



Original Article

Drug Utilization Study in Intensive Cardiac Care Unit of a Tertiary Care Hospital

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Objectives: To evaluate the patterns of cardiovascular drug utilization among patients in ICCU of a tertiary care hospital. **Methods:** A prospective study was carried out in the intensive cardiac care unit (ICCU) of Bapuji hospital, Davangere, for a period of 3 months. Data were analysed for demographics, indications for admission, comorbidities, duration of hospital stay and various drugs prescribed. **Results:** Of the 100 patients, 68% were males, with mean age of 62.1±12.25 yrs. A majority of patients had diagnosis of MI (64%). The average number of days of ICCU stay was 3, with average drugs prescribed per patient was 10.125. Hypertension and diabetes mellitus were the most common co-morbidities. Out of the MI patients 61% received streptokinase for thrombolysis. The commonly prescribed drug classes were dual platelet inhibitors (aspirin, clopidogrel) (72%), statins (83%), ACE-inhibitors/Angiotensin receptor blockers (21%), LMWH (60%) and antianginal drugs like ranolazine (45%), isosorbide dinitrate (27%), opioid analgesics (60%), pantoprazole (80%) to prevent peptic ulcer and anxiolytics (59%). Antibiotics were also prescribed (24%) and most commonly prescribed was combination of ceftriaxone and salbactam. **Conclusion:** Need based polypharmacy is commonly practised and majority of the drugs were prescribed according to standard treatment guidelines. Drug utilization studies need to be conducted more often to improve the efficiency of drug usage.

Keywords: drug utilization, cardiovascular, intensive cardiac care unit, tertiary care hospital, polypharmacy.

1. INTRODUCTION

The trend for non-communicable diseases has been on a rise and currently it is one of the major public health problem. The four leading causes among them are cardiovascular diseases (CVDs), diabetes mellitus, chronic obstructive pulmonary disease (COPD) and

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cancer as measured by their prevalence.¹ CVDs are one of the largest causes of mortality among non-communicable diseases .

Cardiovascular disease encompass atherosclerotic vascular diseases like coronary heart disease (CHD), cerebrovascular disease and peripheral arterial diseases². According to WHO an estimated 17 million people died from CVD in 2005 comprising 30% of all global deaths and of these nearly 80% of deaths took place in low and middle income countries like India^[1]. Overall, CVDs accounted for around one fourth of all deaths in India in 2008. CVDs are expected to be the fastest growing chronic illness by 2015 growing at 9.2% annually from 2000 onwards.³

Drug utilization research is thus an essential part of pharmacoepidemiology as it describes the extent, nature and determinants of drug exposure. The principal aim of drug utilization research is to facilitate rational use of drugs in populations. For the individual patient rational use of a drug implies the prescription of a well-documented drug in an optimal dose on the right indication, with the correct information and at an affordable price⁴. Knowledge about drug prescription is required to discuss whether the treatment followed is rational or irrational and to plan for better prescribing pattern.

Many studies have been conducted about the burden of cardiovascular diseases, their risk factors and determinants but studies on drug utilization pattern among patients admitted to intensive cardiac care unit (ICCU) are very few. Hence the present study was aimed at identifying the patient parameters, the associated co-morbidities, common cardiovascular causes for ICCU admission, duration of stay and the pattern of drug prescribing among inpatients admitted in the ICCU of a teaching hospital.

2. MATERIAL AND METHOD

The present study was a prospective drug utilization study carried out in the intensive cardiac care unit of a tertiary care hospital in JJM Medical College, Davangere, Karnataka for a period of 3 months. Pattern of drug utilization among 100 patients were recorded. Prior permission of the Head of ICCU was obtained for conducting the study.

Data were analysed for demographics, indications for admission, comorbidities, duration of hospital stay and various drugs prescribed. Out of the total drugs prescribed during the study period number of drugs included in National List of Essential Medicine-2011 of India⁵ and WHO Essential Medicine List, 2013 were noted.⁶

Commonly used drugs were classified based on WHO's Anatomic Therapeutic Chemical (ATC) Classification System. Drugs are classified in groups at five different levels. The drugs are divided into 14 main groups (first level), with two therapeutic/pharmacological subgroups (second and third levels). The fourth level is a therapeutic/pharmacological/chemical subgroup and the fifth level is the chemical substance. The second, third and fourth levels are often used to identify pharmacological subgroups when these are considered to be more appropriate than therapeutic or chemical subgroups.⁷

The following criteria was used for the study:

2.1 Inclusion criteria:

All patients of any age and of either sex admitted in Intensive Coronary Care Unit with cardiovascular disease only and having other comorbid diseases.

