Medications in Bronchospasm and Asthma among the Critically Ill Patients: A Drug Utilization Study from Southern India

John J L[1], John J[2] , Devi P[3], Arifulla M[4], Guido S[5]

[1]Research Assistant, Department of Pharmacology, Gulf Medical University, Ajman, UAE.

[2]Specialist, Department of Pediatrics, Gulf Medical College Hospital, Ajman, UAE.

[3]Assistant Professor, Department of Pharmacology, St. John's Medical College, Bangalore, India.

[4]Professor & Head, Department of Pharmacology, Gulf Medical University, Ajman, UAE.

[5]Professor, Department of Pharmacology, St. John's Medical College, Bangalore, India.

Original Article

Corresponding Author:
Dr. Lisha Jenny John,
Research Assistant,
Gulf Medical University, Ajman, UAE.
Email : drlishaj@yahoo.com

Abstract

Objective
Critically ill patients are prone for altered reactivity of the airway and drug therapy has pivotal role in the management of bronchospasm. The objective of the study was to evaluate the prescribing patterns and adverse effects of therapeutic agents for bronchospasm and asthma in the medical ICU.

Methods
A prospective observational study was carried out among inpatients of the medical ICU receiving drugs for bronchospasm and asthma.

Results
220 patients received drugs for bronchospasm and asthma. Male preponderance was noticed (60.5%). Salbutamol (R03AC02) 92.7% was the most common bronchodilator prescribed. Ipratropium plus salbutamol (R03AK04) 55.5% was most frequently used bronchodilator combination. All bronchodilators were administered by inhalational route (nebulization) except methylxanthines

Conclusion
Utilization patterns of drugs for bronchospasm and asthma were in concordance with treatment guidelines.

Key Words
Bronchospasm, Asthma, Southern India

Introduction
In the intensive care unit (ICU), the airway reactivity and resistance is potentially altered by many factors such as associated infections, changes in lung volume, fluid balance, and use of other drugs (beta-adrenergic blocking agents, steroids, etc)[1]. Severe asthma remains a challenge in the ICU, with mortality of 1 to 3 percent[2]. Pharmacotherapy plays an integral role in preventing the mortality associated with severe asthma. Drug treatment in asthma has changed during recent years, reflecting asthma is not just a disease of reversible bronchoconstriction, and that the underlying inflammation occurring in the airways contributes in a major way to its pathological processes[3].
Drug utilization studies is a component of medical audit that does monitoring and evaluation and suggests necessary modifications in prescribing practices to achieve rational therapeutic practices and cost effective health care[4]. It also improves the standards of medical treatment at all levels of health care. The objective of this study was to evaluate the prescribing patterns and adverse of drugs for bronchospasm and asthma in the medical ICU of a tertiary care hospital.

Materials and Methods
An observational study was carried out at St. John's Medical College a tertiary care teaching hospital in Southern India with a dedicated medical intensive care unit for a period of one year from October 2006 to September 2007 after

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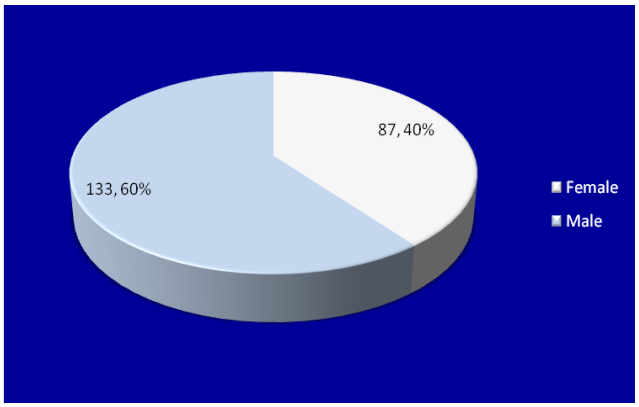
obtaining ethical approval from the Institutional Review Board. All patients admitted to the medical ICU receiving drugs for bronchospasm and asthma during the study period was included. Patients transferred to other specialty ICUs from medical ICU within 24 hours of admission were excluded. To evaluate the drug prescribing patterns a pre-tested structured questionnaire containing relevant details (demographic and drug data) was used. The relevant data was collected prospectively from the inpatient medical records. The data was subjected to descriptive analysis using Microsoft Excel. Drugs were classified into different groups based on WHO-ATC classification5. Utilization of different classes of drugs as well as individual drugs was analyzed and presented as percentage.

Results

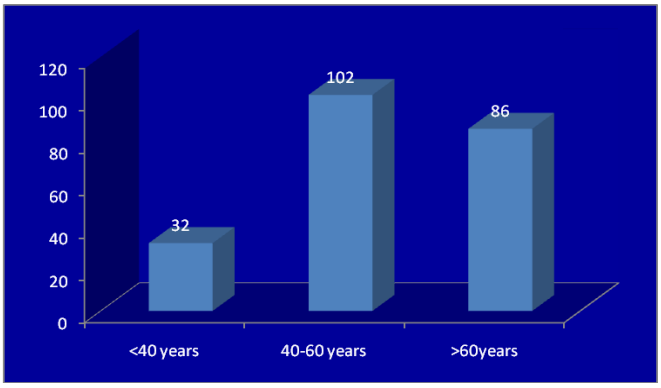
During the study period a total of 728 patients were admitted to the medical ICU. Of which 220 received drugs for bronchospasm and asthma and were included in the analysis. Male patients were 133 (60%) as compared to 87 (40%) female patients (figure.1).

