

Efficacy of Short - and Long - Term Oral Steroid Therapy in patients with Asthma Exacerbations

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Article History:

Received: Aug 15, 2024
Revised: Oct 18, 2024
Accepted: Jan 22, 2025
Available Online: Mar 02, 2025

Author Contributions:

RMK conceived idea, SR drafted the study, MI collected data, MI did statistical analysis and interpretation of data, RKB SR critical reviewed manuscript. All approved final version to be published.

Declaration of conflicting interests:

The authors declare that there is no conflict of interest.

How to cite this article:

Baloch RK, Iqbal M, Rehman S. Efficacy of Short - and Long - Term Oral Steroid Therapy in patients with Asthma Exacerbations. Pak J Chest Med. 2025;31 (01):30-36

ABSTRACT

Background: Asthma is a chronic inflammatory airway condition with acute exacerbations frequently necessitating systemic corticosteroids (OCS). Although effective, long-term OCS use poses important risks.

Objective: To compare the effectiveness of short-term and long-term oral corticosteroid therapy in improving asthma control, lung function, and symptom relief in mild asthma exacerbations.

Methodology: A Retrospective analysis was performed at Hayatabad Medical Complex, Peshawar, from January 2022 to January 2023 on 76 adult patients with mild asthma exacerbation. Patients were divided into short-term (<10 days) and long-term (≥10 days) OCS therapy groups. Asthma Control Test (ACT), FEV1, and severity of symptoms through Visual Analog Scale (VAS) were measured pre- and post-treatment. Side effects were also noted. Statistical analysis was performed with SPSS version 26, with a p-value of <0.05 being taken as significant.

Results: Both groups demonstrated significant change in ACT scores (to 20.4 from 10.7) and FEV1 (to 92.0% from 86.7%) post-treatment. VAS measures of dyspnea, cough, sputum production, wheezing, and night awakening all declined significantly in both groups. There were no significant differences in post-treatment status between short- and long-term groups. The long-term group did experience a greater, though not statistically significant, incidence of side effects such as gastrointestinal upset and weight gain.

Conclusion: This study concluded that short-term OCS treatment is as efficient as long-term treatment in managing mild asthma exacerbations with less side effects. These results favor short-term OCS as the treatment of choice in this setting.

Keywords: Asthma exacerbation; Oral corticosteroids; Short-term therapy; Long-term therapy; OCS

Introduction

Asthma is a chronic airway inflammatory condition characterized by recurrent attacks of wheezing, shortness of breath, chest tightness, and coughing.¹ These are accompanied by variable airflow obstruction and airway hyperresponsiveness triggered by allergens, respiratory infections, irritants, and exercise. Although asthma can be controlled by inhaled corticosteroids and bronchodilators, most patients develop acute exacerbations, which is acute deterioration of symptoms that may need urgent treatment.² Oral corticosteroids (OCS) are at the forefront in the treatment of asthma exacerbations given their strong anti-inflammatory action. They are applied to inhibit airway inflammation, restore lung function, and avert hospitalization or relapse.³

Short-term oral corticosteroids are now popular for the management of moderate to severe exacerbations.⁴ With a duration of 5 to 10 days, the therapy is designed to reduce airway inflammation promptly and regain control over symptoms. Prednisolone or prednisone is commonly used in such situations. Clinical trials have repeatedly demonstrated that short-course OCS treatment decreases the severity and duration of exacerbations, reduces rates of hospitalization, and shortens the chances of early relapse. Nevertheless, even short-term oral steroid use can result in side effects such as insomnia, mood disturbances, gastrointestinal upset, and increased blood glucose. Furthermore, frequent short courses can add up to systemic exposure, increasing the overall corticosteroid burden.

