

Study on Prescribing Pattern of Corticosteroids in the Management of Asthma in a Tertiary Care Teaching Hospital

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Abstract: Asthma is a chronic inflammatory disease of airways and is of increasing prevalence, affecting all age groups. Long-term treatment is required for the effective management of the disease. Corticosteroids are widely prescribed in asthmatic patients. These anti-inflammatory agents can have significant systemic effects which are harmful to the patient. Hence, the selection of steroidal drugs and its dosage regimen should be done cautiously. **Aim:** This study attempts to assess the prescribing pattern of corticosteroids in asthma patients in a tertiary care teaching hospital. **Methodology:** The prospective study was conducted for a period of 6 months. Case records of 150 patients were selected based on the study criteria. A suitably designed data collection form was used to collect the required data. Statistical analysis was done using Microsoft Excel. **Results:** In the study, 64% of the patients were female. Steroid nebulizers (68.7%) were found to be the most commonly prescribed formulation followed by systemic steroids (41.33%) followed by metered dose inhalers (26%) followed by oral corticosteroids (14%) and dry powder inhalers (14%) that were the least prescribed. **Conclusion:** Inhaled corticosteroids were found to be the effective therapy for the management of asthma. Nebulisation was the most preferred route of administration. Budesonide + Formoterol were the most commonly prescribed fixed dose combination. Cost analysis of the prescription was carried out and found to be affordable by the patient population.

Keywords: Asthma, corticosteroids, prescription pattern, retrospective, inflammation

1. Introduction

Asthma is defined as a chronic inflammatory disease of the airways, affecting about 300 million people worldwide. The chronic inflammation is associated with airway hyper-responsiveness (an exaggerated airway-narrowing response to specific triggers such as viruses, allergens and exercise) that leads to recurrent episodes of wheezing, breathlessness, chest tightness and/or coughing that can vary over time and in intensity. Symptom episodes are generally associated with widespread, but variable, airflow obstruction within the lungs that is usually reversible either spontaneously or with appropriate asthma treatment.

Asthma is associated with T helper cell type-2 (Th2) immune responses. Elevated levels of Th2 cells in the airways release specific cytokines, including interleukin (IL)-4, IL-5, IL-9 and IL-13, and promote eosinophilic inflammation and immunoglobulin E (IgE) production. IgE production, in turn, triggers the release of inflammatory mediators, such as histamine and cysteinyl leukotrienes, that cause bronchospasm (contraction of the smooth muscle in the airways), edema, and increased mucous secretion, which lead to the characteristic symptoms of asthma. The mediators and cytokines released during the early phase of an immune response leads to progressive airway inflammation and bronchial hyper-reactivity. Over time, the airway remodeling that occurs with frequent asthma exacerbations leads to greater lung function decline and more severe airway obstruction. This suggests the importance of frequent assessment of asthma control and the prevention of exacerbations.

The pharmacologic agents commonly used for the treatment of asthma can be classified as controllers (medications taken daily on a long-term basis that achieve control primarily through anti-inflammatory effects) and relievers (medications used on an as-needed basis for quick relief of bronchoconstriction and symptoms). Controller medications include ICSs, leukotriene receptor antagonists (LTRAs), LABAs in combination with an ICS, long-acting muscarinic receptor antagonists (LAMAs), and biologic agents including anti-IgE therapy and anti-IL-5 therapy. Reliever medications include rapid-acting inhaled beta₂-agonists and inhaled anticholinergics.

Guidelines like GINA (Global Initiative for Asthma) recommend the use of inhaled corticosteroids as the first line therapy for the management of asthma. The anti-inflammatory effects of corticosteroids are mediated by both genomic and non-genomic effects. Inhaled corticosteroids (ICS) target gene transcription through their interactions with the glucocorticoid receptor (GR) at the glucocorticoid response element (GRE).

2. Methodology

The study was undertaken in Father Muller Multi-Speciality Hospital, Mangalore, India and was approved by IEC. This retrospective study was conducted for a period of 6 months, from January 2021 to June 2021. The study is a non-experimental (observational) and prospective study Patient case records were reviewed and a total of 120 subjects were selected based on the study criteria. Data such as age, gender, duration of diabetes, duration of asthma, duration of hospital stay, co-morbidities, severity of asthma. The data source needed for the study was collected from the case

reports, treatment charts and suitably designed documentation forms. Collected information was analyzed by descriptive statistical tools like frequency, percentage, mean and standard deviation. Kruskal Wallis test and Chi-square test were done to find the correlation. A suitably designed data collection form was used to record all the necessary data including patient demographic details, patient medication history, reason for admission, medication details and the laboratory investigation. In this if any harmful medication errors are observed, intervention were suggested. The collected data will be subjected for suitable statistical analysis. The study provides an understanding of the consumption, rationality, and appropriateness of the corticosteroid drugs prescribed to the patients with asthma. It serves as a tool for better understanding of treatment choice related to corticosteroid therapy.

