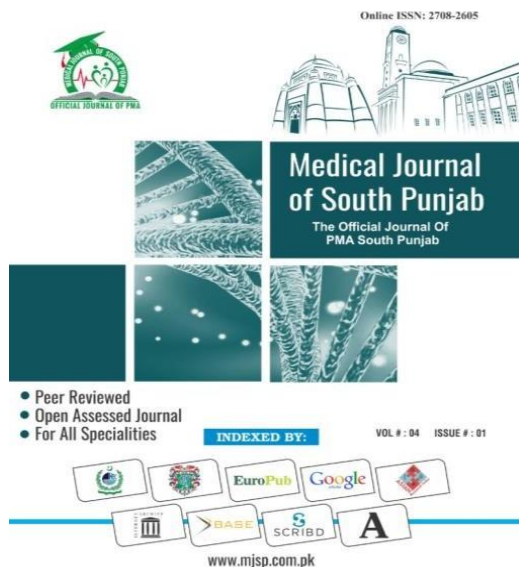


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Original Article

Comparison of Nebulized vs Systemic Corticosteroids for Management of Children Presenting with Acute Exacerbation of Asthma

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ABSTRACT

Objective: The present study aimed is to compare the effectiveness of nebulized and systemic corticosteroids for management of acute exacerbation of asthma in children.

Methods: This randomized control trial was conducted at emergency department of Agha Khan University Hospital, Karachi in 6 months' duration from 1st July 2021 to 30th December 2021. A total of 90 patients were enrolled in study and divided into two groups I and II. In group I nebulized corticosteroids were administered and in group II systemic corticosteroids were administered. Final outcomes were assessed after 2 weeks post treatment follow up.

Results: Comparison of disease reduction (pre-treatment) of both the groups was shown in table II. Oscillometric Resistances at 1st day, 7th day and 14th day were almost equal in both the groups, ($p > 0.010$). The mean length of stay of group I and group II was 1.75 ± 0.56 days and 3.62 ± 1.44 days, respectively, ($p < 0.001$). most of the patients of group I were satisfied as compare to group II, 42 (93.3%) and 34 (75.6%), respectively, (< 0.001).

Conclusion: Comparison of disease reduction (pre-treatment) of both the groups was shown in table II. Oscillometric Resistances at 1st day, 7th day and 14th day were almost equal in both the groups, ($p > 0.010$). The mean length of stay of group I and group II was 1.75 ± 0.56 days and 3.62 ± 1.44 days, respectively, ($p < 0.001$). most of the patients of group I were satisfied as compare to group II, 42 (93.3%) and 34 (75.6%), respectively, (< 0.001).

Keywords: Ashtma, Acute exacerbation, Corticosteroids, Nebulized, Systemic

1. INTRODUCTION

An acute exacerbation of asthma, often referred to as an asthma attack, is a sudden worsening of asthma symptoms. This can include difficulty breathing, coughing, wheezing, and chest tightness¹. It's a serious and potentially life-threatening situation that requires immediate medical attention. Treatment typically involves the use of bronchodilators (like albuterol) to open the airways and corticosteroids to reduce inflammation². Asthma exacerbations can be serious, leading to emergency room visits for a significant percentage of patients. Additionally, the decrease in asthma quality of life scores for hospitalized children highlights the importance of managing asthma effectively to prevent such exacerbations³.

Viral respiratory tract infections are a leading cause of acute asthma exacerbations in both adults and children, with a higher prevalence in children⁴. These infections can trigger or worsen asthma symptoms, leading to wheezing, coughing, shortness of breath, and other asthma-related issues⁵. Various respiratory viruses can be responsible for these exacerbations, including rhinovirus, respiratory syncytial virus (RSV), influenza, and others⁶.

