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Utilization of antihypertensive medications among the critically ill patients

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ABSTRACT

In the medical intensive care unit (ICU) extensive pharmacologic interventions is necessary to stabilize critically ill patients. In patients with cardiovascular illnesses, pharmacotherapy is the primary line of management. We evaluated the utilization pattern of antihypertensive drugs and their adverse effect profile among the inpatients in the ICU. An observational study was carried out in medical ICU of a tertiary care hospital in South India. The medical records of all inpatients of the ICU were reviewed over a period of twelve months. The demographic data, clinical data, and drug details were recorded. WHO Anatomic Therapeutic Chemical classification system was used to classify drugs. Descriptive statistical analysis was carried out. A total of 337 patients received antihypertensive medications among 728 patients. The most commonly prescribed drug class was calcium channel blockers 117(34.7%), beta-blockers 83(24.6%) and angiotensin converting enzyme inhibitors 73(21.6%) represented the major classes. Amlodipine (C08CA01) was the single most commonly prescribed anti-hypertensive drug (32.6%). Anti-hypertensive polytherapy was noticed in 295(87.5%) prescriptions. A wide spectrum of antihypertensive medications was utilized from various drug classes.

Keywords: prescription pattern, critically ill, anti-hypertensives

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INTRODUCTION

The critically ill patients are a unique patient group who receive a cocktail of various medications due the presence of multiple co-morbidities. A substantial proportion of patients admitted to the medical ICU with non cardiac illnesses have associated cardiac co-morbidities. [1] Hypertension is one of the common cardiovascular co-morbidities in these patients. Diversity of disease processes, impending organ failures alters the response to medications and also can compromise the acutely ill patient. It is a challenge for the physician to optimize therapy in these patients and to provide an effective pharmacotherapy. [2-4] Pharmacological manipulation of the cardiovascular function is therefore important in critically ill patients.

In patients diagnosed with cardiac disease in the ICU, pharmacotherapy is the primary line of management. Cardiovascular agents such as inotropes, vasopressors, antihypertensives, antiplatelet agents, lipid lowering agents, and anticoagulants are frequently used in the critical care setting for the management of the unstable cardiac patient. [4, 5] There has been tremendous increase in the cardiovascular drugs over the past few decades with newer drugs are being approved annually.

Escalating costs of medications is a major concern for both the patient and the physician especially in the developing countries. Hence, it is very important to prescribe drugs rationally so that the available funds can be utilized optimally. Drug utilization studies reviews the concordance of current drug prescription pattern with the treatment protocol. [6] This study aimed to evaluate the utilization pattern of drugs for hypertension in patients who were admitted to medical ICU.

MATERIALS AND METHODS

A prospective observational study was carried out at a tertiary care teaching hospital in Southern India. The study was carried out over a period of one year. The institutional ethics committee approval was obtained before starting the study. All admitted to the ICU during the study period were included. A questionnaire was used as study tool to record the relevant details pertaining to the study objectives age, gender, clinical diagnosis, cardiovascular co-morbid conditions, medication information (number of drugs prescribed, generic/trade name, and adverse drug reactions (ADR)(drug reaction and suspected drug) were collected. Descriptive statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS version.18). WHO-ATC classification was used to classify drugs into different. [7] The results are number of patients (percentage) or mean $\pm$ SD.

RESULTS

Over a 12-month period, of the total 728 patients, 337 patients received anti-hypertensive medications. Male predominance was observed (219, 65%). The frequent primary diagnoses in these patients were sepsis (septic shock), followed by renal insufficiency (acute

renal failure, chronic renal failure). The mean age of the patients included was 49 years and standard deviation (SD) for age was 15 years. The most common cardiovascular conditions observed in the medical ICU patient are shown in table 1.

Table 1: Indications for the use of cardiovascular drugs in the ICU

Sl. No.	Cardiovascular diagnosis	Number (n=728)	% of patients
1	Hypertension	221	30.4
2	Coronary artery disease	85	11.6
3	Dyslipidemia	63	8.7
4	Myocardial Infarction (chronic)	25	3.4
5	Congestive heart failure	22	3
6	Cardiac arrest	20	2.7
7	Arrhythmias/ Septal valve disorders/ Myocarditis/ Pericarditis	35	4.8

Among the anti-hypertensive drugs prescribed, calcium channel blockers 117 (34.7%), beta-blockers 83(24.6%) and angiotensin converting enzyme inhibitors (ACEIs) 73 (21.6%) represented the major classes. Amlodipine (C08CA01) was the single most commonly prescribed anti-hypertensive drug. Anti-hypertensive polytherapy was noticed in 295(87.5%) prescriptions. Calcium channel blockers (Amlodipine) were the most widely used antihypertensive followed by beta blockers. It was observed metoprolol was the most frequently used beta blocker. The commonly prescribed antihypertensive medications in the medical ICU are shown in table.2.

