Original Research Article

Recent trends in the pattern and long-term management strategy of patients diagnosed with acute coronary syndrome in India: an observational study

Mithilesh Nayak[1]*, Dixit Patel[1], Alok Chaturvedi[1], Ankita Shah[2]

[1]Medical Affairs, Intas Pharmaceuticals Limited, Ahmedabad, Gujarat, India
[2]Biostatistics and Programming, Lambda Therapeutic Research Ltd., Ahmedabad, Gujarat, India

*Correspondence:
Dr. Mithilesh Nayak,
E-mail: mithilesh_nayak@intaspharma.com

ABSTRACT

Background: The understanding of demographic patterns and the real-world management practices for patients with acute coronary syndrome (ACS) will facilitate optimizing the management strategies for ACS based on the patient's clinical profile and the associated risk factors in Indian patients. Hence, this study determined the demographic details and the treatment patterns in Indian patients with ACS.

Methods: The RECent trends in the pattern and lOng-term management stRategy of patients Diagnosed with acute coronary syndrome in India (RECORD ACS-2) study was a real-world, retrospective, cross-sectional, observational study conducted at various centres across India between 2021 and 2022. The study outcomes included the demographic profile and therapeutic management in patients with ACS.

Results: A total of 9945 patients with a mean age of 59 years were included. The ACS was commonly observed in the age group of 41-70 years with highest incidence in the age group of 51-60 years. The ST-elevation myocardial infarction (STEMI) was most common (53.2%) presentation. Hypertension (37.2%) and dyslipidemia (29.3%) followed by diabetes (21.3%) were the most common comorbidities. Single vessel disease was the most common angiographic feature (58%). Percutaneous coronary intervention was the most preferred management strategy (57%). Ticagrelor was the most preferred loading (68.3%) as well as maintenance (71.2%) P2Y12 inhibitor in ACS patients. Most of the patients (81.8%) had received high intensity statin therapy for the secondary prevention of the disease.

Conclusions: The prevalence of ACS was high between 51-60 years of age, more so in males, smokers, and physically less active patients. Associated comorbidities were hypertension, dyslipidemia and diabetes. Incidence of STEMI was high, and more than half of the patients underwent PCI. Ticagrelor was the most preferred P2Y12 inhibitor in ACS patients for loading as well as maintenance therapy.

Keywords: ACS, STEMI, Cardiovascular, Coronary artery disease

INTRODUCTION

Acute coronary syndrome (ACS) is a spectrum of diseases comprising unstable angina (UA), ST segment elevation myocardial infarction (STEMI) and non-STEMI. It is the leading cause of death in cardiovascular diseases (CVDs) and represents a significant aspect of its clinical presentation.[1] Currently, among developing nations, India is experiencing the fastest epidemiological transformation from communicable to non-communicable diseases, and it is marked by the high burden of non-communicable atherothrombotic diseases.[2]

As compared to the western countries, coronary arterial disease (CAD) epidemiology in India is characterized by premature incidence in the young and low-to-middle

income community, high mortality and high diabetes prevalence.[3] According to the reported data, patients with ACS in India have a higher proportion of STEMI as compared to developing countries.[4] The commonly employed pharmacotherapy includes aspirin, clopidogrel, statins, angiotensin converting enzyme inhibitor (ACEi)/angiotensin receptor blocker (ARBs) and β-blockers.[5] The potent anti-platelet agents such as prasugrel and ticagrelor are also available in India.[6]

For the treatment of ACS with or without ST-segment elevation, ticagrelor and prasugrel have been proven to significantly reduce the rate of ischemic events.[7] During the last decade, India has witnessed a significant growth in the hospital infrastructure, quality of care and centres enabled with infrastructure for percutaneous coronary intervention (PCI).[8] It is vital to understand the basic demographic pattern of disease and management approach for ACS patients. The findings of the study will aid in optimizing management strategies for ACS in Indian patients. The present observational study was designed to determine the demographic details and initial management approach in Indian patients with ACS.

