Original Article

Study of differences in presentation, risk factors and management in diabetic and nondiabetic patients with acute coronary syndrome

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ABSTRACT

Objectives: To compare clinical characteristics, treatment, and utilization of evidence-based medicines at discharge from hospital in acute coronary syndrome (ACS) patients with or without diabetes at a tertiary care cardiac center in India. Methods: We performed an observational study in consecutive patients discharged following management of ACS. We obtained demographic details, comorbid conditions, and cardiovascular risk factors, physical and biochemical parameters, and management. Descriptive statistics are reported. Results: We enrolled 100 patients (diabetics = 28) with mean age of 59.0 ± 10.8 years (diabetics 59.3 ± 11.6, nondiabetics 58.9 ± 8.5). Forty-nine patients had ST-elevation myocardial infarction (STEMI) (diabetics = 14, 28.7%) while 51 had nonSTEMI/ unstable angina (diabetics = 14, 27.4%) (P = nonsignificant). Among diabetics versus nondiabetics there was greater prevalence (%) of hypertension (78.6% vs. 44.4%), obesity (25.0% vs. 8.3%), abdominal obesity (85.7% vs. 69.4%) and sedentary activity (89.2% vs. 77.8%), and lower prevalence of smoking/tobacco use (10.7% vs. 25.0%) (P < 0.05). In STEMI patients 28 (57.1%) were thrombolysed (diabetes 17.8% vs. 31.9%), percutaneous coronary interventions (PCI) was in 67.8% diabetics versus 84.7% nondiabetics and coronary bypass surgery in 21.4% versus 8.3%. At discharge, in diabetics versus nondiabetics, there was similar use of angiotensin converting enzyme inhibitors (67.9% vs. 69.4%) and statins (100.0% vs. 98.6%) while use of dual antiplatelet therapy (85.7% vs. 95.8%) and beta-blockers (64.3% vs. 73.6%) was lower (P < 0.05). Conclusions: Diabetic patients with ACS have greater prevalence of cardiometabolic risk factors (obesity, abdominal obesity, and hypertension) as compared to nondiabetic patients. Less diabetic patients undergo PCIs and receive lesser dual anti-platelet therapy and beta-blockers.

Key words: Acute coronary syndrome, diabetes, management

INTRODUCTION

Cardiovascular complications are more common among diabetic patients and are usually associated with a significantly greater risk of morbidity and mortality than in nondiabetic subjects.[¹] Presence of diabetes worsens prognosis in acute coronary syndrome (ACS). The relative risk of myocardial infarction (MI) is 50% greater in diabetic men and by 150% greater in diabetic women compared to age-matched nondiabetic subjects.[²] Sudden cardiac death is 50% more frequent in diabetic men and 300% more frequent in diabetic women compared to age-matched patients.[³]

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nondiabetic controls. Diabetes also influences outcomes following ACS, and therefore, secondary prevention in diabetic individuals is equally critical. Consequently, the diabetic patient needs special management and monitoring, with a view to the prevention, control, and treatment of the various manifestations of coronary artery disease. All patients with ACS require evidence-based treatments such as lifestyle advise and drugs including antiplatelets, angiotensin converting enzyme inhibitors (ACEIs), or angiotensin receptor blockers (ARBs), beta-blockers, and lipid-lowering medications (statins) therapy to prevent death, and secondary complications. This is especially important in patients with diabetes. This study was conducted to assess clinical characteristics, management, and prognosis in ACS patients with or without diabetes presenting to a tertiary care hospital.

**Methods**

The study protocol was approved by the Institutional Ethics Committee, and individual written consent was obtained from all the patients. Demographic details, clinical characteristics, lifestyle factors, and prescribed treatment were obtained in successive patients presenting to the hospital with a diagnosis of ACS. Diagnosis of ACS was confirmed by the presence of typical chest pain or uneasiness, combined with electrocardiographic changes, and cardiac enzyme elevation. The patients were recruited over a 12-month period from July 2011 to June 2012.

Details of presentation and risk factors had been obtained. Smokers were patients with present smoking or regular nonsmoked tobacco use. Former tobacco users were also identified. Physical activity was classified as mild, moderate, or severe based on the WHO criteria. Overweight was defined as body mass index (BMI) 25.0–29.9 kg/m², obesity as BMI ≥30 kg/m², abdominal obesity as waist circumference >90 cm in men, and >80 cm in women according to the WHO guidelines. Subjects were defined as hypertensive when a person was either a known hypertensive or had multiple readings over the course of hospitalization of ≥140/90 mmHg. Dyslipidemia was defined according to the National Cholesterol Education Program guidelines. The patients were classified as diabetics if they had been previously diagnosed were receiving hypoglycemic therapy or repeatedly has high fasting blood glucose levels (>126 mg/dL at ≥2 measurements) during admission. Details of medical and interventional coronary management were prospectively recorded for each patient by interview of patients and treating physicians.

**Statistical analysis**

SPSS (SPSS Inc., Chicago, USA; version 13.0 for Windows) was used for the data analysis. Numerical variables are reported as a mean and standard deviation. Descriptive statistics is reported. Differences in continuous variables have been determined by independent t-test and \( \chi^2 \) test as used for ordinal variables. \( P < 0.05 \) was considered significant.