Conversely, long-term systemic steroid therapy is largely reserved for a select population of patients with chronic, treatment-refractory asthma who do not respond to high-dose inhaled therapy and other controller medication like long-acting beta-agonists, leukotriene receptor antagonists, or biologics. These individuals can be on continuous or intermittent OCS for the purpose of ongoing symptom relief and decreased rate of exacerbations. Long-term systemic corticosteroid therapy, though, is associated with serious risks, such as osteoporosis, hypertension, diabetes, suppression of the adrenals, gain in weight, glaucoma, and cataracts, as well as infection susceptibility.^{5, 6} Due to the nature of these severe side effects, long-term oral steroid use is cautiously treated and is only used as an ultimate measure.

Over the last few years, there has been increasing focus on reducing the use of OCS in asthma control.⁷ The introduction of targeted biologic agents has made it possible for most patients with difficult-to-control asthma to decrease or even avoid the need for systemic steroids. Drugs like omalizumab, mepolizumab, benralizumab, and dupilumab work through targeted pathways of inflammation and have proved to be effective in decreasing

exacerbation rates and the use of OCS. With these advancements also come the need for a more personalized asthma care. Specific asthma phenotypes can be identified, and biomarkers like blood eosinophil levels or fractional exhaled nitric oxide (FeNO) concentrations can inform treatment options and outcomes.⁸ Finally, although oral corticosteroids are still a vital tool for the treatment of asthma, particularly at the time of acute exacerbation, the significant risks linked to long-term use necessitate careful and judicious administration. With better diagnostic equipment and the option of newer and more selective treatments, today's asthma management seeks to maximize control with minimal need for systemic steroids.

Objective

To compare the effectiveness of short-term and long-term oral corticosteroid therapy in improving asthma control, lung function, and symptom relief in mild asthma exacerbations.

Methodology

A Retrospective analysis was performed at Hayatabad Medical Complex, Peshawar, from January 2022 to January 2023 to analyze the clinical use, efficacy, and side effects of short- and long-term oral corticosteroid (OCS) therapy for the treatment of asthma exacerbations. In this study, we included patients diagnosed with asthma who had exacerbations and were treated with oral corticosteroids. At the clinic, oral steroids were started routinely at a dose of 0.5 mg per kg per day, with a maximum of 40 mg daily, and then reduced by 50% every three days to the end of treatment. All enrolled patients received pulmonary function tests, the Asthma Control Test (ACT), and a visual analog scale (VAS) for measuring symptom severity, from 1 to 10, prior to and following the course of steroids. The research analyzed 76 patients who were treated with either short-term (less than 10 days) or long-term (10 days and more) oral methylprednisolone treatment, and it highlighted their symptom scores and outcomes in asthma control. Patients maintained their usual asthma medications throughout the course of steroids, and any side effects were noted at the end of treatment.

Diagnosis of asthma was based on the Global Initiative for Asthma (GINA) guidelines. Exacerbation was diagnosed by worsening of respiratory symptoms including shortness of breath, wheezing, cough, or chest tightness, coupled with a reduction in peak expiratory flow (PEF) or forced expiratory volume in one second (FEV1). Demographic information, current comorbidities, medications, and laboratory results such as total IgE and eosinophils were retrieved from clinical records. The trial enrolled only adults with mild asthma exacerbations. Exclusion criteria included patients younger than 18

years, pregnant and breastfeeding females, those who were already on systemic corticosteroids upon presentation, or the presence of any other chronic respiratory diseases.

For data analysis, SPSS version 26 was used. Quantitative data was presented in the form of means with standard deviations and ranges, whereas categorical data were presented in frequencies and percentages. Statistical tests employed were the student's t-test for the comparison of means, the marginal homogeneity test for related categorical data, and chi-square tests for independent categorical comparison. The p-value less than 0.05 was used as statistically significant. Ethical clearance for the study was granted. Informed consent was explained to all participants, and written consent was received.

Result

In the present study, the age mean of the participants was 42.2 ± 12.7 years, and 59.2% were female. The mean BMI was 27.6 ± 4.72 , and 14.4% were smokers with a mean smoking history of 9.6 pack-years. Among the study cases, the most prevalent comorbidities were hypertension (17.1%), diabetes mellitus (10.5%), and GERD (13.1%). Inhaled corticosteroids (96.0%) and leukotriene receptor antagonists (78.9%) were most commonly used, but 15.8% were biologic-treated. Atopy was seen in 32.8% of patients, and nasal polyps were seen in 21.0% (Table 1).