3. Results

The study was undertaken in Father Muller Multi-Specialty Hospital, Mangalore, India and was approved by IEC. The study was conducted for a period of 6 months. Patient case records were reviewed and a total of 150 subjects were selected based on the study criteria.

Gender wise distributions of the patients were analyzed and majority of patients were females (64 %). Out of 150 patients, it was found that most of the patients were hospitalized for 1-10 days (87.33%), followed by 11-20 days (11.33%). Out of 150 patients 45 (30%) had mild asthma followed by 61 (40.66%) patients with moderate asthma and 44 (29.33%) patients with severe. it was found that a significant relationship exists between gender and severity of asthma found by chi-square test (P value = 0.002565). it was found that a significant relationship exists between age and severity of asthma found by kruskalwallis test (P value = 0.01955).

Co-morbidities

42 (28.0%) patients out of 150 had no co morbidity and a total of 140 co morbidities were identified from 108 patients. 54 patients had hypertension (36%) which makes it the most common co morbidity identified during the study. 37 patients had diabetes mellitus Disease (24%), followed by 15 patients with Chronic Kidney Disease (10%) and 14 patients with hypothyroidism (9.33%).

Prescribing pattern of corticosteroids:

Different formulations of steroids were used in the management of asthma. Steroid nebulizers (68.7%) were the most commonly used formulations followed by systemic steroids (41.3%). The results are presented in table 6. Table 7 depicts the age wise prescription pattern of corticosteroids. Budesonide (80.6%) was majorly prescribed corticosteroid followed by Prednisolone (26%). Ipratropium bromide (62.66%) was most commonly prescribed followed by levosalbutamol (52%). A total of 598 drug interaction were identified from the prescription of 150 patients 19 (3.17%) were major 271 (45.31%) were moderate 308 (51.50%). On an average, a patient spends Rs.1096 (± 506.68) per month on anti asthmatic drugs.

4. Discussion

Asthma is one of the most common under diagnosed and under treated disease, especially in the elderly people. Deaths due to asthma are rare and preventable. All the guidelines for asthma recommend early treatment for a good quality of life. A good management of the disease can be achieved with the proper use of corticosteroids. Thus, it is important to know the trend for the appropriate use of corticosteroids.

In our study, a total of 150 patients meeting the inclusion criteria were enrolled. The prevalence of asthma was predominantly found to be more in women (64%) than in men (36%). This gender disparity has been explained in the study of Dirkje S. Postma. The prevalence of asthma is more in boys as compared to girls in childhood while this trend is reversed in adulthood. This switch in asthma prevalence is coincided with the age of puberty onset. Asthma was found to be more prevalent in the individuals aged between 61 and 70 (22.66%). A study by Hasan Hamzacebi *et al* found that the asthma related respiratory symptoms were higher among 50 years of age and older group than the others. This may be due to degenerative changes in the respiratory tract through aging.

The severity of asthma was assessed. The majority of the patients had moderate asthma (40.66%) followed by mild asthma (30%) which is followed by severe asthma (29.33%). Hypertension (36%) was identified to be the most common co morbidity during the study. A similar result has been found in a study conducted by Aleksandra Wardzyńska *et al*. Allergic co morbidities were the most frequently found co morbidity in the study of Anahi Yanez *et al* whereas non-psychotic mental disorders were the most common co morbidity in the study of M. Cazzola *et al*. The second most common co morbidity was diabetes mellitus (24%).

The prescription pattern of corticosteroids were analyzed and noted that Budesonide (80.66%) was the most commonly prescribed corticosteroid followed by prednisolone. A study conducted by Thomas Zacharia *et al* had similar findings. Budesonide and Formoterol (22%) were the most commonly prescribed combination of ICS and LABA in our study. This result is in favour of the study carried out by Garima Adhulia *et al*. Nebulisation (68.66%) was the most preferred route of administration in our study and this is supported by the study conducted by R D'cruz *et al*. Nebulizers deliver steroids as fine mist into the lungs of patients at a faster rate. It has the advantage of administering multiple medications at the same time and modifying the dose of ICS if needed. Also, it can administer high doses of corticosteroids as needed in case of exacerbations and severe uncontrolled asthma. The second most prescribed route of administration was intravenous route (41.33) followed by metered dose inhalers (MDIs) which is followed by dry powder inhalers (DPIs) (14%) and oral route (14%). Intravenous route is mostly preferred for the management of moderate to severe asthma while oral route is preferred only for the management of severe asthma.

