A retrospective study on drug utilization in patients with acute exacerbation of bronchial asthma in adults at a tertiary teaching hospital in Bengaluru

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Bronchial asthma; Drug utilization studies; β2 agonist; Corticosteroids

Abstract  Background: Drug utilization plays a role in helping the health care system to understand, interpret and improve the drug use and continuous quality improvement. It plays an essential part of pharmaco-epidemiological studies. The purpose of this study was to evaluate the drug utilization trends in patients with acute exacerbation of bronchial asthma in a tertiary teaching hospital in Bengaluru.

Materials and methods: 100 prescriptions from patients with established diagnosis of acute exacerbation of bronchial asthma were assessed from the Department of Pulmonary Medicine and the data gathered was analysed using MS Excel.

Results: Majority of the prescriptions irrespective of severity received inhalation β2 agonist (formoterol) as a bronchodilator. Nebulization route was given for managing the acute exacerbations followed by inhalation route. Hydrocortisone was prescribed to all patients for managing acute exacerbations. Montelukast was used as an adjuvant therapy. Most of them were prescribed combination therapy. Doxophylline was prescribed among all the methylxanthines.

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Introduction
Drug utilization research is defined by WHO as “marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences”. Drug utilization evaluation (DUE) or drug utilization review (DUR) is an essential part of pharmaco-epidemiological studies which provide a proper understanding usage pattern of drugs, quality and efficiency use of drugs and its outcomes. DUR can play a key role in helping the healthcare 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 by allocating them with the feed-back and also in designing, conducting and imparting educational programmes for healthcare providers [1,2].
Asthma is a chronic inflammatory disorder of the airways characterized by bronchial hyper-responsiveness and airflow limitation that may vary in severity and frequency from person to person. The symptoms of asthma include recurrent episodes of wheezing, breathlessness, chest tightness and cough [3]. The characteristic pathophysiological changes in asthma involve several inflammatory cells and mediators that contribute to symptoms. 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 paediatric population [4]. The target of asthma treatment is to achieve and maintain clinical control.

According to GINA (Global Initiative for Asthma) guidelines, various drugs are suggested for the management of asthma that includes long and short acting β2 agonists (salbutamol, salmeterol, formoterol), corticosteroids (fluticasone, prednisolone, budesonide), xanthine derivatives (theophylline) and leukotriene receptor antagonists (Montelukast). These drugs can be used alone or in conjunction with other antiasthmatic drugs [5]. The present study was done to describe trends in the consumption of drugs for managing acute exacerbation of bronchial asthma in adult population in a health-care system.

Aim and objective

The aim was to evaluate drug utilization pattern in acute exacerbation of bronchial asthma among adult population at a teaching tertiary-care hospital in Bengaluru.

### Table 1 Demographic data.

| Age (in years) | Male | Female | Total (n = 100) |
|----------------|------|--------|-----------------|
| 10–19          | 3    | 3      | 6               |
| 20–29          | 27   | 14     | 41              |
| 30–39          | 9    | 7      | 16              |
| 40–49          | 14   | 10     | 24              |
| 50–59          | 4    | 3      | 7               |
| 60–69          | 2    | 2      | 4               |
| 70–80          | 1    | 1      | 2               |

### Materials and methods

A retrospective cross-sectional study analysing about 100 prescriptions was carried out after taking approval from Institutional Ethics Committee. Patients were selected on the basis of inclusion and exclusion criteria. Patients of age more than 18 years diagnosed with acute exacerbation of bronchial asthma were included and who were having other respiratory problems like COPD, cardiac problems were excluded from this study.

### Table 2 Asthmatic medications.

| Category          | Drugs                                          |
|-------------------|------------------------------------------------|
| β agonists        | Salbutamol, formoterol                         |
| Corticosteroids   | Hydrocortisone, budesonide, methyl prednisolone|
| Methylxanthines   | Etophylline, theophylline, doxophylline        |
| Anticholinergics  | Ipratropium bromide                           |
| Leukotriene modifiers | Montelukast                      |
| Anti histamines   | Levocetirizine, fexofenadine                  |

### Table 3 Prescribed asthmatic medications.

| Drugs                                      | Number of prescriptions |
|--------------------------------------------|-------------------------|
| Salbutamol                                 | 7                       |
| Salbutamol + ipratropium bromide           | 87                      |
| Formoterol + budesonide                    | 26                      |
| Etophylline + theophylline                 | 34                      |
| Doxophylline                               | 53                      |
| Budesonide                                 | 53                      |
| Hydrocortisone                             | 61                      |
| Methyl prednisolone                        | 7                       |
| Dexamethasone                              | 1                       |
| Montelukast                                | 57                      |
| Fexofenadine                               | 2                       |
| Levocetirizine                             | 3                       |

### Graph 1 Graphical presentation of demographic data of population under study.
Case records of the patients were assessed from the Department of Pulmonary Medicine at Victoria Hospital attached to Bangalore Medical College and Research Institute and the data was collected. The data collection form provides the information regarding the demographic details of the patient which includes 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 calculated.