Factors that have contributed to the

. Nebulized medications are often used in acute asthma exacerbations to deliver bronchodilators, such as albuterol, directly to the airways⁷. Nebulization helps relax the airway muscles quickly, providing rapid relief of symptoms like wheezing and shortness of breath⁸. Corticosteroids: Corticosteroids, typically inhaled or taken orally, are used to reduce airway inflammation in asthma⁹. They are a cornerstone of long-term asthma management and are not used for immediate symptom relief. Inhaled corticosteroids are preferred for daily maintenance therapy¹⁰.

The specific focus of this research is on the treatment of acute asthma exacerbation in children who have been admitted to the hospital. It aims to provide an updated and comprehensive overview of the effectiveness of both inhaled corticosteroids (ICS) and systemic steroids in managing this condition in pediatric patients.

2. METHODOLOGY

Study conducted at Agha Khan University Hospital Karachi. The study took place over duration of six months, from 1st April 2021 to 30th March 2021, and it focused on 90 children who were experiencing an acute exacerbation of asthma patients who had at least mild symptoms in the 24 hours before enrollment were included in the study. After obtaining written consent from

the participants (or their legal guardians), the researchers collected demographic information about all the registered patients. Non probability consecutive sampling technique was used and sample size was calculated from 95% confidence interval, 5% margin of error and hospital stay 1.5 ± 3.14 in group nebulized corticosteroid and 2.8 ± 9.31 in group systemic corticosteroids. Certain criteria were used to exclude potential participants from the study. Patients were divided into two I and II by lottery method. In group I Flunisolide was administered twice daily for seven days after the initial seven days, flunisolide was administered every other day for the next seven days. In group II Systemic budesonide was administered initially, budesonide was given at a dosage of 0.5 milligrams (mg) twice daily for seven days. After the initial seven days, the dosage of budesonide was reduced to 0.25 mg twice daily for the next seven days.

The dosage of flunisolide was 20 micrograms (ug) per kilogram (kg) of body weight. Both Groups 1 and 2 received inhaled salbutamol using an Aerochamber Plus (from Markos Mefar SpA) at a dose of 200 micrograms (ug). Initially, this was administered four times daily for the first three days of the research. Afterward, it was given as needed. Children who were taking

inhalational corticosteroids (ICSs) daily from past three months, cromones, theophylline, antileukotrienes, antihistamine drugs, systemic corticosteroids in the preceding month. Determination of the existence and severity of an asthma exacerbation based on three factors: sleep disruption, wheezing, and the usage of axillary muscle and/or suprasternal retraction. These factors score single.

The nebulizer was used to deliver medication to the patients. The medication was first diluted in 3 ml of sterile saline solution before being administered through the nebulizer. Parents were taught how to use the nebulizer and likely educated on the proper technique for medication administration and any precautions or care instructions. After two weeks of follow-up, outcomes among both groups of patients were assessed. The method used for assessment in this case was oscillometric resistances.

A mild exacerbation is classified based on a total symptom score between 4 and 8. This score likely measures the severity and number of symptoms a patient is experiencing during an exacerbation. A total symptom score within the range of 4 to 8 suggests a mild exacerbation. Patient's oxygen levels while breathing room air. A SaO₂ between 91-95 percent indicates

that the patient is receiving an adequate amount of oxygen. This parameter is important because in exacerbations of conditions like asthma or chronic obstructive pulmonary disease (COPD), the oxygen saturation can drop, and maintaining it in this range is considered mild. Change in oscillometric resistances following the inhalation of 200 micrograms of salbutamol delivered via a metered-dose inhaler and spacer. A decrease in oscillometric resistances greater than 35 percent from baseline suggests a positive response to the bronchodilator medication.

SPSS version 27 was used for data analysis. Test of significance was applied and p values ≤ 0.05 was used for data analysis.

3. RESULTS

Overall, 90 patients were included in this study, both genders. All the patients were divided into two equal groups. The mean age of group I and group II was 6.71 ± 1.30 years and 6.35 ± 1.24 years, respectively, ($p=0.190$). The mean duration of asthma of group I and group II was 3.18 ± 1.28 years and 3.34 ± 1.44 years, respectively, ($p=0.591$). Allergy family history of group I and group II was 37 (82.2%) and 31 (68.9%), respectively, ($p=0.141$). (Table. I).

