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Original Research Article

Prescription Pattern of Drugs in the Management of Acute Coronary Syndrome at a Tertiary Care Hospital

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Abstract

Background: Acute coronary syndrome remains a leading cause of morbidity and mortality worldwide, necessitating evaluation of real-world prescribing patterns against guideline-directed therapy to ensure rational, cost-effective care.

Objective: To evaluate the prescribing patterns of pharmacotherapy in patients with acute coronary syndrome admitted to a tertiary-care hospital.

Methods: This was a single-centre, prospective observational study conducted over 12 months in the MICU of a tertiary-care teaching hospital, approved by the Institutional Ethics Committee; consecutive adults with clinician-confirmed ACS (STEMI/NSTEMI/UA) were enrolled (n=130).

Results: Among 130 ACS admissions, most were older adults (≥60 y: 42.3%; 46–59 y: 30.8%), with marked male predominance (76.2%) and predominantly rural residence (73.8%). STEMI was the commonest presentation (63.8%), followed by unstable angina (26.9%) and NSTEMI (9.2%). Chest pain led symptoms (84.6%), with sweating (69.2%) and dyspnea (53.8%) frequent; epigastric pain (30.7%) and nausea (23.0%) were less common. A total of 1,137 drugs were prescribed (mean 8.74/patient), including fixed-dose combinations in 26 patients. Guideline classes predominated: dual antiplatelet therapy (aspirin + clopidogrel) and atorvastatin in 100%, nitrates in 96.15%, LMWH in 90.00%, and streptokinase in 46.00%. β-blockers were widely used (carvedilol 49.23%, metoprolol 21.53%), alongside ACE inhibitors (enalapril 33.84%, ramipril 32.30%) and ARBs (losartan 15.38%, telmisartan 13.84%). WHO indicators reflected polypharmacy (8.74 drugs/prescription), low antibiotic load (0.15/prescription), and moderate generic use (41.09%), high alignment with NLEM-2022 (86.0%) and moderate with WHO EML-2023 (62.0%), with limited parenteral use (18.51%).

Conclusion: ACS pharmacotherapy in this tertiary-care cohort was largely guideline-concordant with substantial alignment to essential medicine lists, yet polypharmacy and suboptimal generic prescribing indicate clear opportunities for audit-driven stewardship to further optimize rational, cost-effective care.

Keywords: Acute Coronary Syndrome, Drug Utilization, Evidence-Based Medicine, Pharmacotherapy, Prescription Pattern.

Introduction

Acute coronary syndromes (ACS) remain a leading contributor to global morbidity and mortality, reflecting the sustained burden of coronary heart disease within overall cardiovascular deaths worldwide. [1] ACS encompasses a clinical spectrum that includes ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina, unified by acute myocardial ischemia. [2,3] The pathobiology typically involves acute plaque disruption with coronary thrombosis and a sudden mismatch between myocardial oxygen supply and demand; timely reperfusion for STEMI is a cornerstone to restore coronary patency and limit infarct size. [4,5] Contemporary guideline-directed medical therapy (GDMT) for ACS emphasizes rapid initiation of antiplatelet therapy (aspirin plus a P2Y12 inhibitor), high-intensity statins, β-blockers when not contraindicated, and renin–angiotensin–aldosterone system (RAAS) blockade, alongside individualized decisions regarding invasive evaluation and

revascularization. [5,6] Robust evidence underpins these classes for reducing recurrent ischemic events, improving ventricular remodeling, and lowering mortality across ACS presentations, and they are codified in the most recent joint American guidelines. [5] Yet, despite clear recommendations, real-world studies continue to show heterogeneity in prescribing at discharge and during follow-up, with gaps particularly evident for certain agents and patient subgroups.[7-9] Suboptimal adherence to GDMT after ACS is clinically meaningful, as better compliance is consistently associated with improved outcomes.[10]

Understanding local prescribing behavior is therefore essential for quality improvement, formulary stewardship, and benchmarking against evidence-based standards. The World Health Organization's core drug-use (prescribing) indicators provide a validated, standardized framework to appraise the rational use of medicines—capturing metrics such as average number of drugs per encounter, proportion of generics, and alignment with essential medicines lists. These indicators have been widely applied across settings to identify irrational polypharmacy, measure essential-list adherence, and target interventions that enhance safe, cost-effective pharmacotherapy.[11, 12]

In tertiary-care critical units managing ACS, systematic assessment of prescription patterns against GDMT and essential-medicine benchmarks can illuminate opportunities to optimize antithrombotic selection and intensity, up-titrate high-intensity statins, close β-blocker and RAAS-inhibitor gaps, and increase generic utilization without compromising outcomes.[5] Against this background, the objective of the present study was to evaluate the prescribing patterns of pharmacotherapy in patients with acute coronary syndrome admitted to a tertiary-care hospital.