The ACT score, reflecting asthma control, increased from 10.7 to 20.4, and FEV1 values also increased from 86.7% to 92.0% ($p < 0.001$), which is a reflection of improved lung function. All VAS scores for the symptoms of dyspnea, cough, sputum production, wheezing, and night waking significantly reduced after treatment, which reflects the efficacy of corticosteroids in controlling the severity of symptoms in patients with asthma exacerbation (Table 2).

The graph shows the variation in Visual Analog Scale (VAS) scores, a measure of the severity of symptoms, prior to and following oral corticosteroid treatment in individuals with asthma exacerbation. The short-term and long-term treatment groups initially had high pre-treatment VAS scores (7.1 and 7.3 respectively), reflecting heavy symptom burden. After therapy, there was significant improvement in symptom scores in both groups such that post-treatment scores reduced to 3.0 in the short-term and 3.2 in the long-term group. This indicates that both treatment periods were effective in symptom improvement. The similar decrease in VAS scores indicates that short-term treatment with oral corticosteroids can yield equivalent clinical benefit to long-term therapy, validating the use of such therapy to reduce steroid exposure with preserved therapeutic efficacy (Figure 1).

Both the groups had almost equivalent increases in post-treatment ACT scores, FEV1, and symptom relief with no statistically significant differences. Long-term therapy was linked with a greater rate of side effects like

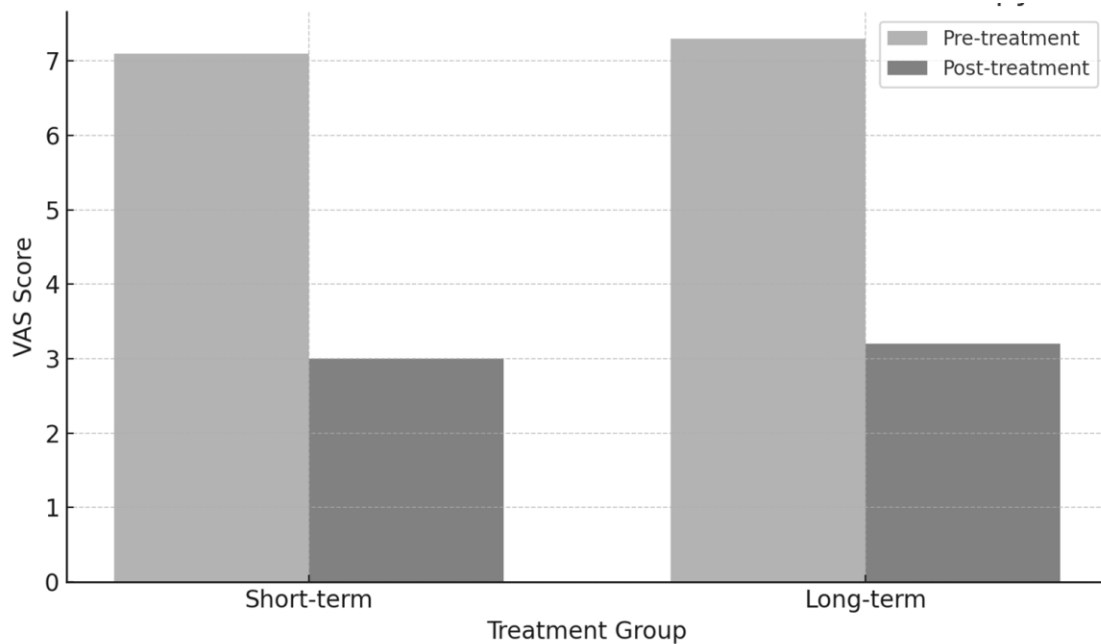


Figure 1. VAS Score before and after Oral Corticosteroid Therapy

Table 1. Patient Demographics and Clinical Characteristics (n = 76)