Figure1: Gender distribution of patients



The mean age of the patients was 53±11 years and age range was 25 years to 89 years. The age wise distribution of patients is detailed in figure 2. The average number of drugs per patient (prescription) was 11.6±2.09. All the patients received more than 5 drugs, 70% were prescribed by brand name and 42% drugs from WHO essential drug list.

Figure 2: Distribution of patients in different age groups



Salbutamol (R03AC02) 204 (92.7%) and ipratropium bromide (R03BB01) 131(59.5%) were the most common bronchodilators prescribed among the medical ICU patients. Methyl xanthines and corticosteroids were less frequently prescribed. The utilization pattern of drugs for bronchospasm and asthma among patients in the medical ICU is shown in table 1. The most common route of administration of all bronchodilators was inhalational route (nebulization) but for methylxanthines which were administered by intravenous route. Intravenous hydrocortisone was prescribed in 82(37.2%) patients and oral prednisolone in 10 (4.5%) patients.

Table 1: Utilization pattern of drugs for bronchospasm and asthma

Drug class	Drug	ATC Code	Number (%) of patients (n =220)*
Beta-2 agonists	Salbutamol	R03AC02	204(92.7)
	Terbutaline	R03AC03	12(54.5)
	Salmetrol	R03AC12	10(4.5)
	Orciprenaline	R03AB03	6(2.7)
Anticholinergics	Ipratropium bromide	R03BB01	131(59.5)
Xanthines	Theophylline	R03DA04	44(20)
	Aminophylline	R03DA05	9(4)
Corticosteroids	Budesonide	R03BA02	5(2.3)
α+β receptor agonists	Adrenaline	R03AA01	3(2)

More than one bronchodilator was prescribed in 140(63.6%) patients. Among the 220 patients 132 (60%) received two bronchodilators, 32 (14.5%) received three medications and 10 (4.5%) received 4 drugs for bronchospasm. The most commonly used fixed drug combination was Ipratropium plus salbutamol (R03AK04) in majority of patients 123(55.5%). The mean duration of drug therapy was 5 days (1- 10 days).The adverse drug reactions noted among these patients were salbutamol induced tremors 6(0.8%), tachycardia 6(0.8%), theophylline induced seizures 2(0.2%) and corticosteroid induced hyperglycemia 2(0.2%). All the adverse reactions based on WHO classification were of probable type since only dechallenge was performed and the adverse effects resolved.

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Discussion

The results of the present study revealed the pattern of use of drugs for bronchospasm and asthma in the critically ill patients. The three basic mechanisms of the disease process of asthma are airway wall inflammation, smooth-muscle-mediated bronchoconstriction, and intraluminal mucus. Aerosolized administration of bronchodilators and anti-inflammatory medications are the cornerstone in the treatment of bronchospasm and airway inflammation[2].In concordance with the guidelines6 developed for optimal delivery of drugs in bronchospasm, inhalational route (nebulization) was the primary route of drug administration in the present study. The use of nebulizers and metered dose inhalers among the critically ill patients on mechanical ventilation have shown equal efficacy in earlier reports[7].Consistent with Shankar et al[8] salbutamol (92.7%) and ipratropium (59.5%) were the most common bronchodilators used in the present study. Inhaled beta2-adrenergic agonists are by far the most effective bronchodilators. These agents have a rapid onset of action and are indicated as first-line treatment for the short-term relief of bronchoconstriction and acute exacerbations of asthma symptoms. The bronchodilating efficacy of ipratropium bromide is superior to that of beta2-agonists in patients with chronic obstructive pulmonary disease[3].Corticosteroids were prescribed along with bronchodilators in 44% patients (all routes included). Corticosteroids reduce airway wall inflammation, decrease mucus production, and have a synergistic effect with beta-adrenergic agonists on bronchial smooth muscle relaxation and thus preferred in severe asthma[3]. Overall, reduced utilization of xanthines was noticed in the study. Methyl xanthines are regarded as a second-line drug because of its narrow therapeutic range and the high incidence of side-effects[9]. Therapeutic polypharmacy defined as use of multiple medications to treat a specific disease for the therapeutic benefit as recommended by expert panel or researchers[10].Therapeutic polypharmacy among bronchodilators was observed in 79% prescriptions. The most frequent bronchodilator combination was salbutamol with ipratropium (R03AK04) (55.5%), similar to Chan et al[11]. Treatment guidelines for chronic obstructive pulmonary disease suggest the combined use of beta2 agonist with anticholinergics[12]. Combining anticholinergic with a beta2-agonist can result in an additive bronchodilator effect because ipratropium acts on the larger and medium sized airways whereas beta2-agonist acts on the smaller bronchi as well as reducing the adverse effects[13].In conclusion, as per the current treatment recommendations for bronchospasm and asthma, increased utilization of both bronchodilators and anti-inflammatory agents was noticed. Based on the observations made in this study on drug prescribing patterns in medical ICU,the information obtained on drug prescribing patterns can provide a framework for continuous prescription audit in the medical ICU.

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