Materials and Methods

This study was a prospective, observational, period-based drug-use evaluation conducted over 12 months in the Medical Intensive Care Unit (MICU) of a tertiary-care teaching hospital. The focus was on pharmacotherapy administered to patients with ACS during index admission and at discharge. The protocol received prior approval from the Institutional Ethics Committee, and written informed consent was obtained from participants or their legally authorized representatives as appropriate. Patient confidentiality was maintained by assigning de-identified, study-specific codes and restricting data access to authorized personnel. Consecutive, eligible patients admitted with ACS were enrolled using complete enumeration until the end of the study period (achieved sample size n=130). ACS was classified as STEMI, NSTEMI, or unstable angina (UA) based on standard clinical criteria, including ischemic symptoms, electrocardiographic changes, and cardiac biomarker profiles. Inclusion criteria were age ≥18 years, admission to the MICU with a clinician-confirmed diagnosis of ACS, and availability of the inpatient case sheet and medication orders for the index hospitalization. Exclusion criteria were alternative non-ischemic diagnoses mimicking ACS (e.g., myocarditis or type-2 MI without coronary etiology) after full evaluation, inter-facility transfers without complete medication records for the index episode, readmission for the same ACS event (only the first admission considered), and patients who left against medical advice before medication reconciliation could be completed.

All consecutive admissions meeting eligibility were included during the 12-month window, and the attending clinical team established the ACS subtype, reperfusion strategy (e.g., thrombolysis with streptokinase or primary PCI when applicable), and in-hospital care per institutional protocols. Data were abstracted prospectively into a pre-tested case record form (CRF) by trained investigators using admission notes, medication charts, nursing records, and discharge summaries. The CRF captured demographics and cardiovascular risk factors (such as hypertension, diabetes, and tobacco use), ACS subtype and key clinical parameters at presentation, reperfusion strategy and timing when applicable, and all prescribed drugs during MICU stay and at discharge, including drug name, dose, route, frequency, timing relative to presentation, and any documented contraindications or intolerance. Brand/generic status for each item was recorded, with subsequent mapping to the National List of Essential Medicines 2022 (NLEM-2022) and the WHO Model List of Essential Medicines 2023 (WHO EML-2023). The total number of drugs per patient at discharge was determined by medication reconciliation against the discharge summary.

Operational definitions were prespecified. GDMT classes comprised antiplatelet therapy (aspirin plus a P2Y12 inhibitor), statins (with high-intensity defined as atorvastatin 40–80 mg/day or rosuvastatin 20–40 mg/day, when documented), β-blockers, and RAAS inhibitors (ACE inhibitor or ARB). Recognized clinical contraindications—such as shock, bradyarrhythmia or heart block, and hypotension for β-blockers; or acute kidney injury and hyperkalemia for RAAS blockade—were recorded from charts and considered when assessing GDMT use. WHO core prescribing indicators were adapted to the ACS context and included the average number of drugs per patient at discharge, the percentage of drugs prescribed by generic name, and the percentage of prescribed

items listed in NLEM-2022 and in WHO EML-2023. The primary endpoint was the distribution and proportion of patients receiving each GDMT class during hospitalization and at discharge, accounting for documented contraindications. Secondary endpoints included the average number of drugs per patient at discharge, the proportion of items prescribed by generic name, alignment with NLEM-2022 and WHO EML-2023, and use patterns of adjunctive therapies such as nitrates, low-molecular-weight heparin, and fibrinolytics.

Statistical Analysis: Data were analyzed using Microsoft Excel (version 16.x). Continuous variables were summarized as mean ± standard deviation (SD) when normally distributed and as median (interquartile range, IQR) otherwise (normality assessed with the Shapiro–Wilk test). Categorical variables were reported as counts and percentages.

Results

Among 130 ACS patients, most were older adults; 42.3% were >60 years, 30.8% were 46–59 years, 15.4% were 31–45 years, and 11.8% were <30 years. Males predominated (76.2%; 99/130).