**Results**

Demographic analysis of data revealed that there were 60% men and 40% women in the study and also showed that maximum asthmatic patients belonged to 20–29 years age group (Table 1, Graph 1). The drugs prescribed primarily in the study population are presented in Table 2. The results of this study showed that most of the patients received combination therapy when compared with individual therapy. Majority of the patients received combination therapy of β2 agonist and corticosteroids via inhalational routes.

From Table 3 and Graph 2, the study showed salbutamol (β-agonists) + ipratropium bromide (anti cholinergic) was the most commonly used combination as bronchodilator in 87% prescriptions followed by doxophylline (methyl xanthines) that was used in 53% of prescriptions. Corticosteroids which were in the form of hydrocortisone (61%), budesonide (53%), dexamethasone (1%), and prednisolone (7%) were depicted in 100 prescriptions. Majority of patients also received Montelukast, leukotriene receptor antagonist (LTRA) as an adjuvant treatment (57%) apart from β agonists and corticosteroids for the control of asthmatic symptoms. Nebulization route was preferred for managing the acute exacerbations.

**Discussion**

Prescription-based study evaluates the rationality of the prescription. Guidelines for rational prescribing practices are put forth to improve the standards of prescribing [6,7]. An international body on asthma has enhanced the prescribing practice of the physicians through various recommendations. In our study majority of the prescriptions used nebulization as a preferred route of drug delivery to manage acute exacerbations of asthmatic episodes. Nebulizer produces an aerosol by blowing air or oxygen through a solution to produce droplets requiring little coordination from the patient as drug is inhaled through a face-mask or a mouth piece using normal tidal breathing. Thus, it is useful in patients who are unable to use conventional inhaler. The disadvantages of using a nebulizer include the long time commitment maintenance treatments and lack of portability [8].

However, the inhalation therapy through metered dose inhalers was given to all patients who had treatment for acute exacerbation of bronchial asthma at the time of discharge. The inhalational route delivers more drugs locally and the dose used is also less with less side effects. This is in accordance to treatment guidelines, i.e. Inhalation therapy for asthma to be the first choice [9,10]. The effectiveness of inhaler therapy also depends on the inhaler technique. Patients may not be adequately instructed in the inhaler technique, thereby reducing the amount of drug delivered to the lungs. Cochrane, in a study stated it is important to reinforce the simple concept that failure to instruct patients on how to use inhalers and to reinforce these instructions will decrease compliance, whatever the drug or inhalation device [11].

The most commonly prescribed inhaled bronchodilator was salbutamol with ipratropium bromide (87%) followed by formoterol with budesonide (26%) which was in coherence with the study done in Malaysia in which salbutamol was the most commonly prescribed [11] and also study done in Bareilly, which showed inhaled salbutamol was received by 100% of the patients irrespective of the severity [12]. The study conducted by Pinal et al. showed that 84% of patients [4] and 76% of patients in Shimpi et al. [1] were given combination therapy over monotherapy. The reason for using short acting β2 agonist i.e salbutamol is due to its rapid onset and its low cost. In our study injection hydrocortisone (61%) was also used in managing an acute asthma attack. It prevents the side effect of inhaled medication which causes irritation on respiratory tract. NAEPP guidelines recommend corticosteroids by oral route even for severe exacerbation and it is reported to be as effective as intravenous route [13]. Anticholinergics were less prescribed as monotherapy but was given in combination with, as they are preferred medication for treating COPD instead of asthma.
Intravenous doxophylline was the most commonly prescribed methylxanthines. Doxophylline is preferred over theophylline for it has less cardio-toxic effects than the former with preserved mucosal-regulatory 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 [14]. However, Faiz et al. conclude that there is no significant difference in spirometric variables between doxophylline and theophylline [15]. The conclusions of Faiz et al. are further reinforced by the study of Margay et al. [16], but he concludes that doxophylline has a better safety profile over theophylline.

Corticosteroids constituted the most commonly used medication and intravenous was the preferred route, and was prescribed in 61% of the prescriptions, in contrast to study done by Sayadeda et al., corticosteroid was given by IV route in 100% cases of severe exacerbation and some cases of severe exacerbation were also given MgSO4 (28.57%) for additional bronchodilatation [12]. Montelukast, a leucotriene receptor antagonist (57%) was seen in most of the prescription as add-on therapy. It was prescribed as a fixed dose combination with levocetirizine (36.8%) in a study done by Rajathilagam et al. [17]. 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

β2 agonists Combinations and corticosteroids are the most commonly prescribed combination drugs for asthma followed by methylxanthines. The most commonly prescribed asthmatic medication in combination therapy was inhaled salbutamol with ipratropium followed by intravenous hydrocortisone and oral Montelukast. The most commonly prescribed methylxanthine was intravenous doxophylline. Nebulization was preferred route to tackle the acute exacerbation of asthmatic symptoms.

Conflict of interest

We have no conflict of interest to declare.

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