Table 2: Utilization pattern of anti-hypertensive drugs in the medical ICU

Drug class	Drug	ATC code	Number of prescriptions (n=337)	%
Calcium channel blockers	Amlodipine	C08CA01	110	32.6
	Nimodipine	C08CA06	7	2
Beta blockers	Metoprolol	C07AB02	46	13.6
	Atenolol	C07AB03	37	11
Angiotensin converting enzyme inhibitors	Enalapril	C09AA02	46	13.6
	Ramipril	C09AA05	15	4.4
	Captopril	C09AA01	12	3.5
Angiotensin II antagonists	Losartan	C09CA01	18	5.3
Alpha blockers	Prazosin	C02CA01	18	5.3
Alpha-2 agonists	Clonidine	C02AC01	11	3.2
Fixed drug combination	Atenolol+ Amlodipine	C07FB03	9	2.6
	Losartan+ Hydrochlorthiazide	C09DA01	8	2.4

The commonly encountered ADRs to the antihypertensive drugs in the medical ICU were dyselectrolytemia by enalapril (12 cases), drug induced bradycardia (10 cases) by beta blockers (metoprolol).

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DISCUSSION

Male preponderance and mean age of the patients included in the study was similar to Shankar et al. [8] of the cardiovascular conditions, hypertension was the predominant cardiovascular co-morbidity followed by coronary artery disease and dyslipidemia. The probable reason for predominance of chronic cardiac conditions was that these patients were primarily admitted to the medical ICU for non cardiac indications.

Anti-hypertensives were the most frequently used cardiovascular drug category. Hypertension (30.4%) was the most common co-morbidity found our study, which explains the high number of prescriptions for anti-hypertensive agents. Hypertension and diabetes were co-existent in 23% of the patients and according to Joint National Committee VII (JNC-VII) Report; [9] ACE inhibitors are the preferred agents in these patients. However, in this study maximum prescription was observed for calcium channel blockers particularly amlodipine (32.6%). Critically ill patients are generally more prone to renal failure secondary to sepsis. In addition majority of patients in our study had renal insufficiency as their primary diagnosis and therefore calcium channel blockers were preferred to ACE inhibitors to avoid hyperkalemia and worsening of renal function.

Very few prescriptions with fixed drug combinations for hypertension were observed. However, 87.5% of patients were on combination therapy of antihypertensive medication. The use of combination drugs in hypertension as the first line of management is now becoming increasingly popular. Several antihypertensive drug combinations have been tested in randomized controlled trials. Polypill is a fixed drug combination of multiple agents to tackle various components of the coexisting common risk factors which necessitates polypharmacy. [10] This will also reduce cost and improve patient adherence to treatment. [11]

Metoprolol was the one of the commonly prescribed anti-hypertensive drug. Several recent reports have questioned the role of beta blockers in the management of hypertension especially metoprolol as majority of the randomized trials were performed with atenolol. [12-15] These studies concluded the beta blockers are not effective in preventing cardiovascular events. Beta blockers are indicated only if there are compelling indications such as congestive heart disease. This prescribing practice of beta blockers in hypertension observed in this study requires modification.

In the present study, enalapril and metoprolol were the most commonly attributed cardiovascular drugs to ADRs. This finding was dissimilar to Karimzadeh I et al and Gholami K findings in which Digoxin and Diltiazem respectively were the most frequent causative agents in ADRs. [16, 17] In a review published on the preventable ADRs, ADRs to cardiovascular drugs were identified as the most commonly preventable ADRs especially anti-hypertensive drugs (beta blockers, angiotensin converting enzyme inhibitors), nitrates and anticoagulant. [18] Majority of these preventable ADRs are manifested within few days of initiation of the

medication, therefore intensive monitoring during this period can reduce the occurrence of these ADRs.

CONCLUSION

A wide spectrum of antihypertensive drugs was utilized from various drug classes. Continuous drug utilization reviews in the medical ICU would give insights on the current utilization practices and suggest modification to improve the practices. The critically ill patient represent a high risk population in whom judicious and appropriate pharmacotherapy can be lifesaving and irrational use of medications can be life threatening.

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