METHODS

Study design

RECent trends in the pattern and lOng-term management stRategy of patients Diagnosed with acute coronary syndrome in India (RECORD ACS-2) was a retrospective, cross-sectional, data capture form based observational study conducted between April 2021 and March 2022. The data was collected from multiple centres across India including hospitals, clinics and health care institutes. The data was captured by the clinicians at respective center on the predesigned data capture form in a retrospective manner.

The data collected in the forms included demographic details (age, gender, weight), diagnosis, history of smoking, comorbidities, level of physical activity, number of vessels involved, adopted treatment strategies, details of used antiplatelet and lipid lowering agents.

Sample size and statistical analysis

In this real-world study, patients' data was collected retrospectively without any predetermined sample size. The study did not test any hypothesis and only the observations from patient's records were analyzed. The data collected from various centres across India was compiled and statistical analysis was performed at Lambda Therapeutic Research Limited, Ahmedabad, India. Demographic and baseline characteristics were summarized using descriptive statistics. Categorical variables were summarized with frequency and percentage. Continuous variables were summarized with count, mean, standard deviation, etc. Graphical presentation of data was done using bar chart as

appropriate. Statistical analyses were performed using SAS® version 9.4 (SAS institute inc., USA).

Study endpoints

The study endpoints included basic demographic data like the age and gender wise distribution, proportion of different types of ACS patients, proportion of ACS patients with comorbid conditions, smoking history, and physical activity. It also included management strategies like angiographic classification of ACS, proportion of patients managed with invasive/pharmaco-invasive/non-invasive strategy, type and loading dose of antiplatelet agents, and choice of maintenance antiplatelet therapy.

Ethics statement

As per the Indian council of medical research 'ethical guidelines for biomedical research on human participants', the study protocol presented less than minimal risk.[4] The study protocol was approved by independent Bio-smart ethics committee, Ahmedabad, India. As it was a retrospective study without patient identifiers, informed consent of patients was not obtained. No confidentiality of the data was breached during its analysis and interpretation.

RESULTS

A total of 9945 patients with a mean age of 59 years (males-7099 [71.38%], females-2846 [28.62%]) were included in this study. The prevalence of ACS was predominantly observed in the age group of 41-70 years with highest incidence (39.2%) in the age group of 51-60 years (Table 1). Most common associated comorbidities were hypertension (37.2%) and dyslipidemia (29.3%) followed by diabetes (21.3%). About half (44.3%) of the male patients were smokers, while only 2.3% female patients were smokers. The level of physical activity in majority of the patients (79.9%) was 'light active' to 'not very active'. Single vessel disease was the most common angiographic feature (58%) in these ACS patients (Table 2). The prevalence of STEMI (53.2%) was the commonly reported ACS presentation followed by NSTEMI (28%) and unstable angina (18.7%) (Figure 1).
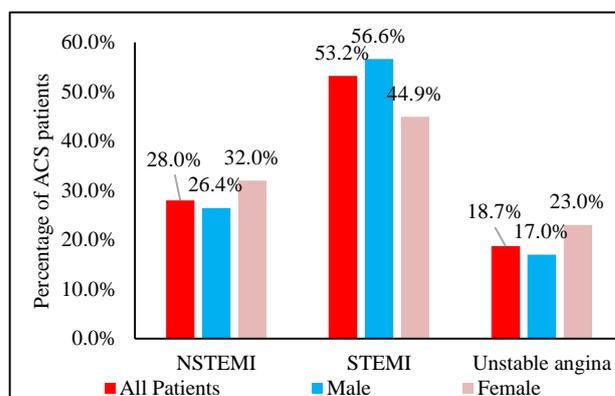

Figure 1: Distribution for different types of ACS.

Table 1: Demographic details.