2.2 Statistical Analysis:

The data collected was analyzed statistically using descriptive statistics, namely mean and standard deviation for quantitative variables. Wherever

necessary, the results were depicted in the form of percentages and graphs.

3. RESULTS

Out of the total 100 patients admitted in ICCU during the study period 68 patients were male and 32 were female (figure 1) with mean age of 62.1 ± 12.25 yrs i.e., 29 % patients in the age group of 51-60 yrs and 30% of patients were 61-70yrs of age (figure 2), showing higher incidence of cardiovascular diseases among elderly with male predominance.

Majority of the patients admitted to ICCU were diagnosed to have myocardial infarction (MI) including both ST elevated myocardial infarction (STEMI) & Non ST elevated myocardial infarction (NSTEMI), accounting for 64% of the indication for admission followed by Ischemic heart diseases accounting for 11% of admission. Out of the 58 patients of STEMI majority had anterior wall MI (55.2%) followed by inferior wall MI (27.6%). The other causes for admission included CCF/LVF, cardiomyopathy, pulmonary edema as given in (figure 3). These were associated with arrhythmias, heart block, cardiogenic shock. Hypertension and diabetes mellitus are the major comorbid conditions associated with cardiovascular diseases (Table 1).

The average number of days of ICCU stay was 3, with average drugs prescribed per patient was 10.125 (figure 4). Out of the total 831 drugs prescribed during the study period 626 drugs were included in National List of Essential Medicine-2011 of India and 205 drug prescribed did not belong to the National List of Essential Medicine-2011 of India but 18 drugs in that 205 drugs were available in WHO Essential Medicine List, 2013.

Commonly used cardiovascular drugs classes were hypolipidemics, anti-platelets, anti-anginals, anticoagulants, thrombolytics, antihypertensives.

As cardiovascular conditions are emergencies requiring rapid stabilization of the patient in order to prevent morbidity/mortality initial treatment with drugs in parenteral form is required. Commonly used parenteral drugs are given in table 2.

Out of the total 100 patients hypolipidemics (83%) were the most commonly used drugs and atorvastatin (77%) was the hypolipidemic widely prescribed.

Low molecular weight heparins (LMWH) were the frequently prescribed anticoagulants, enoxaparin (60 prescriptions) being the commonest LMWH used. Aspirin and clopidogrel alone or the combination of aspirin and clopidogrel were the commonly used antiplatelet drugs. Out of the total 81 patients who received antiplatelet therapy 72 were given dual antiplatelet drug combination.

Among antianginal drugs prescribed to patients ranolazine (45%) was widely used followed by isosorbide dinitrate (27%), ivabradine(8%), nicorandil(7%),glyceryl trinitrate(6%). Streptokinase (61%) was used for the purpose of thrombolysis in MI patients and in NSTEMI patients in whom thrombolytics was contraindicated, heparin (5%) was used. Among ionotropes dobutamine was commonly used (15%) followed by dopamine (7%). Only 6 patients were prescribed antiarrhythmics and 4 among them received amiodarone, the rest 2 were treated with lignocaine. Opioid analgesics was widely used and tramadol (60%) was majorly prescribed followed by morphine (10%).

The use of antihypertensive was high with 60 prescriptions containing diuretics, 48 drugs among it being furosemide, followed by Angiotensin receptor blockers (15 prescriptions), carvedilol (10 prescriptions), calcium channel blockers (8 prescriptions), beta blocker (7 prescriptions), angiotensin converting enzyme inhibitors (6 prescriptions). Among the 27 diabetics on treatment

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with drugs 89% were put on insulin during their stay in ICU.

Apart from cardiovascular drugs the use of proton pump inhibitors, mainly pantoprazole was seen in 80% cases as prophylaxis against gastritis and 33 % usage of antiemetics mainly ondansetron was noted. Alprazolam (53%) was widely used anxiolytic.

Percentage of antibiotics usage was 24%, among them 15% were cephalosporin and sulbactam combination, main indication being urinary tract infection.

Figure 5 shows the commonly prescribed drugs in ICU.