The cohort was largely rural (73.8%; 96/130) rather than urban (26.2%). STEMI was the commonest presentation (63.8%; 83/130), followed by unstable angina (26.9%; 35/130) and NSTEMI (9.2%; 12/130). In this cohort with ACS, chest pain was the predominant presenting symptom (84.6%), followed by sweating (69.2%) and difficulty in breathing (53.8%). Epigastric pain was reported by 30.7%, nausea by 23.0%, and vomiting by 9.2%, while giddiness was least frequent at 2.3%. Across 130 ACS admissions, 1,137 drugs were prescribed—an average of 8.74 per patient—and 26 patients received agents as fixed-dose combinations. Guideline-class medicines predominated: all patients received dual antiplatelet therapy with aspirin and clopidogrel (100% each) and a statin (atorvastatin 100%). Nitrates were used in 96.15%, and anticoagulation with LMWH in 90.00%; fibrinolysis with streptokinase was given to 46.00%. β-blockers were common, led by carvedilol 49.23%, followed by metoprolol 21.53% and atenolol 15.38%. RAAS blockade featured ACE inhibitors—enalapril 33.84% and ramipril 32.30%—and ARBs—losartan 15.38% and telmisartan 13.84%. Other frequently used classes included CCBs (amlodipine 26.15%), diuretics (furosemide 16.15%, spironolactone 6.15%), tramadol for analgesia (43.84%), anti-diabetic agents (metformin 21.53%, insulin 21.53%, glimepiride 9.23%), gastroprotection (pantoprazole 84.61%, omeprazole 7.69%, ranitidine 6.15%), antiemetics (ondansetron 33.84%), antibacterials (15.38%), bronchodilators (salbutamol 6.15%), and multivitamin supplementation (6.15%).

WHO core prescribing indicators showed polypharmacy, with an average of 8.74 medicines per prescription, and a low antibiotic burden (mean 0.15 antibiotic per prescription). Generic prescribing accounted for 41.09% of items, consistent with the pie chart indicating 41% generics versus 59% brand-name drugs. Alignment with essential medicines lists was moderate to high: 62.0% of prescribed items were from the WHO EML-2023 and 86.0% from India's NLEM-2022. Parenteral use was limited overall, with 18.51% of drugs administered as injections.

Table 1: Distribution of sociodemographic and clinical characteristics

		N	%
Age	<30 years	15	11.81
	31-45 years	20	15.38
	46-59 years	40	30.76
	>60 years	55	42.30
Gender	Male	99	76.15
	Female	31	23.85
Residence	Rural	96	73.84
	Urban	34	26.16
Diagnosis	STEMI	83	63.84
	NSTEMI	12	9.23
	Unstable angina	35	26.92