Parameters	
Mean age in years (range), mean (SD)	59 (21-100)
Age group (in years), N (%)	
21-30	10 (0.1)
31-40	179 (1.8)
41-50	1621 (16.3)
51-60	3898 (39.2)
61-70	3073 (30.9)
71-80	935 (9.4)
81-90	179 (1.8)
91-100	50 (0.5)
Weight (kg), mean (SD)	75.05 (11.62)
Gender, N (%)	
Male	7099 (71.38)
Female	2846 (28.62)
Physical activity, N (%)	
Very active	159 (1.6)
Active	1392 (14)
Lightly active	4754 (47.8)
Not very active	3192 (32.1)
Smoking habit, N (%)	3209 (32.3)
Comorbid diseases, N (%)	
Hypertension	3701 (37.21)
Dyslipidemia	2911 (29.27)
Diabetes	2120 (21.32)
History of MI	452 (4.55)
Heart Failure	451 (4.53)
Cerebrovascular disease	90 (0.9)

Table 2: Number of vessels involved in ACS patients.

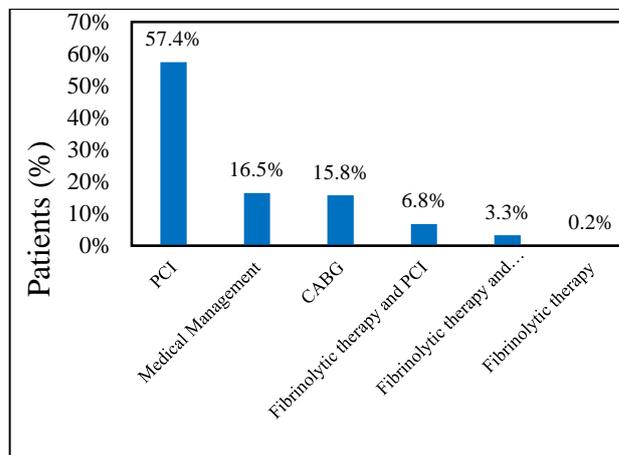| Parameters	N (%)
No. of vessels involved	
Single vessel disease	5766 (57.98)
Multi vessel disease	3312 (33.3)
Bifurcation lesion	484 (4.87)
Not available	383 (3.85)

Treatment profile in ACS patients

The PCI was the most preferred management strategy in 57% of the patients while medical management was offered to 16.5% of patients (Figure 2).

Ticagrelor (68.3%) was the most preferred loading P2Y12 inhibitor in ACS patients followed by clopidogrel (29.2%). Dual antiplatelet therapy (DAPT) was used in majority of patients (80%) as the maintenance therapy post discharge in ACS patients. Here also ticagrelor was the most commonly (71.2%) prescribed P2Y12 inhibitor followed by clopidogrel (26.7%) in ACS patients post discharge. As expected, aspirin was utilised in almost all patients as antiplatelet therapy both during loading and maintenance phase. The DAPT was received for ≥12 months by 62% of the patients. High bleeding risk was noted in 16.8% patients, of which 48.6% had received DAPT for ≤6 months. The choice of P2Y12 inhibitor as a loading strategy was not influenced by weight of the patients (Table 4).

Most of patients (81.8%) received high intensity statin therapy wherein atorvastatin prescribed to 58.2% of patients and rosuvastatin-40.8% patients. Total of 18.2% patients didn't receive high intensity statin therapy.

Figure 2: ACS management strategy.

Table 3: Treatment profile in ACS patients.

Parameter	N (%)
Loading P2Y12 inhibitor (mg)*	
Ticagrelor 180	6135 (68.31)
Prasugrel 30/ 60	228 (2.54)
Clopidogrel 150-600	2262 (29.2)
Maintenance P2Y12 inhibitor (mg)#	
Ticagrelor 90 BD	6524 (71.18)
Prasugrel 5/10	197 (2.15)
Clopidogrel 75/150	2444 (26.67)
Preferred lipid lowering therapy (mg)	
Atorvastatin 10	342 (3.4)
Atorvastatin 20	785 (7.9)
Atorvastatin 40	2928 (29.4)
Atorvastatin 80	1744 (17.5)
Rosuvastatin 10	588 (5.9)
Rosuvastatin 20	1342 (13.5)
Rosuvastatin 40	2128 (21.4)
Rosuvastatin 5	88 (0.9)

*Data available-8981 patients. #Data available-9165 patients.