5. Conclusion

The present study illustrates that asthma was more prevalent in those aged between 61 and 70 years old and found to have female predominance. The majority of the patients had moderate asthma. Age and gender were found to have an impact on the severity of asthma. Hypertension was the most common comorbidity identified in the asthmatics. The prescription pattern of steroids were assessed and found that Budesonide was the most commonly prescribed corticosteroid and Budesonide and Formoterol were the frequently prescribed combination of ICS-LABA. Steroidal nebulizers were the preferred route of administration. The study shows that the management of asthma was effective with inhaled corticosteroids. The rationality of drug use was evaluated and found to comply with the standard guidelines (GINA). Drug interactions with corticosteroids were observed but the benefits of the therapy weighed more than the adverse effects. Cost per prescription increases with an

increase in the number of comorbidities. This may affect the medication adherence and quality of life of the patient.

Table 1: Prescribing pattern of corticosteroids.

Combination drugs	Frequency (%)
Budesonide+ Formeterol	33 (22%)
Fluticasone+Formeterol	7 (4.66%)
Fluticasone+Salmeterol	17 (11.33%)
Beclamethasone+Levosalbutamol	3 (2%)
Ciclesonide+Formoterol+Tiotropium	3 (2%)

Table 8: Route of administration of corticosteroids prescribed.

Formulation	Frequency (%)
Systemic (IV)	62 (41.33%)
Oral	21 (14%)
MDI	39 (26%)
Dry powder inhaler	21 (14%)
Nebulization	103 (68.66%)

Table 9: Age wise prescription pattern

formulations→ Age group (years) ↓	Systemic (IV)	Oral	MDI	Rotahaler	Nebulization
1-19	7 (4.66%)	8 (5.33%)	6 (4%)	-	4 (2.66%)
20-39	15 (10%)	5 (3.33%)	10 (6.66%)	4 (2.66%)	18 (12%)
40-59	16 (10.66%)	1 (0.66%)	12 (8%)	8 (5.33%)	31 (20.66%)
60-79	22 (14.66%)	7 (4.66%)	8 (5.33%)	8 (5.33%)	45 (30%)
>79	2 (1.33%)	-	3 (2%)	1 (0.66%)	5 (3.33%)

Table 10: Steroidal drugs prescribed.

Formulation	Frequency (%)
Budesonide	121 (80.66%)
Prednisolone	39 (26%)
Hydrocortisone	38 (25.33%)
Fluticasone	25 (16.66%)
Dexamethasone	14 (9.33%)
Beclamethasone	6 (4%)
Ciclesonide	3 (2%)
Deflazacort	2 (1.33%)

Table 11: Non steroidal anti-asthmatic drugs

Non steroidal anti asthmatic drugs	Frequency (%)
Albuterol	21 (14%)
Levosalbutamol	78 (52%)
Theophylline	38 (25.33%)
Acebrophylline	17 (11.33%)
Doxophylline	8 (5.33%)
Ipratropium bromide	94 (62.66%)
Montelukast	40 (26.66%)

