\(08\)60623-6](https://doi.org/10.1016/s0140-6736(08)60623-6)
- [4] Mohanan, P.P., Mathew, R., Harikrishnan, S., Krishnan, M.N., Zachariah, G., Joseph, J., et al. (2012) Presentation, Management, and Outcomes of 25 748 Acute Coronary Syndrome Admissions in Kerala, India: Results from the Kerala ACS Registry. *European Heart Journal*, **34**, 121-129. <https://doi.org/10.1093/eurheartj/ehs219>
- [5] Negi, P.C., Merwaha, R., Panday, D., Chauhan, V. and Guleri, R. (2016) Multicenter HP ACS Registry. *Indian Heart Journal*, **68**, 118-127. <https://doi.org/10.1016/j.ihj.2015.07.027>
- [6] Sharma, R., Bhairappa, S., Prasad, S. and Manjunath, C. (2014) Clinical Characteristics, Angiographic Profile and in Hospital Mortality in Acute Coronary Syndrome Patients in South Indian Population. *Heart India*, **2**, 65-69. <https://doi.org/10.4103/2321-449x.140228>
- [7] Krishnan, M.N., Zachariah, G., Venugopal, K., Mohanan, P.P., Harikrishnan, S., Sanjay, G., et al. (2016) Prevalence of Coronary Artery Disease and Its Risk Factors in Kerala, South India: A Community-Based Cross-Sectional Study. *BMC Cardiovascular Disorders*, **16**, Article No. 12. <https://doi.org/10.1186/s12872-016-0189-3>
- [8] Prabhakaran, D., Jeemon, P. and Roy, A. (2016) Cardiovascular Diseases in India. *Circulation*, **133**, 1605-1620. <https://doi.org/10.1161/circulationaha.114.008729>
- [9] Sreeniwas Kumar, A. and Sinha, N. (2020) Cardiovascular Disease in India: A 360 Degree Overview. *Medical Journal Armed Forces India*, **76**, 1-3. <https://doi.org/10.1016/j.mjafi.2019.12.005>
- [10] Ahmad, N. (2005) Is Coronary Heart Disease Rising in India? A Systematic Review Based on ECG Defined Coronary Heart Disease. *Heart*, **91**, 719-725. <https://doi.org/10.1136/hrt.2003.031047>
- [11] Thygesen, K., Alpert, J.S., Jaffe, A.S., Chaitman, B.R., Bax, J.J., Morrow, D.A., et al. (2018) Fourth Universal Definition of Myocardial Infarction (2018). *Circulation*, **138**, e618-e651. <https://doi.org/10.1161/cir.0000000000000617>
- [12] Amsterdam, E.A., Wenger, N.K., Brindis, R.G., Casey, D.E., Ganiats, T.G., Holmes, D.R., et al. (2014) 2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes. *Journal of the American College of Cardiology*, **64**, e139-e228. <https://doi.org/10.1016/j.jacc.2014.09.017>
- [13] Physical Activity Guidelines Advisory Committee (2008) Physical Activity Guidelines Advisory Committee Report, 2008. US Department of Health and Human Services.
- [14] American Diabetes Association (2020) 2. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes—2021. *Diabetes Care*, **44**, S15-S33. <https://doi.org/10.2337/dc21-s002>
- [15] Whelton, P.K., Carey, R.M., Aronow, W.S., Casey, D.E., Collins, K.J., Dennison Himmelfarb, C., DePalma, S.M., Gidding, S., Jamerson, K.A., Jones, D.W. and MacLaughlin, E.J. (2017) ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA

- Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Journal of the American College of Cardiology*, **71**, e127-e248.
- [16] Knapper, J.T., Khosa, F., Blaha, M.J., Lebeis, T.A., Kay, J., Sandesara, P.B., *et al.* (2015) Coronary Calcium Scoring for Long-Term Mortality Prediction in Patients with and without a Family History of Coronary Disease. *Heart*, **102**, 204-208. <https://doi.org/10.1136/heartjnl-2015-308429>
- [17] Khoja, A., Andraweera, P.H., Lassi, Z.S., Zheng, M., Pathirana, M.M., Ali, A., *et al.* (2021) Risk Factors for Premature Coronary Artery Disease (PCAD) in Adults: A Systematic Review Protocol. *F1000Research*, **10**, 1228. <https://doi.org/10.12688/f1000research.74926.1>
- [18] National Institutes of Health (1998) Clinical Guidelines for the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults—The Evidence Report. *Obesity Research*, **6**, 51S-209S.
- [19] Pentapati, S.S.K. and Debnath, D.J. (2023) Updated BG Prasad's Classification for the Year 2022. *Journal of Family Medicine and Primary Care*, **12**, 189-190. https://doi.org/10.4103/jfmprc.jfmprc_1478_22
- [20] (2024) Indian Standard Classification of Education. Gov.in. https://www.education.gov.in/sites/upload_files/mhrd/files/statistics-new/In-SCED2014.pdf
- [21] Lee, K.L., Woodlief, L.H., Topol, E.J., Weaver, W.D., Betriu, A., Col, J., *et al.* (1995) Predictors of 30-Day Mortality in the Era of Reperfusion for Acute Myocardial Infarction. *Circulation*, **91**, 1659-1668. <https://doi.org/10.1161/01.cir.91.6.1659>
- [22] Bhatt, D.L. (2015) Cardiovascular Intervention: A Companion to Braunwald's Heart Disease. Elsevier.
- [23] Levine, G.N., Bates, E.R., Blankenship, J.C., Bailey, S.R., Bittl, J.A., Cercek, B., Chambers, C.E., Ellis, S.G., Guyton, R.A., Hollenberg, S.M. and Khot, U.N. (2011) ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. *Journal of the American College of Cardiology*, **58**, e44-e122.
- [24] Gensini, G.G. (1983) A More Meaningful Scoring System for Determining the Severity of Coronary Heart Disease. *The American Journal of Cardiology*, **51**, 606. [https://doi.org/10.1016/s0002-9149\(83\)80105-2](https://doi.org/10.1016/s0002-9149(83)80105-2)
- [25] Yokokawa, T., Yoshihisa, A., Kiko, T., Shimizu, T., Misaka, T., Yamaki, T., *et al.* (2020) Residual Gensini Score Is Associated with Long-Term Cardiac Mortality in Patients with Heart Failure after Percutaneous Coronary Intervention. *Circulation Reports*, **2**, 89-94. <https://doi.org/10.1253/circrep.cr-19-0121>
- [26] O'Gara, P.T., Kushner, F.G., Ascheim, D.D., Casey, D.E., Chung, M.K., De Lemos, J.A., Ettinger, S.M., Fang, J.C., Fesmire, F.M., Franklin, B.A. and Granger, C.B. (2013) ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology*, **61**, e78-e140.
- [27] Sharma, S., Rashid, A., Ashraf, M., Ismail, M., Tanvir, M., Sharma, P., *et al.* (2017) Clinical Profile of Acute Coronary Syndromes (ACS) in North Indian Population: A Prospective Tertiary Care Based Hospital Study. *Annals of International Medical and Dental Research*, **2**, 50-53. <https://doi.org/10.21276/aimdr.2017.3.5.me11>