Table 4: Selection of P2Y12 inhibitor as a loading strategy and average weight of patients.

P2Y12 inhibitor (mg)	Average weight (kg)	N (%)
Clopidogrel 150	73.1	929 (9.3)
Clopidogrel 300	75.1	1275 (12.8)
Clopidogrel 600	75.2	415 (4.2)
Prasugrel 30	73.5	68 (0.7)
Prasugrel 60	76.2	159 (1.6)
Ticagrelor 180	75.3	6135 (61.7)

DISCUSSION

The present observational study reports the demographic details and the treatment strategies of 9945 ACS patients across India. According to the findings, the most common associated modifiable risk factors included physical inactivity, hypertension and diabetes. STEMI was the most common presentation in ACS patients treated with PCI. Ticagrelor was the most preferred P2Y12 inhibitor as well as maintenance strategy and majority of patients received high intensity statin therapy for secondary prevention.

In the present study, the highest number of cases was among 51-60 years (39.2%) a finding similar to a study conducted in South India, which noted 31% in this age group.[9] On the contrary studies on migrant Asian Indians showed higher prevalence of acute myocardial infarction (AMI) at relatively younger ages.[10] The percentage of males was higher as compared to females (71.38% vs. 28.62%), a finding similar to 2 Pakistani studies wherein the percentages of male patients were 78% and 88.5% respectively.[11,12] Within country, a study from Kerala state reported 72.9% males with ACS while a study from Gujarat reported 71.7% males among STEMI cases.[12,13]

Associated comorbidities like diabetes and hypertension are modifiable risk factors of CVD.[14] In the present study, 21.32% had diabetes in accordance with global literature.[15] A study from Kerala reported a higher (31.47%) percentage of diabetes among STEMI patients with the hypothesis of positive relation.[16] Many studies have established a significant association between hypertension and CVD.[17] In the present study 37.21% of the subjects had hypertension. Various studies have linked cigarette smoking with an increased risk of CVD.[18] In the present study, 44.3% of males and 2.3% of females reported smoking. In the study from Kerala, smoking was a risk factor among 52.55% of cases, while the study from Gujarat had 28.3%, South Indian study had 76%, and in the North Bengal study, the prevalence of ischemic heart disease among smokers was significantly higher than in non-smokers.[13,16,19,20] Other published literature correlated smoking to be an important risk factor for CAD in Indian population.[21] The findings by global research groups have observed the protective role of physical activity with the onset of CVD.[22,23] In the present study the level of physical activity in majority of the patients (79.9%) was 'light active' to 'not very active and rising incidence of ACS in Indians has been related to lifestyle changes.[16] Literature reviews have reported sedentary lifestyles as an important determinant of CVD in India.[17]

The types of ACS in our study were different as compared to data summaries of developed countries.[24-27] About 53% of our study patients had STEMI, which was higher compared to developed countries, which reported about 40% incidence of STEMI.[24-27] This infers that Indian patients with ACS are likely to have poor outcomes as compared to their counterparts of developed nations.

According to the American heart association (AHA) and the American college of cardiology (ACC) guidelines, the door to balloon time should be within 90 minutes for STEMI patients.[28] Less than 50% of patients with STEMI underwent thrombolysis or PCI in the previously reported Indian ACS registries.[29] The treatment and outcomes of ACS were assessed in a large prospective CREATE registry study in India. It reported that 58.5% of STEMI patients received thrombolysis and only 8% of STEMI patients underwent PCI.[4] The current study reported a different trend where in about 57% of the patients underwent PCI, another 6.8% were thrombolysed followed by PCI, and about 15.8% underwent CABG.[4]