The ATC classification of commonly used drugs in ICU is given in table 3.

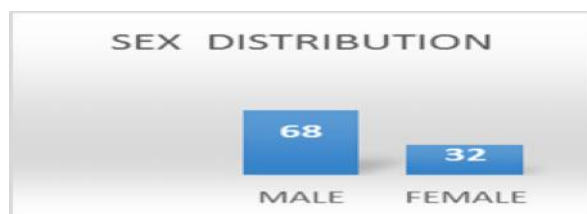


Fig 1: Sex distribution of patients admitted to ICU

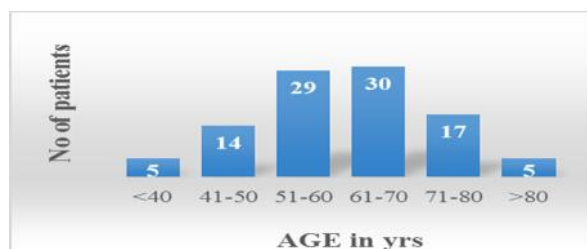


Fig 2: Age wise distribution of patients

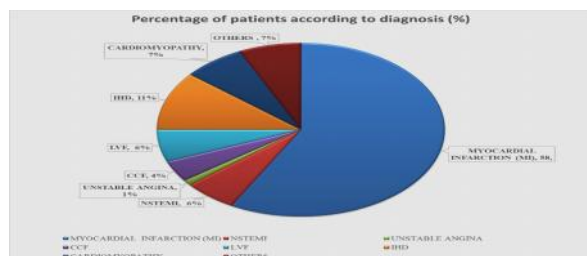


Fig 3: Diagnosis of cases admitted in ICU

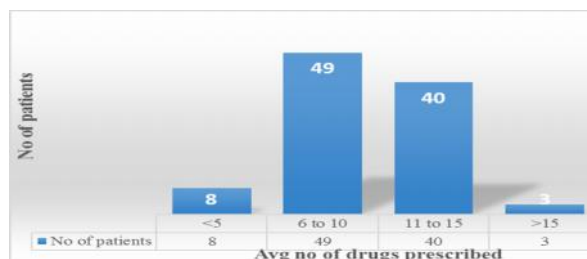


Fig 4 : Average no of drugs prescribed /patient

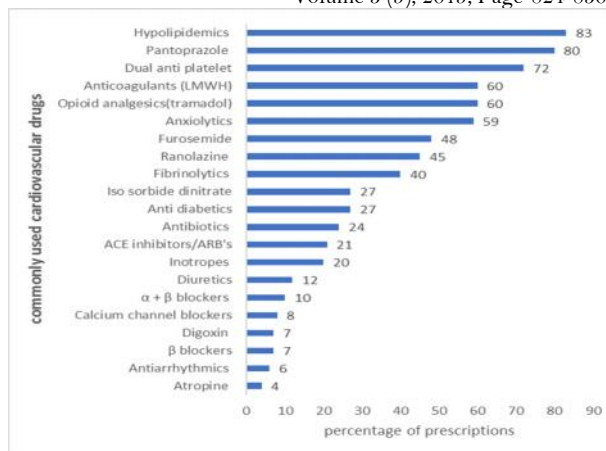


Fig 5 : Commonly used drugs in ICU

Table 1: Comorbidities associated with cardiovascular disorders among patients admitted to ICU

Co- morbidity	No of patients	Percentage of patients
Hypertension	17	30.91
Diabetes mellitus	12	21.82
Hypertension and diabetes	18	36.36
Hypothyroidism	1	
Anemia	1	
COPD		
Hypertension	2	3.64
Diabetes	1	
ARF	3	5.46
Total	55	100

Table 2 : Commonly used parenteral drugs

Sl.no	Drug	Percentage
1	Proton pump inhibitors	80
2	Opioid analgesics	60
3	Anti coagulants	56
4	Thrombolytics	40
5	Antiemetics	33
6	Antibiotics	26
7	Insulin	24
8	Diuretics	17

Table 3: ATC classification of commonly prescribed drugs with the number of prescriptions

Drugs	ATC classification	No of prescriptions
Ranolazine	C01EB18	45
Isosorbide dinitrate	C01DA08	27
Nicorandil	C01DX16	7
Ivabradine	C01EB17	8
Glyceryltrinitrate	C01DA02	6
Aspirin	B01AC06	73

