

# A Study on Prescribing Trends of Drugs in the Management of Bronchial Asthma: A Hospital-Based Study

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## Abstract

**Background:** Bronchial asthma is a common allergic condition with varied symptoms and necessitates the attention of the physician especially in acute attacks and poses a challenge to treat. Treatment to overcome the acute asthmatic episodes and control of chronic symptoms, nocturnal, and exercise-induced asthmatic symptoms leaves the physician in a dilemma. Pharmacologic management includes the use of control agents such as inhaled corticosteroids, long-acting bronchodilators (beta-agonists and anticholinergics), theophylline, and leukotriene modifiers. Relief medications include short-acting bronchodilators, systemic corticosteroids, and ipratropium.

**Aim of the Study:** The aim is to study the current prescribing trends of specialists in a tertiary teaching hospital who treat patients' bronchial asthma as primary or secondary physicians.

**Materials and Methods:** A cross-sectional prospective study was conducted in the outpatient department (OPD) of a tertiary teaching hospital of Northern Kerala including the Departments of Medicine and Allied specialties over a period of 2 years. The specialties included were Medicine, Dermatology, Chest Diseases, and Psychiatry. 2,99,520 attended the OPD of the four specialty clinics of the hospital over a period of 2 years. 76,608 patients among these were positive history for different types of allergy. 31,194 patients (40.71%) among those patients with a history of various allergy disorders had a history of bronchial asthma. All the case records were accessed from the four specialty departments, and the demographic data were recorded for analysis including age, sex, occupation, history, family history, and drug prescription which includes the drugs prescribed dosage form and frequency. The percentage of all observed data was tabulated.

**Observations and Results:** Salbutamol ( $\beta$ -agonists) + ipratropium bromide (anticholinergic) + levocetirizine + montelukast was the most commonly used combination as bronchodilator in 10287 (32.98%) of the patients. Formoterol + budesonide + fexofenadine + diphenhydramine combination was used in 5893 patients (18.71%). Doxophylline + fexofenadine combination was used in 4134 (13.25%) patients. Budesonide + montelukast + fexofenadine combination was used in 3256 (10.44%) patients. Etophylline + theophylline + levocetirizine combination was used in 2048 (9.97%) patients. Hydrocortisone + theophylline combination was found in 1947 (6.24%) patients. Methyl prednisolone + doxophylline + levocetirizine combination was used in 1001 (3.21%) patients. Dexamethasone + theophylline combination was used in 833 (2.67%) patients. Montelukast + doxophylline combination was used in 1.13% of the patients. Fexofenadine + diphenhydramine combination was used in 1.01% of the patients. Levocetirizine + montelukast combination was used in 0.39% of the patients.

**Conclusions:** Combination therapy in the treatment of both acute and chronic types of bronchial asthma was found to be popular among the consultants of different specialties who treat the condition. The most common combination used in this study was salbutamol ( $\beta$ -agonists) + ipratropium bromide (anticholinergic) + levocetirizine + montelukast.

**Key words:** Allergy, Asthma, Bronchial asthma, Bronchodilator, Bronchospasm, Lung function tests

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## INTRODUCTION

Asthma is an allergic disorder characterized by immune-inflammatory response requiring prolonged treatment. There are many factors such as aeroallergens, chemicals, drugs, exercise, cold dry air, infections, and personal emotions which can aggravate the symptoms and precipitate attacks.<sup>[1,2]</sup>

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The incidence of asthma is increasing in view of increasing pollution in many cities, and the incidence is equally increasing in children as in adults all over the world.<sup>[3]</sup> The fundamental principle of treatment of chronic disease should be based on establishing a working diagnosis and initial assessment of severity which provides as a guide to the intensity of therapy required. Regular follow-up thereafter monitors the control of the disease processes and their clinical manifestations.<sup>[4]</sup> Bronchial asthma is characterized by narrowing of the smaller airways in the lungs. This narrowing is partially or completely reversible. Symptoms of asthma include wheezing, coughing, chest tightness, and shortness of breath. These symptoms tend to come and go and are related to the degree of airway narrowing in the lungs. In India, asthma is known to be one of the major causes of morbidity and mortality, comprising about 3–11% of adults and 3–5% of pediatric population.<sup>[5]</sup> The target of asthma treatment is to achieve and maintain clinical control. Many bronchodilators are now available in the market which relieves the bronchospasm in asthma. Drug utilization reviews are important studies to understand the prescription patterns of physicians in various parts of the country. They play an important role in helping the health-care system to understand, interpret, and improve the prescribing administration and to maintain the rational use of drugs which assist the physician's prescribing attitude in accordance with the predetermined standards.<sup>[6,7]</sup> In this context, an institutional study was conducted over a period of 2 years to describe trends in the prescription and consumption of bronchodilators for managing acute exacerbation of bronchial asthma in adult population.