The use of dual anti-platelet agents (ticagrelor, prasugrel, clopidogrel) and statins (atorvastatin and rosuvastatin) was in line with the recommendations from the ACC/AHA guidelines in majority of patients.[5] This acknowledges the awareness of evidence-based treatments by Indian physicians, and the wide availability and the relatively low cost of generic drugs in India. Regulations in the pricing policy and execution of various national healthcare policies could have been the major factors contributing to the improvement in the treatment across the country.[30] The study strength encompasses the inclusion of patients across the country covered throughout the year overruling seasonal trends. The major limitation of the study was the treatment outcomes at various time intervals were not captured, besides the socio-economic status which influences type of treatment was also not included.

CONCLUSION

The prevalence of ACS was high between 51-60 years of age, more so in males, smokers, and physically inactive patients. Associated comorbidities were hypertension, dyslipidemia and diabetes. Incidence of STEMI was high, and more than half of the patients underwent PCI. Ticagrelor was the most preferred P2Y12 inhibitor in ACS patients for loading as well as maintenance therapy. The understanding of these parameters will facilitate the physicians in optimizing the management strategies for ACS patients in India.

ACKNOWLEDGEMENTS

REFERENCES

1. Isezuo S, Subban V, Krishnamoorthy J, Pandurangi UM, Janakiraman E, Kalidoss L et al. Characteristics, treatment and one-year outcomes of patients with acute coronary syndrome in a tertiary hospital in India. Indian Heart J. 2014;66:156-63.
2. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart. 2008;94:16-26.
3. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364:937-52.
4. Xavier D, Pais P, Devereaux PJ, Xie C, Prabhakaran D, Reddy KS et al. Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data. Lancet. 2008;371:1435-42.
5. Gulati M, Levy PD, Mukherjee D, Amsterdam E, Bhatt DL, Birtcher KK et al. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2021;144:e368-454.
6. Kaul U, Sethi A, Arambam P, Omar AK, Keshava R, Roy S et al. Safety of Prasugrel in Indian patients - multicentric registry of 1000 cases. Indian Heart J. 2014;66:598-601.
7. Schüpke S, Neumann F-J, Menichelli M, Mayer K, Bernlochner I, Wöhrle J et al. Ticagrelor or Prasugrel in Patients with Acute Coronary Syndromes. N Engl J Med. 2019;381:1524-34.
8. Mohanan PP, Mathew R, Harikrishnan S, Krishnan MN, Zachariah G, Joseph J et al. Presentation, management, and outcomes of 25 748 acute coronary syndrome admissions in Kerala, India: results from the Kerala ACS Registry. Eur Heart J. 2013;34:121-9.
9. Seetharama N, Mahalingappa R, GK RK, Veerappa V, CL A. Clinical profile of acute myocardial infarction patients: a study in tertiary care centre. Int J Res Med Sci. 2017;3:8.
10. Anand SS, Yusuf S, Vuksan V, Devanesen S, Teo KK, Montague PA et al. Differences in risk factors, atherosclerosis, and cardiovascular disease between ethnic groups in Canada: the Study of Health Assessment and Risk in Ethnic groups (SHARE). Lancet. 2000;356:279-84.
11. Siddiuqi AH, Kayani AM. Acute myocardial infarction-clinical profile of 1000 cases. Age. 2000;56:11-48.
12. Hafeez S, Javed A, Kayani AM. Clinical profile of patients presenting with acute ST elevation myocardial infarction. J Pak Med Asso. 2010;60:190.
13. Vaidya CV, Majmudar DK. A study of clinical profile of acute ST elevation myocardial infarction patients from GMERS Medical College and Hospital, Gandhinagar, Gujarat. 2014;1.
14. Ajay VS, Prabhakaran D. Coronary heart disease in Indians: Implications of the INTERHEART study. Indian J Med Res. 2010;132:561.
15. Steg PG, Goldberg RJ, Gore JM, Fox KA, Eagle KA, Flather MD et al. Baseline characteristics, management practices, and in-hospital outcomes of patients hospitalized with acute coronary syndromes in the Global Registry of Acute Coronary Events (GRACE). Am J Cardiol. 2002;90:358-63.
16. Misiriya K, Sudhayakumar N, Khadar SA, George R, Jayaprakasht V, Pappachan JM. The clinical spectrum of acute coronary syndromes: experience from a major center in Kerala. J Assoc Physicians India 2009;57:377-83.
17. Gupta R. Recent trends in coronary heart disease epidemiology in India. Indian Heart J. 2008;60:B4-18.
18. Al-Delaimy WK, Manson JE, Solomon CG, Kawachi I, Stampfer MJ, Willett WC et al. Smoking and risk of coronary heart disease among women with type 2 diabetes mellitus. Arch Intern Med. 2002;162:273-9.
19. Seetharama N, Mahalingappa R, Ranjith KG, Veerappa V, Aravindh C. Clinical profile of acute myocardial infarction patients: a study in tertiary care centre. 2015;1-2.
20. Mandal S, Saha JB, Mandal SC, Bhattacharya RN, Chakraborty M, Pal PP. Prevalence of ischemic heart disease among urban population of Siliguri, West Bengal. Indian J Comm Med Indian Asso Prev Social Med. 2009;34:19.
21. Mitra A, Pradhan R, Mukherjee S. Importance of heart-healthy diet. J Human Ecol. 2009;27:53-61.
22. Sofi F, Capalbo A, Cesari F, Abbate R, Gensini GF. Physical activity during leisure time and primary prevention of coronary heart disease: an updated meta-analysis of cohort studies. Eur J Prev Cardiol. 2008;15:247-57.
23. Nocon M, Hiemann T, Müller-Riemenschneider F, Thalau F, Roll S, Willich SN. Association of physical activity with all-cause and cardiovascular mortality: a systematic review and meta-analysis. Eur J Prevent Cardiol. 2008;15:239-46.
24. Rogers WJ, Canto JG, Lambrew CT, Tiefenbrunn AJ, Kinkaid B, Shoultz DA et al. Temporal trends in the treatment of over 1.5 million patients with myocardial infarction in the US from 1990 through