Clopidogrel	B01AC04	80
Amiodarone	C01BD01	4
Lignocaine	C01BB01	2
Atorvastatin	C10AA05	77
Streptokinase	B01AD01	39
Enoxaparin	B01AB05	60
Heparin	B01AB01	5
Metoprolol	C07AB02	7
Furosemide	C03CA01	48
Telmisartan	C09CA07	7
Ramipril	C09AA05	6
Cilnidipine	C08CA14	4
Digoxin	C01AA05	7
Dobutamine	C01CA07	15
Dopamine	C01CA04	7
Atropine	A03BA01	4
Insulin	A10AC01	24
Ceftriaxone	J01DD04	15
Pantoprazole	A02BC02	80
Ondansetron	A04AA01	28
Tramadol	N02AX02	50

4. DISCUSSION

Drug utilization research was defined by WHO in 1977 as the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences.⁸

Elderly patients and male predominance of cardiovascular emergencies were similar to the findings conducted by Bhumika J Patel et al⁹ and Lisha Jenny John et al¹⁰. Polypharmacy is a major problem with cardiovascular inpatients admitted as they are associated with multiple comorbidities hence around 10 drugs per prescription were justifiable.

Similar to previous studies conducted in ICCU by Pendhari S R et al¹¹ majority of the admission was due to myocardial infarction and ischaemic heart disease .

The quantification of the drugs which were used was done by using the Anatomical Therapeutic Chemical (ATC) classification. The main purpose of the ATC classification is as a tool for presenting drug utilization statistics⁴.

The utilization of hypolipidaemic, antiplatelet agents and anticoagulant drugs was high and it is in accordance with the standard guidelines which were mentioned for the treatment of such emergencies.

Various studies such as HPS, 2002; ASCOT-LLA, 2003 has indicated that prophylactic use of a statin in CAD/hypertensive patients even with average or lower than average CH levels lowers coronary and stroke events^{12, 13}. In our study the use of high dose statin (80mg) was observed instead of low dose as used previously as recent studies have shown that Intensive lipid-lowering therapy with 80 mg of atorvastatin per day in patients with stable CHD provides significant clinical benefit beyond that afforded by treatment with 10 mg of atorvastatin per day.¹⁴

Another interesting concern is on use of Proton pump inhibitor (PPI). PPIs are known to interfere with the metabolism of clopidogrel. PPIs are often prescribed prophylactically to prevent gastrointestinal (GI) complications such as ulceration due to dual antiplatelet therapy, in particular aspirin and clopidogrel. There are studies concluding the risk of recurrence of cardiovascular outcomes when the antiplatelet regimen of clopidogrel and aspirin was accompanied by PPIs . One study reported that the PPI pantoprazole was not associated with recurrent MI among patients receiving clopidogrel, possibly due to pantoprazole's lack of inhibition of CYP450 2C19¹⁵.

Streptokinase was the most commonly used fibrinolytic though newer plasminogen activators with less side

effects available, as streptokinase is less expensive and effective. Among antianginals the use of newer novel drugs like ranolazine was more. Some studies suggests that ranolazine may have additional efficacy in combination with other anti-anginal drugs and also has some beneficial effects on glucose metabolism.¹⁶

The usage of ACE-inhibitors and ARBs was high in comparison to beta blockers as stated in various guidelines for treating myocardial infarction as ACE inhibitors/ ARBs are beneficial by preventing fibrosis and cardiac remodelling compared to other anti-hypertensives. Among adrenergic antagonists (18%) used carvedilol accounted for 55% of adrenergic antagonist as it causes vasodilatation and has antioxidant properties which are cardioprotective¹⁷.

According to guidelines though morphine is the analgesic of choice to control cardiac pain, the use of tramadol was noted in our study as it easily available as stated by a study conducted by Kunkulol Rahul et al¹⁸.

In our study only the pattern of cardiovascular drug usage was given importance, follow up of the patients once they are stabilized and shifted to wards would have given more information about drug induced adverse reactions. Future studies including the cost analysis of the drugs used in ICCU would be more informative.

5. CONCLUSION

This study provides information on the various cardiovascular disorders commonly seen in intensive cardiac care unit and the spectrum of cardiovascular drug utilization in them. Similar drug utilization study with longitudinal surveillance should be done in ICCU frequently to collect more information on drug use pattern and comment on rationality of prescriptions.

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