Characteristic	Value
Age, years (mean $\pm$ SD)	42.2 $\pm$ 12.7
Gender, female (%)	45 (59.2%)
BMI (mean $\pm$ SD)	27.6 $\pm$ 4.72
Total IgE, kU/L (mean)	129.3
Eosinophil count, cells/ μ L (mean)	322
Mean steroid duration (days $\pm$ SD)	8.57 $\pm$ 3.58
Smokers, n (%)	11 (14.4%)
Pack-years of smoking (mean)	9.6
Comorbidities	
Hypertension	13 (17.1%)
Diabetes Mellitus	8 (10.5%)
GERD	10 (13.1%)
Inhaled corticosteroid use	73 (96.0%)
Leukotriene receptor antagonist use	60 (78.9%)
Biologic therapy (e.g., omalizumab)	12 (15.8%)
Atopy (Skin prick test or sIgE +)	25 (32.8%)
Nasal polyps	16 (21.0%)

gastrointestinal discomfort, weight gain, and hunger but these are not statistically significant. These results indicate that the short-term use of steroids is as good with less side effects, supporting its preferential use in treating mild asthma exacerbation (Table 3).

Discussion

This research gives valuable information on the clinical effectiveness and safety of short-term vs long-term oral corticosteroid (OCS) treatment in patients with mild asthma exacerbation who are adults. Asthma exacerbations are acute or subacute periods of progressive worsening of symptoms and lung function that necessitate a step-up in therapy.⁹ The Global Initiative for Asthma (GINA) suggests the use of oral corticosteroids for treatment of moderate to severe exacerbations, but the

ideal duration of therapy remains a subject of investigation. This research is among the first to add to the increasing level of evidence that short-course therapy with OCS for less than 10 days can be just as effective as longer durations, with less side effects.

Both treatment groups in this study had significant improvement in the control of asthma as per the Asthma Control Test (ACT), lung function as assessed by forced expiratory volume in one second (FEV1), and the severity of symptoms as per visual analog scale (VAS) scores. The ACT score improved from a mean of 10.7 prior to treatment to 20.4 post-treatment, with an improvement from poor to well-controlled asthma. Likewise, FEV1 was enhanced from 86.7% to 92.0%, indicating significant improvement in air limitation. The outcome is consistent with clinical trial data from Rowe et al. and Edmonds et al., which showed that a 5 to 7 day course of oral predni-

Table 2. VAS Symptom Scores, ACT, and FEV1 Before and After Oral Steroid Therapy

Parameter	Before Treatment (mean $\pm$ SD)	After Treatment (mean $\pm$ SD)	p-value
ACT Score	10.7 $\pm$ 4.1	20.4 $\pm$ 3.5	<0.001
FEV1 (%)	86.7 $\pm$ 19.1	92.0 $\pm$ 17.1	<0.001
Dyspnea (VAS)	6.4 $\pm$ 3.1	2.5 $\pm$ 1.5	<0.001
Cough (VAS)	7.2 $\pm$ 2.7	2.5 $\pm$ 1.7	<0.001
Sputum (VAS)	4.5 $\pm$ 3.1	1.7 $\pm$ 1.3	<0.001
Wheezing (VAS)	5.7 $\pm$ 3.0	2.3 $\pm$ 1.4	<0.001
Night waking (VAS)	5.1 $\pm$ 2.9	1.5 $\pm$ 1.5	<0.001

solone or prednisone was adequate to manage moderate asthma exacerbation and recover lung function.^{10, 11}

Walters et al., in a review, also noted that short durations of OCS were not inferior to longer durations of OCS regarding decreasing rates of relapse and improving lung function.¹²

Symptom severity, as measured by post-treatment VAS scores for cough, wheezing, sputum production, dyspnea, and nocturnal symptoms, also decreased markedly after treatment. The decreases were comparable in the short-term and long-term groups, with post-

treatment VAS scores decreasing to the level of about 3 in both groups. Thereby confirming that symptom control with short-course therapy is the same as that with prolonged treatment courses. The study by Çakmak et al. (2023) also found that short-course oral steroid treatment provides an effective and safe symptom management for mild asthma exacerbation, possibly reducing the risk of steroid-related complications of longer courses of treatment.¹³