1999: the National Registry of Myocardial Infarction 1, 2 and 3. J Am Coll Cardiol. 2000;36:2056-63.

25. Hasdai D, Behar S, Wallentin L, Danchin N, Gitt A, Boersma E et al. A prospective survey of the characteristics, treatments and outcomes of patients with acute coronary syndromes in Europe and the Mediterranean basin. The Euro Heart Survey of Acute Coronary Syndromes (Euro Heart Survey ACS). Eur Heart J. 2002;23:1190-201.

26. Mandelzweig L, Battler A, Boyko V, Bueno H, Danchin N, Filippatos G et al. The second Euro Heart Survey on acute coronary syndromes: characteristics, treatment, and outcome of patients with ACS in Europe and the Mediterranean Basin in 2004. Eur Heart J. 2006;27:2285-93.

27. Fox KA, Dabbous OH, Goldberg RJ, Pieper KS, Eagle KA, Van de Werf F et al. Prediction of risk of death and myocardial infarction in the six months after presentation with acute coronary syndrome: prospective multinational observational study (GRACE). BMJ. 2006;333:1091.

28. Butt TS, Bashtawi E, Bououn B, Wagley B, Albarrak B, Sergani HE et al. Door-to-balloon time in the treatment of ST segment elevation myocardial infarction in a tertiary care center in Saudi Arabia. Ann Saudi Med. 2020;40:281-9.

29. Guha S, Sethi R, Ray S, Bahl VK, Shanmugasundaram S, Kerkar P et al. Cardiological Society of India: Position statement for the management of ST elevation myocardial infarction in India. Indian Heart J. 2017;69(1):S63-97.

30. Motkuri V, Mishra RN. Pharmaceutical Market and Drug Price Policy in India. Rev Develop Change. 2020;25:30-53.