**Results**

The CONSORT statement and flowchart of patients in the study are shown in Figure 1. Five hundred and fifty patients with ACS were admitted to the hospital. Majority of these patients were transferred from other hospitals more than 5 days after the acute event (n = 389) and 15 (2.7%) died and not included in the study. One hundred and forty-six patients were eligible, and 46 did not agree to participate in the study or had screen failure, and finally, 100 patients were included in this study. The baseline demographic and clinical characteristics are shown in Table 1. Mean age was 59.0 ± 10.8 years; it was 59.3 ± 11.6 years in diabetics and 58.9 ± 8.5 years in nondiabetics. Overall, 49 patients had ST-elevation MI (STEMI) while 51 had nonSTEMI or unstable angina. In diabetics as compared to nondiabetics, there was the similar prevalence of STEMI (50.0% vs. 48.6%) as well as nonSTEMI (50.0% vs. 51.4%). Among diabetics versus nondiabetics, there was greater prevalence of hypertension (78.6% vs. 44.4%), obesity (25.0% vs. 8.3%), abdominal obesity (85.7% vs. 69.4%), and physical inactivity (89.2% vs. 77.8%) (\( P < 0.05 \)). Lifestyle factors in diabetics versus nondiabetics were smoking and/or tobacco use (10.7% vs. 25.0%), high fat intake (78.6% vs. 76.4%), high salt intake (53.6% vs. 59.7%), high calorie intake (35.7% vs. 48.6%), low fiber intake (64.3% vs. 54.9%), low fruits and vegetables intake (53.6% vs. 52.8%), and

![Figure 1: CONSORT statement depicting the study flow](image-url)
alcohol use (3.6% vs. 6.9%) \[ P = \text{nonsignificant, Table 1}. \] Compared to patients without diabetes, diabetic patients had greater mean heart rate and BMI \( (P < 0.05) \). Prevalence of obesity, abdominal obesity, and hypertension was also greater in diabetic patients \( (P < 0.05, \text{Table 1}) \).

In STEMI, patients 28 (57.1%) were thrombolysed (diabetics 17.8% vs. 31.9%). In diabetes versus nondiabetics, percutaneous coronary intervention (PCI) was in 67.8% versus 84.7% \( (P < 0.05) \) and coronary artery bypass grafting (CABG) surgery was in 21.4% versus 8.3%. At discharge, 91 patients were on dual antiplatelets, aspirin, or thienopyridine (clopidogrel, prasugrel, or ticagrelor) (diabetes 85.7%, nondiabetes 95.8%), 71 patients were on ACEIs or ARBs (diabetes 71.4%, nondiabetes 70.8%), 71 patients were on beta-blockers (diabetics 64.3%, nondiabetics 73.6%), 99 patients were on lipid-lowering agents (diabetics 100%, nondiabetics 98.6%), 19 patients were on diuretics (diabetics 21.4%, nondiabetics 18.1%), and 7 patients were on calcium channel blockers (diabetics 14.3%, nondiabetics 4.2%) \[ \text{Table 2} \].

**Discussion**

This study shows that diabetic patients with ACS have a higher prevalence of cardiometabolic risk factors (obesity, abdominal obesity, and hypertension) than nondiabetics, and there was the lower use of PCI. There was the lower use of dual anti-platelet therapies and beta-blockers in patients with diabetes.

### Table 1: Demographic, lifestyle, and clinical characteristics in diabetic and nondiabetic patients with acute coronary syndrome