- [28] Lal Bansal, B. and P J, A. (2016) Study of Risk Factors, Clinical Profiles and Angiographic Patterns in Patients of Coronary Artery Disease in a Tertiary Care Centre in Chhattisgarh. *Journal of Evolution of Medical and Dental Sciences*, **5**, 7638-7648. <https://doi.org/10.14260/jemds/2016/1724>
- [29] Nayak, M., Patel, D., Chaturvedi, A. and Shah, A. (2022) Recent Trends in the Pattern and Long-Term Management Strategy of Patients Diagnosed with Acute Coronary Syndrome in India: An Observational Study. *International Journal of Research in Medical Sciences*, **10**, 2144-2149. <https://doi.org/10.18203/2320-6012.ijrms20222373>
- [30] Adil, M., Iqbal, M.A., Hassan, Z., Ullah, M., Ahmed, S. and Khan, M.S. (2023) Clinical Profile, Angio-Graphic Profile and Outcome in Acute Coronary Syndrome Patients in a Tertiary Care Hospital. *Journal of Postgraduate Medical Institute*, **37**, 109-113.
- [31] Ahsan, M.M., Shahidul Haque, S.M., Sultana, S., Sarker, A.C., Hossain, M.S., Siddiqui, M.K., Jamil, A.B. and Faruq, M.F. (2023) Clinical Characteristics, Risk Factors and Angiographic Profile of Patients Undergoing Coronary Angiography in a Tertiary Care Hospital. *Cardiology and Cardiovascular Medicine*, **7**, 1-4.
- [32] Deshmukh, P.P., Singh, M.M., Deshpande, M.A. and Rajput, A.S. (2019) Clinical and Angiographic Profile of Very Young Adults Presenting with First Acute Myocardial Infarction: Data from a Tertiary Care Center in Central India. *Indian Heart Journal*, **71**, 418-421. <https://doi.org/10.1016/j.ihj.2019.12.004>
- [33] Bashandy, M., Abd Elgalil, H. and Abou Elhassan, H.E. (2019) Epidemiological and Clinical Profile of Acute Coronary Syndrome of Egyptian Patients Admitted to the Coronary Care Unit, Al-Azhar University Hospital, New Damietta. *The Scientific Journal of Al-Azhar Medical Faculty, Girls*, **3**, 625-634. https://doi.org/10.4103/sjamf.sjamf_74_19
- [34] Khan, H.U., Khan, M.U., Noor, M.M., Hayat, U. and Alam, M.A. (2014) Coronary Artery Disease Pattern: A Comparison among Different Age Groups. *Journal of Ayub Medical College Abbottabad*, **26**, 466-469.
- [35] Sharma, Y.P., Santosh Vemuri, K., Bootla, D., Kanabar, K., Pruthvi, C.R., Kaur, N., et al. (2021) Epidemiological Profile, Management and Outcomes of Patients with Acute Coronary Syndrome: Single Centre Experience from a Tertiary Care Hospital in North India. *Indian Heart Journal*, **73**, 174-179. <https://doi.org/10.1016/j.ihj.2020.11.149>
- [36] Gupta, M.D., MP, G., Kategari, A., Batra, V., Gupta, P., Bansal, A., et al. (2020) Epidemiological Profile and Management Patterns of Acute Myocardial Infarction in Very Young Patients from a Tertiary Care Center. *Indian Heart Journal*, **72**, 32-39. <https://doi.org/10.1016/j.ihj.2020.03.003>
- [37] Sidhu, N.S., Rangaiah, S.K.K., Ramesh, D., Veerappa, K. and Manjunath, C.N. (2020) Clinical Characteristics, Management Strategies, and In-Hospital Outcomes of Acute Coronary Syndrome in a Low Socioeconomic Status Cohort: An Observational Study from Urban India. *Clinical Medicine Insights: Cardiology*, **14**, 1-7. <https://doi.org/10.1177/1179546820918897>
- [38] Mirza, A.J., Taha, A.Y. and Khdir, B.R. (2018) Risk Factors for Acute Coronary Syndrome in Patients Below the Age of 40 Years. *The Egyptian Heart Journal*, **70**, 233-235. <https://doi.org/10.1016/j.ehj.2018.05.005>
- [39] Santos, R.C.D.O.D., Goulart, A.C., Kisukuri, A.L.X., Brandão, R.M., Sitnik, D., Staniak, H.L., et al. (2016) Time-to-Treatment of Acute Coronary Syndrome and First Contact in the ERICO Study. *Arquivos Brasileiros de Cardiologia*, **107**, 323-330. <https://doi.org/10.5935/abc.20160138>
- [40] Kumar, A. and Cannon, C.P. (2009) Acute Coronary Syndromes: Diagnosis and

Management, Part I. *Mayo Clinic Proceedings*, **84**, 917-938.

<https://doi.org/10.4065/84.10.917>

- [41] Revaiah, P.C., Vemuri, K.S., Vijayvergiya, R., Bahl, A., Gupta, A., Bootla, D., *et al* (2021) Epidemiological and Clinical Profile, Management and Outcomes of Young Patients (≤ 40 Years) with Acute Coronary Syndrome: A Single Tertiary Care Center Study. *Indian Heart Journal*, **73**, 295-300. <https://doi.org/10.1016/j.ihj.2021.01.015>
- [42] Raju, V. (2023) Clinical and Angiographic Profile in Non-St Elevation Acute Coronary Syndrome (NSTEMI-ACS) and Chronic Stable Angina: A Tertiary Care Centre-Based Cohort Study from Southern Indian Population. *Cureus*, **15**, e38369. <https://doi.org/10.7759/cureus.38369>