References

- [1] O'Byrne PM, FitzGerald JM, Bateman ED, Barnes PJ, Zhong N, Keen C, et al. Inhaled combined budesonide-formoterol as needed in mild asthma. *N Engl J Med.*2018; 378 (20): 1865–76.
- [2] Vähätalo I, Ilmarinen P, Tuomisto LE, Niemelä O, Kankaanranta H. Inhaled corticosteroids and asthma control in adult-onset asthma: 12-year follow-up study. *Respir Med.*2018; 137: 70–6.
- [3] Peters SP, Bleecker ER, Canonica GW, Park YB, Ramirez R, Hollis S, et al. Serious asthma events with budesonide plus formoterol vs. Budesonide alone. *N Engl J Med.*2016; 375 (9): 850–60.
- [4] Lin J, Fu X, Jiang P, Song W, Hu X, Jie Z, et al. INITIAL-An observational study of disease severity in newly diagnosed asthma patients and initial response following 12 weeks' treatment. *Sci Rep.*2019; 9 (1): 1254.
- [5] D'cruz R, Reddy N, Marise DL. Prescribing pattern and use of steroids among asthmatic patients in a tertiary care hospital. *Value Health.*2018; 21: S417.
- [6] Dhar S, Seth J, Parikh D. Systemic side-effects of topical corticosteroids. *Indian J Dermatol.*2014; 59 (5): 460–4.
- [7] Yanagisawa S, Ichinose M. Definition and diagnosis of asthma-COPD overlap (ACO). *Allergol Int.*2018; 67 (2): 172–8.
- [8] Mims JW. Asthma: definitions and pathophysiology: Asthma: definitions and pathophysiology. *Int Forum Allergy Rhinol.*2015; 5 Suppl 1 (S1): S2-6.
- [9] Côté A, Godbout K, Boulet L-P. The management of severe asthma in 2020. *BiochemPharmacol.*2020; 179 (114112): 114112.
- [10] Barnes PJ, Adcock IM. How do corticosteroids work in asthma? *Ann Intern Med.*2003; 139 (51): 359–70.
- [11] Padem N, Saltoun C. Classification of asthma. *Allergy Asthma Proc.*2019; 40 (6): 385–8.
- [12] Heffler E, Madeira LNG, Ferrando M, Puggioni F, Racca F, Malvezzi L, et al. Inhaled corticosteroids safety and adverse effects in patients with asthma. *J Allergy Clin Immunol Pract.*2018; 6 (3): 776–81.
- [13] Suissa S, Ernst P, Kezouh A. Regular use of inhaled corticosteroids and the long term prevention of hospitalisation for asthma. *Thorax.*2002; 57 (10): 880–4.
- [14] Boushey HA, Sorkness CA, King TS, Sullivan SD, Fahy JV, Lazarus SC, et al. Daily versus as-needed

- corticosteroids for mild persistent asthma. *N Engl J Med.*2005; 352 (15): 1519–28.
- [15] Zacharia T, S S, Kuriakose TM, Queen VV, Jacob SS. Prescribing pattern and use of steroids in asthma patients. *Int Res J Pharm.*2016; 7 (5): 38–41.
- [16] Shende M, Ghutke B, Panekar D, Kachewar A. Assessment of drug utilization pattern of steroids in a district general hospital in Amravati region. *Research Results in Pharmacology.*2019; 5 (2): 57–64.
- [17] Bleecker ER, Menzies-Gow AN, Price DB, Bourdin A, Sweet S, Martin AL, et al. Systematic literature review of systemic corticosteroid use for asthma management. *Am J Respir Crit Care Med.*2020; 201 (3): 276–93.
- [18] Shahnaz S. The prescribing pattern of anti-asthmatic drugs for the treatment of asthma, at different settings of Karachi, Pakistan. *Bull Pharm Sci.*2020; 43 (2): 209–15.
- [19] Tran TN, King E, Sarkar R, Nan C, Rubino A, O’Leary C, et al. Oral corticosteroid prescription patterns for asthma in France, Germany, Italy and the UK. *Eur Respir J.*2020; 55 (6): 1-10.
- [20] D’cruz, R., Reddy, N., &Marise, D. L. (2018). Prs81-prescribing pattern and use of steroids among asthmatic patients in a tertiary care hospital. *Value in Health: The Journal of the International Society for Pharmacoeconomics and Outcomes Research*, 21, S417.
- [21] Fuseini, H., & Newcomb, D. C. (2017). Mechanisms driving gender differences in asthma. *Current Allergy and Asthma Reports*, 17 (3), 19.
- [22] Wardzyńska, A., Kubsik, B., & Kowalski, M. L. (2015). Comorbidities in elderly patients with asthma: Association with control of the disease and concomitant treatment: Comorbidities in elderly asthmatics. *Geriatrics & Gerontology International*, 15 (7), 902–909.
- [23] Cazzola, M., Calzetta, L., Bettoncelli, G., Novelli, L., Cricelli, C., &Rogliani, P. (2011). Asthma and comorbid medical illness. *The European Respiratory Journal: Official Journal of the European Society for Clinical Respiratory Physiology*, 38 (1), 42–49.
- [24] Postma, D. S. (2007). Gender differences in asthma development and progression. *Gender Medicine*, 4, S133–S146.
- [25] Ramadan, A. A., Gaffin, J. M., Israel, E., &Phipatanakul, W. (2019). Asthma and corticosteroid responses in childhood and adult asthma. *Clinics in Chest Medicine*, 40 (1), 163–177.