#### Period of Study

The study duration was from March 2013 to February 2015.

#### Institution of Study

This study was conducted at Kannur Medical College, Anjarakandy, Kannur, Kerala.

#### Type of Study

This was a cross-sectional prospective study.

### MATERIALS AND METHODS

A cross-sectional prospective study was conducted in a tertiary teaching hospital of Northern Kerala. The study was conducted in the outpatient department (OPD) of Medicine and Allied specialties over a period of 2 years. An ethical committee clearance was obtained before the commencement of the study. The specialties included were Medicine, Dermatology, Chest Diseases, and Psychiatry.

#### Inclusion Criteria

1. All the patients with a history of allergy and bronchial asthma alone or in association with other specialty diseases were included.

2. Patients aged above 12 years and below 65 years were included.
3. Patients with acute or chronic bronchial asthma were included.
4. Patients already on treatment for bronchial asthma were included.
5. Patients who had suffered more than 3 acute attacks of bronchospasm were included in this study.

#### Exclusion Criteria

1. Patients aged below 12 and above 65 years were excluded.
2. Patients with acute infectious diseases were excluded.
3. Patients with fulminating diseases were excluded.
4. Patients with malignant hypertension and severe uncontrolled diabetes mellitus were excluded.
5. Patients who were having other respiratory problems such as chronic obstructive pulmonary disease (COPD) and cardiac problems were excluded from this study.

A total of 2,99,520 attended the OPD of the four specialty clinics of the hospital over a period of 2 years. 76,608 patients among these were positive history for different types of allergy. 31,194 patients (40.71%) among those patients with a history of various allergy disorders had a history of bronchial asthma. All the case records were accessed from the four specialty departments, and the demographic data were recorded for analysis including age, sex, occupation, past history, family history, and drug prescription which includes the drugs prescribed dosage form and frequency. The percentage of all observed data was tabulated.

### OBSERVATIONS AND RESULTS

31,194 prescriptions of the patients attending the OPDs of Medicine, Psychiatry, Dermatology, and Chest Diseases were accessed and analyzed, and the data were tabulated. There were 18,058 males (57.88%) and 13,136 females (42.11%). The male-to-female ratio was 1.3:1. The demographic data are shown in Table 1.

The bronchodilators used in the present study are shown in Table 2. The bronchodilators were used alone or in combination with other drugs such as antihistamines, steroids, mast cell stabilizers, antibiotics, and mucolytic agents.

In this study, it was observed that patients received combination therapy in all the patients (100%). The bronchodilators and their combination drugs used are shown in Table 3.

Table 4 shows the drugs used in the combination therapy of the present study. The study showed salbutamol