The pattern of adverse effects in this study highlights another significant consideration. While statistical

Table 3. Comparison Between Short-term (<10 d) and Long-term ($\geq$ 10 d) Steroid Therapy

Variable	Short-term (n = 36)	Long-term (n = 40)	p-value
Age, years	45.5 $\pm$ 13.9	41.3 $\pm$ 12.3	0.18
Female, n (%)	21 (58.3%)	24 (60.0%)	0.74
Treatment duration (days)	6.4 $\pm$ 1.1	11.6 $\pm$ 3.6	<0.001
ACT (Post - treatment)	19.7 $\pm$ 3.6	20.5 $\pm$ 3.6	0.35
FEV1 (Post - treatment, %)	96.0 $\pm$ 12.2	89.9 $\pm$ 19.7	0.20
Dyspnea VAS (Post)	2.3 $\pm$ 1.3	2.3 $\pm$ 1.8	0.32
Cough VAS (Post)	2.6 $\pm$ 1.5	2.6 $\pm$ 2.1	0.16
GI Upset (%)	5 (13.8%)	12 (30.0%)	0.09
Weight Gain (%)	3 (8.3%)	8 (20.0%)	0.22
Increased Appetite (%)	4 (11.1%)	7 (17.5%)	0.33

significance was not reached for differences in gastrointestinal distress, weight gain, and increased appetite between the two groups, the trend favored short-term therapy. These observations are consistent with prior reports showing that long-term systemic use of steroids is linked to a wide array of complications such as suppression of the adrenal glands, hypertension, osteoporosis, glucose intolerance, and susceptibility to infections. A review by Lester et al. (1998) further documented that systemic corticosteroids are potent agents in dermatology because of their anti-inflammatory and immunosuppressive properties, yet they pose serious risks. Their side effects from mild symptoms such as insomnia to more serious complications like increase with longer duration and frequency of use, necessitating careful risk-benefit analysis.¹⁴

The results of the study also match current trends in asthma management now, particularly the increasing application of biologic treatments to minimize the utilization of systemic steroids. In this research, approximately 15.8% of patients were on biologics like omalizumab, mepolizumab, benralizumab, or dupilumab. A study by Agache et al. (2020) also reported that there is an increase usage of biologics for the treatment of asthma to decrease steroids usage.¹⁵ These medications operate by addressing certain pathways of inflammation in asthma and have demonstrated lowering asthma attacks, enhanced lung function, and diminished requirement for steroids. Large clinical trials such as DREAM, MENSA, SIROCCO, and LIBERTY ASTHMA have established that biologics are effective substitutes for steroids, particularly in patients with severe or eosinophilic asthma. To direct therapy, physicians now use biomarkers such as blood eosinophil counts and fractional exhaled nitric oxide (FeNO), which personalize treatment and decrease the use of steroids. According to studies done by Busse (2019) and Rogliani et al. (2020), monoclonal antibodies directed against T2-high inflammation pathways like anti-IgE, anti-IL-5, and anti-IL-4/IL-13 have been found to benefit symptoms, decrease exacerbations, and improve lung function in these patients.^{16,17}

Our research indicates that short-course oral steroids are effective for mild attacks of asthma and cause fewer side effects. This argument in favor of using short-course treatment as the initial option in such situations. It also calls for customizing the treatment of asthma for every patient, employing steroids judiciously and turning to other alternatives such as biologics in cases involving frequent or severe symptoms.

Conclusion

Our research concluded that short-term corticosteroid oral treatment is efficient and well tolerated in treating mild asthma exacerbations. It provides comparable clinical benefit to extended courses of therapy and may

minimize the risk of steroid-induced side effects of systemic steroid use. As asthma management develops further with the inclusion of personalized medicine and biologic agents, reducing corticosteroid exposure should remain a central aim in maximizing patient outcomes and long-term safety.

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