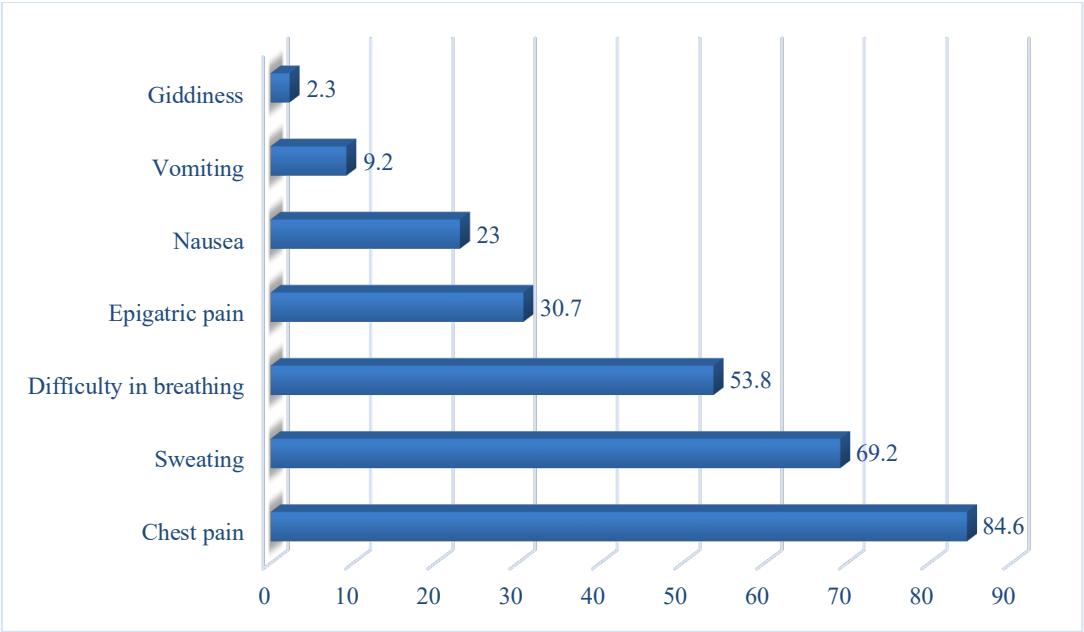

Figure 1: Frequency of presenting symptoms in ACS

Table 2: Drugs Prescribed for ACS patients

Drug Classes	Drugs	%
Antiplatelets	Aspirin Clopidogrel	100 100
Anticoagulants	LMWH	90.00
Fibrinolytics	Streptokinase	46.00
Statins	Atorvastatin	100
Beta blockers	Carvedilol Metoprolol Atenolol	49.23 21.53 15.38
ACE inhibitors	Enalapril Ramipril	33.84 32.30
ARBs	Losartan Telmisartan	15.38 13.84
CCBs	Amlodipine	26.15
Nitrates	Glyceryl trinitrate	96.15
Diuretics	Furosemide Spironolactone	16.15 6.15
Analgesics	Tramadol	43.84
Antidiabetics	Metformin Glimepiride Insulin	21.53 9.23 21.53
Anti-peptic ulcer drugs	Pantoprazole Omeprazole Ranitidine	84.61 7.69 6.15
Antiemetics	Ondansetron	33.84
Bronchodilators	Salbutamol	6.15
Antibiotics	Antibacterials	15.38
Vitamins	Multivitamin supplementation	6.15

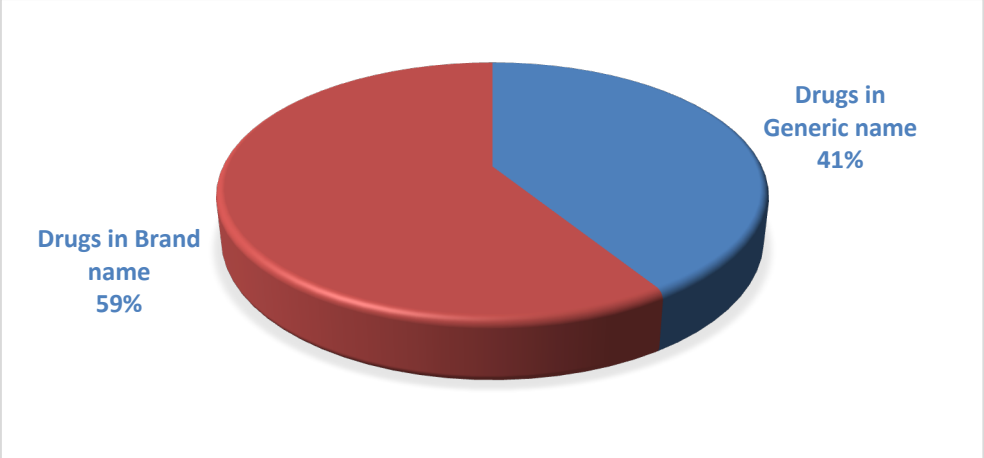

Figure 2: Percentage of drugs prescribed in generic/brand name

Table 3: WHO core prescribing indicators

WHO core prescribing indicators	%
Average number of drugs per prescription	8.74
Average number of antibiotics per prescription	0.15
% of drugs prescribed by generic name	41.09
% utilization of drugs from WHO EML-2023	62.00
% utilization of drugs from NLEM- 2022	86.00
% of drugs prescribed as injections	18.51

Discussion

In the present study, the mean age was 54.5 years, with most patients aged ≥60 years; 11.8% were <30 years. This age pattern accords with findings from Ahmedabad by Thaker V et al.,[13] where the largest proportion was 51–60 years (25.5%), followed by 61–70 years (24%), and only 2.5% were 21–30 years, underscoring the lower prevalence of ACS in younger adults. These observations reinforce the established association between advancing age and ACS risk, with risk becoming particularly salient in males ≥35 years and females ≥45 years.

A marked male predominance was observed (83.8%), consistent with Choudhary P et al.[14] (70.4% male) and with Thaker V et al.[13] (57% male), reflecting the well-described higher occurrence of ACS in men, likely driven by both biological susceptibility and differential exposure to behavioral risk factors. Regarding clinical presentation, STEMI constituted 63.84% of cases, followed by unstable angina (26.92%) and NSTEMI (9.23%). This distribution contrasts with Thaker V et al.,[13] who reported unstable angina as most common (52%), followed by STEMI (42%) and NSTEMI (6%), while other cohorts have documented varying STEMI prevalence (39–51%).[15-17] such variability likely reflects differences in population characteristics, risk-factor burden, and healthcare access across settings. Chest pain was the leading symptom (84.6%), with accompanying features including sweating (69.2%), dyspnea (53.8%), and epigastric pain (30.7%), in line with literature identifying chest discomfort as the hallmark of myocardial ischemia in both sexes.[18] Hypertension and diabetes mellitus were present in 35.4% and 18.18% of patients, respectively, differing from Tanajura et al., who reported a lower diabetes prevalence (4%).(19) Overall, established contributors to ACS include hypertension, diabetes, dyslipidemia, obesity, and smoking.