**Table 1: The demographic data of the study group (n=31,194)**

Observation	Male - 18058 (57.88%)	Female - 13,136 (42.11%)
Age		
12–25	3380 - (18.71%)	2110 - (16.06%)
26–39	8657 - (37.97%)	4510 - (34.33%)
40–53	4005 - (22.17%)	3476 - (26.46%)
54–65	2016 - (11.16%)	3040 - (23.14%)
Social status		
Low	6080 - (33.66%)	4080 - (31.05%)
Middle	9489 - (52.54%)	5798 - (44.13%)
High	2489 - (13.78%)	3258 - (44.13%)
Familial	5674 - (31.65%)	3719 - (28.31%)
Bronchial asthma alone	8816 - (48.82%)	7043 - (53.61%)
Bronchial asthma with other allergies	9242 - (51.17%)	6973 - (53.08%)
Duration of bronchial asthma >6 months	12142 - (67.23%)	8160 - (62.11%)
Number of acute attacks		
3–6	13139 - (72.75%)	10044 - (76.46%)
6–9	2987 - (16.54%)	1474 - (11.22%)
9–12	1932 - (16.54%)	1618 - (12.31%)
Number of times the bronchodilator changed in prescription		
2–5	12547 - (69.48%)	10819 - (82.36%)
6–10	3841 - (21.27%)	1572 - (11.96%)
10–15	1670 - (9.24%)	745 - (05.67%)
Time taken for relief of bronchospasm		
<3 h	1825 - (10.10%)	2009 - (15.29%)
3–5 h	4917 - (27.22%)	4789 - (36.45%)
6–9 h	7717 - (42.73%)	4071 - (30.99%)
9–12 h	2084 - (11.54%)	1104 - (8.40%)
>12 h	2515 - (13.92%)	1163 - (8.85%)
Associated use of antibiotics		
Always initially	9015 - (49.92%)	7985 - (60.78%)
Not always initially	9043 - (50.07%)	5151 - (39.21%)

**Table 2: The incidence of different bronchodilators used in the study**

Beta 2 Agonists	Anticholinergic	Theophylline	Xanthines
Salbutamol	Ipratropium	Theophylline	Diphenhydramine
Formoterol	Tiotropium	Etophylline	
Salmeterol	Acidinium	Doxophylline	
Vilanterol	Glycopyrronium		

( $\beta$ -agonists) + ipratropium bromide (anti cholinergic) + levocetirizine + montelukast was the most commonly used combination as bronchodilator in 10287 (32.98%) patients. Formoterol + budesonide + fexofenadine+ diphenhydramine combination was used in 5893 patients

**Table 3: The drugs used in the combination therapy to treat bronchial asthma patients in the study**

Drugs used in bronchial asthma	Combination drugs
B-agonists	Salbutamol
Corticosteroids	Hydrocortisone, budesonide, methyl prednisolone
Methylxanthines	Diphenhydramine
Anticholinergics	Ipratropium bromide
Leukotriene modifiers	Montelukast
Antihistamines	Levocetirizine, fexofenadine

**Table 4: The combination therapy used in the study (n=31, 194)**

Combination therapy	Percentage
Salbutamol+Ipratropium bromide+Levocetirizine+Montelukast	32.98
Formoterol+budesonide+Fexofenadine+Diphenhydramine	18.71
Doxophylline+Fexofenadine	13.25
Budesonide+Montelukast+Fexofenadine	10.44
Etophylline+Theophylline+Levocetirizine	09.97
Hydrocortisone+Theophylline	06.24
Methyl prednisolone+Doxophylline+Levocetirizine	03.21
Dexamethasone+Theophylline	02.67
Montelukast+Doxophylline	01.13
Fexofenadine+Diphenhydramine	01.01
Levocetirizine+Montelukast	00.39

(18.71%). Doxophylline + fexofenadine combination was used in 4134 (13.25%) patients. Budesonide + montelukast + fexofenadine combination was used in 3256 (10.44%) patients. Etophylline + theophylline + levocetirizine combination was used in 2048 (09.97%) patients. Hydrocortisone + theophylline combination was found in 1947 (06.24%) patients. Methyl prednisolone + doxophylline + levocetirizine combination was used in 1001 (3.21%) patients. Dexamethasone + theophylline combination was used in 833 (2.67%) patients. Montelukast + doxophylline combination was used in 1.13% of the patients. Fexofenadine + diphenhydramine combination was used in 1.01% of the patients. Levocetirizine + montelukast combination was used in 0.39% of the patients [Table 4].

## DISCUSSION

The present study was conducted in a tertiary teaching hospital to know about the trends of prescription by various consultants of four specialties, namely, General Medicine, Psychiatry, Dermatology, and Chest diseases. Review of literature showed that many treatment guidelines<sup>[8,9]</sup> are available for bronchial asthma recommending bronchodilators, especially in the acute phase. They also recommend regular use of inhaled corticosteroids for