| Variables                             | Description                          | Nondiabetic \((n=72)\) | Diabetic \((n=28)\) | \(P\) |
|---------------------------------------|---------------------------------------|-------------------------|---------------------|------|
| Demographic variables                 |                                       |                         |                     |      |
| Mean age                              | Mean age±SD                           | 58.9±11.6               | 59.3±8.5            | 0.860|
| Education                             | None                                  | 8 (11.1)                | 5 (17.9)            | 0.368|
| Any school                            | 16 (22.2)                             | 10 (35.7)               | 0.167               |      |
| University/higher                     | 48 (66.7)                             | 13 (46.4)               | 0.067               |      |
| Occupation                            | Employed                              | 42 (58.3)               | 10 (35.7)           | 0.042|
| Retired                               | 21 (29.2)                             | 9 (32.1)                | 0.770               |      |
| Homemaker                             | 4 (5.6)                               | 2 (7.1)                 | 0.636               |      |
| Unemployed                            | 5 (6.9)                               | 3 (10.7)                | 0.249               |      |
| Socioeconomic status                  | Upper middle                          | 28 (38.9)               | 15 (34.3)           | 0.290|
|                                       | Lower middle                          | 24 (33.3)               | 13 (46.4)           | 0.182|
| Lifestyle variables                   |                                       |                         |                     |      |
| Tobacco use                           | Never                                 | 47 (65.3)               | 23 (82.1)           | 0.098|
|                                       | Former                                | 7 (60.0)                | 3 (10.7)            | 0.115|
|                                       | Current                               | 18 (25.0)               | 3 (10.7)            | 0.115|
| High fat intake                       | Deep fried food or red meat>3/week    | 55 (76.4)               | 22 (78.6)           | 0.815|
| High salt intake                      | Salty foods or fast foods>3/week       | 43 (59.7)               | 15 (34.3)           | 0.576|
| High calorie intake                   | Sugary drinks or sweets>3/week         | 35 (48.6)               | 10 (34.3)           | 0.939|
| Low fiber intake                      | Whole grains/high fiber foods<5/week   | 39 (54.9)               | 18 (64.3)           | 0.529|
| Low fruits and vegetable intake       | Fruits or vegetables<5/week            | 38 (52.8)               | 15 (35.3)           | 0.997|
| Physical activity                     | None                                  | 20 (27.8)               | 9 (32.1)            | 0.666|
|                                       | Sedentary                             | 36 (50.0)               | 16 (57.1)           | 0.521|
|                                       | Mild/moderate                         | 16 (22.2)               | 3 (10.7)            | 0.187|
| Current alcohol use                   |                                       | 5 (6.9)                 | 1 (3.6)             | 0.523|
| Past medical history                  | Hypertension                          | 32 (44.4)               | 22 (78.6)           | 0.002*|
|                                       | Hypertension duration                  | 6 (6.9)                 | 9 (14.3)            | 0.241|
| Family history of premature CAD       | 12 (16.7)                             | 5 (7.9)                 | 0.866               |      |
| Physical parameters                   |                                       |                         |                     |      |
| Body mass index                       | Mean kg/m2±SD                         | 25.4±3.7                | 27.8±3.4            | 0.004*|
| Waist circumference                   | Mean cm±SD                            | 94.5±11.4               | 98.8±12.1           | 0.095|
| Obesity                               | BMI>30 kg/m2                          | 6 (8.3)                 | 7 (25.0)            | 0.044*|
| Abdominal obesity                     | Waist>90 cm men,>80 cm women           | 50 (69.4)               | 24 (85.7)           | 0.032*|
| Systolic blood pressure               | Mean BP mmHg±SD                       | 129.7±19.8              | 130.2±18.5          | 0.924|
| Diastolic blood pressure              | Mean BP mmHg±SD                       | 78.5±11.7               | 77.7±13.6           | 0.741|
| Heart rate                            | Mean per min±SD                       | 78.6±13.2               | 77.7±13.6           | 0.763|
| Biochemical parameters                |                                       |                         |                     |      |
| Total cholesterol                     | ≥200 mg/dl                            | 29 (40.3)               | 13 (46.4)           | 0.575|
| Triglyceride                          | ≥150 mg/dl                            | 37 (51.4)               | 17 (60.7)           | 0.401|
| LDL-cholesterol                       | ≥130 mg/dl                            | 30 (14.3)               | 14 (50.0)           | 0.451|
| HDL-cholesterol                       | <40 mg/dl men/<50 mg/dl women          | 52 (72.2)               | 21 (75.0)           | 0.778|

*Significant. Numbers in parentheses are percentage. CAD: Coronary artery disease, SD: Standard deviation, BP: Blood pressure, BMI: Body mass index, LDL: Low-density lipoprotein, HDL: High-density lipoprotein.
Previous studies from India including large registries such as CREATE,[7] Kerala-ACS[8] and DEMAT,[9] have reported on patterns of ACS and therapies. These studies reported that STEMI was responsible for about half of all hospital admissions similar to this study. These studies also report a low use of various cardioprotective agents, especially beta-blockers, during hospitalization and at discharge. These studies did not study diabetic subgroups and our study, although small, is unique to address this question. Long-term follow-up studies from India have reported similar low use of beta-blockers in ACS patients.[10] Studies from developed countries such as multicountry Global Registry of Acute Coronary Events (GRACE) registry as well as British and North American ACS registries have shown similar results.[11-14] GRACE registry reported that beta-blocker use in diabetics (75.0%) was significantly lower than in nondiabetics (80%).[11] This indicates a physician-level barrier in prescribing beta-blockers to diabetics due to the popular misconception of greater side effects in this group.[12] Lower use of PCI and greater CABG surgery indicates greater prevalence of multivessel disease patients. Our results are similar to studies from other countries.[13]

This is a single-center study with a small sample size, and this is a major study limitation. Moreover, we evaluated patients at a tertiary care hospital, and more than 90% patients underwent some coronary intervention, and the findings may not reflect the general situation in India. Larger and multicentric studies are required to identify patterns of ACS in diabetes, management strategies, outcomes, and secondary prevention therapies. Long-term studies to assess adherence to therapies and lifestyle measures as well as long-term outcomes are also required. Other limitations of the study include lack of assessment of prehospital phase of ACS, details of symptoms, and in-hospital management. Our study is also underpowered to identify the importance of clinical outcomes.

**Conclusion**

Our study shows that diabetic patients with ACS have greater prevalence of obesity, abdominal obesity, and hypertension. These patients receive lesser PCI, dual antiplatelet therapies, and beta-blockers.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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