Therapeutically, dual antiplatelet therapy with aspirin and clopidogrel was prescribed to all patients (100%), mirroring prior reports (e.g., aspirin use 100% in Choudhary P et al.).[14, 20-22] Statins—crucial for secondary prevention after ACS—were universally used (atorvastatin 100%), whereas Choudhary P et al.[14] reported 85% on atorvastatin and 14% on rosuvastatin. Low-molecular-weight heparin was administered to 90% of patients, and 46% received streptokinase thrombolysis in the STEMI context, consistent with the reperfusion principle of limiting infarct size by restoring flow to viable myocardium.

Parenteral administration accounted for 18.5% of all drugs, with most therapy given orally; nitrates were predominantly sublingual for rapid symptomatic relief. β-Blockers were prescribed in 86.15% of patients—principally carvedilol (49.23%) and metoprolol (21.53%)—in keeping with guideline recommendations to reduce myocardial oxygen demand and arrhythmias. ACE inhibitors were common (enalapril 33.84%, ramipril 32.30%), and among ARBs, losartan (15.38%) exceeded telmisartan (13.84%);

comparable class use has been reported elsewhere.[23] Generic prescribing, a key element of rational, cost-effective care, constituted 41.09% of items, higher than proportions reported by Ghosh et al. and Afroj et al. in comparable settings.[21, 24] Polytherapy was expected given ACS complexity; notably, newer anti-anginal agents (ranolazine, ivabradine) were not used, consistent with their adjunctive—not first-line—role in ACS. WHO core prescribing indicators showed an average of 8.74 drugs per patient, close to the 8.59 reported by Narwane et al.[25] Alignment with essential medicine frameworks was substantial: 86.20% of drugs were listed in NLEM-2022 and 62.06% in WHO EML-2023, supporting largely rational, evidence-based pharmacotherapy while highlighting room to strengthen generic prescribing.

This study has several limitations. First, its single-centre, MICU-based, prospective observational design with a modest sample size (n=130) limits external validity and statistical power, particularly for subgroup comparisons by ACS subtype or comorbidity profile; findings may not generalize to non-ICU wards, step-down units, or outpatient care. Second, prescribing information was abstracted from routine records and discharge summaries, introducing potential documentation and classification bias.

Third, the analysis focused on prescription patterns during the index admission and at discharge; it did not assess longitudinal adherence, dose optimization, persistence, or clinical outcomes (reinfarction, mortality, bleeding), precluding inference on effectiveness or safety. Fourth, residual confounding by illness severity, reperfusion strategy/availability, comorbidities, and formulary constraints could not be fully addressed, so observed differences in use may reflect case-mix rather than prescribing quality. Finally, newer anti-anginal or antithrombotic agents and PCI details were not systematically evaluated, which may underrepresent contemporary therapeutic options and service-level factors influencing prescriptions.

Conclusion

In this tertiary-care cohort, ACS predominantly affected older adults—especially those aged ≥60 years—with a marked male predominance, and most patients presented with chest pain accompanied by sweating; STEMI was the commonest diagnosis, and hypertension and diabetes mellitus were frequent comorbidities. Prescribing patterns reflected guideline-oriented, multi-drug management, with universal use of dual antiplatelet therapy (aspirin and clopidogrel), routine atorvastatin, widespread nitrates and LMWH, and frequent β-blockers alongside ACE inhibitors/ARBs; thrombolysis with streptokinase was administered in 7.46% of eligible patients. Polypharmacy was expected in this context, with a mean of 8.74 drugs per patient. From a pharmacoeconomic standpoint, 41.09% of items were prescribed by generic name, while 86.2% and 62.06% aligned with NLEM-2022 and WHO EML-2023, respectively—indicating moderately rational, guideline-concordant practice. Nevertheless, increasing generic prescribing remains a clear opportunity to enhance cost-effectiveness and access. These findings support regular prescription audits to sustain adherence to evidence-based care and optimize outcomes in ACS.

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