patients with mild persistent asthma. They also recommend regular use of inhaled corticosteroids for patients with mild persistent asthma, as this type of regimen provides control of asthma, suppresses airway inflammation, and may prevent the progression of asthma. Recommendations of various international bodies on asthma to improve the prescribing practices of the physicians and ultimately clinical standards are now available.<sup>[10,11]</sup> In the present study, the incidence of bronchial asthma was found to be more in males than in females with a male-to-female ratio of 1.3:1. In the present study, all the consultants used standard bronchodilators which are being used all over the world. In this study, majority of the prescriptions used nebulization as a preferred route of drug delivery to manage acute exacerbations of asthmatic episodes. Even though nebulizer delivered aerosol created by blowing air or oxygen through a solution to produce droplets requiring little coordination from the patient as drug is inhaled through a facemask or a mouthpiece using normal tidal breathing, the disadvantages include the longtime commitment maintenance treatments and lack of portability.<sup>[12]</sup> In the present study, salbutamol ( $\beta$ -agonists) + ipratropium bromide (anticholinergic) + levocetirizine + montelukast was the most commonly used combination as a bronchodilator in 10287 (32.98%) patients. These results are similar to the study done in Malaysia in which salbutamol was the most commonly prescribed<sup>[13]</sup> and also similar to the study done in Bareilly, which showed that inhaled salbutamol was received by 100% of the patients irrespective of the severity.<sup>[14]</sup> Formoterol + budesonide + fexofenadine + in another study conducted by Pinal *et al*<sup>[4]</sup> showed that 84% of patients and 76% of patients in Shimpi *et al*<sup>[1]</sup> were given combination therapy over monotherapy. In this study, in acute attacks of bronchial asthma, injection hydrocortisone was used. It actually prevents the side effect of inhaled medication which causes irritation on the respiratory tract. International guidelines recommend corticosteroids by oral route even for severe exacerbation, and it is reported to be as effective as intravenous route.<sup>[15]</sup> Anticholinergics were less prescribed as monotherapy but were given in combination with, as they are preferred medication for treating COPD instead of asthma. Diphenhydramine combination was used in 5893 patients (18.71%). Doxophylline + fexofenadine combination was used in 4134 (13.25%) patients. Budesonide + montelukast + fexofenadine combination was used in 3256 (10.44%) patients. Etophylline + theophylline + levocetirizine combination was used in 2048 (9.97%) patients. The reason for using short-acting  $\beta_2$  agonist, i.e., salbutamol is due to its rapid onset and its low cost according to the consultants of this hospital. Hydrocortisone + theophylline combination was found in 1947 (6.24%) patients. Methyl prednisolone + doxophylline + levocetirizine combination

was used in 1001 (3.21%) patients. Dexamethasone + theophylline combination was used in 833 (02.67%) patients. Montelukast + doxophylline combination was used in 1.13% of the patients. Fexofenadine + diphenhydramine combination was used in 1.01% of the patients. Levocetirizine + montelukast combination was used in 0.39% of the patients [Table 4]. Among the other injectable bronchodilators used in this study are doxophylline. It was the most commonly prescribed methylxanthines. Doxophylline is preferred over theophylline for it has less cardiotoxic effects than the former with preserved mucoregulatory and anti-inflammatory properties. Hence, doxophylline may constitute a safe and effective alternative treatment to aminophylline/theophylline in the treatment of acute exacerbation of bronchial asthma.<sup>[16]</sup> However, in a study by Faiz *et al.*, they concluded that there was no significant difference in spirometric variables between doxophylline and theophylline.<sup>[17]</sup> Maragay *et al.*<sup>[18]</sup> added that doxophylline has better safety profile than theophylline. Montelukast a leukotriene receptor antagonist was seen in most of the prescription as add-on therapy. It was prescribed as a fixed dose combination with levocetirizine in a study done by Rajathilagam *et al.*<sup>[19]</sup> Limitations of our study were lack of follow-up and cost-effectiveness which should have been done. For higher authenticity, more number of prescriptions should have been included in our study.

## CONCLUSION

Combination therapy in the treatment of both acute and chronic types of bronchial asthma was found to be popular among the consultants of different specialties who treat the condition. The most common combination used in this study was salbutamol ( $\beta$ -agonists) + ipratropium bromide (anticholinergic) + levocetirizine + montelukast. The most commonly prescribed bronchodilator in cases of emergency was intravenous doxophylline. Nebulization was preferred route to tackle the acute exacerbation of asthmatic symptoms.

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