Comparison of disease reduction (pre-treatment) of both the

groups was shown in table II. Oscillometric Resistances at 1st day, 7th day and 14th day were almost equal in both the groups, ($p>0.010$). (Table. II).

The mean length of stay of group I and group II was 1.75 ± 0.56 days and 3.62 ± 1.44 days, respectively, ($p<0.001$). most of the patients of group I were satisfied as compare to group II, 42 (93.3%) and 34 (75.6%), respectively, (<0.001). (Table. III).

Table. I: Demographic and baseline of the study groups

Variable	Group I	Group II	p-value
Age	6.71 ± 1.30	6.35 ± 1.24	0.190
Gender			
Male	31 (68.9)	24 (53.3)	0.130
Female	14 (31.1)	21 (46.7)	
Duration of Asthma (years)	3.18 ± 1.28	3.34 ± 1.44	0.591
Family allergy history	37 (82.2)	31 (68.9)	0.141

Table. II: Comparison of disease reduction (pre-treatment) of the study groups

Variable	Group I	Group II	p-value
Oscillometric Resistances			
1 st day (cmH20/Lls)	8.08 ± 1.19	8.44 ± 1.55	0.227
7 th days (cmH20/Lls)	6.81 ± 0.55	6.92 ± 0.58	0.985
14 th days (cmH20/Lls)	4.44 ± 1.03	4.63 ± 0.86	0.356

Table-III: Comparison of length of hospital stay and satisfaction level of

the study groups

Variable	Group I	Group II	p-value
LOS (days)	1.75±0.56	3.62±1.44	<0.001
Satisfaction	42 (93.3)	34 (75.6)	<0.001

4. DISCUSSION

Budesonide and Fluticasone are both corticosteroid medications commonly used to treat asthma and other respiratory conditions. They work by reducing inflammation in the airways, which helps to alleviate asthma symptoms and improve lung function¹¹. A study by de Benedictis et al¹² suggesting that nebulized Fluticasone, when given as a short course of treatment in children with moderate asthma, has similar effects to a double dosage of nebulized Budesonide when added to bronchodilator treatment. This suggests that these two medications may have comparable efficacy in certain situations, but it's essential to note that the choice between budesonide and fluticasone should be made after research evaluation.

In our study length of hospital stay was shorter with use of nebulizer steroids as compare systemic steroids 1.75±0.56 and 3.62±1.44. In a study conducted by Gillani et al¹³ Concluded that nebulized steroids alone may be sufficient to manage some mild exacerbations, potentially reducing the

need for hospitalization. In another study by Dues et al¹⁴ in 2022 reported similar results that use of inhalational steroids can solve number of respiratory problems in children and infants.

At 14th day of treatment resistance on oscillometr was 4.44±1.03 in group I and 4.63±.86 in group II, difference was not statistically significant (p=0.356). Resistance was reduced rapidly throughout the treatment in group I. Overall satisfaction level was higher in mothers of babies in group I. In study conducted by Alangri et al¹⁵ reported that use of corticosteroid for management of acute exacerbations of asthma reduced stay of patients at emergency room. Systemic corticosteroids are recommended by various asthma guidelines, including the Global Initiative for Asthma (GINA) and the Expert Panel Report 3 (EPR-3) from the National Asthma Education and Prevention Program (NAEPP), for the treatment of acute asthma exacerbations in the emergency department (ED)¹⁶.

Another contrast study was also conducted by Rodrigo et al¹⁷ and reported that there was no improvement in hospital admission rate and lung function with use systemic and inhalational steroids. Schneider et al¹⁸ concluded systemic corticosteroids are often used in the ED to manage acute

asthma exacerbations. They help reduce airway inflammation and improve lung function. When administered appropriately, they can reduce the risk of relapse after discharge by ensuring that airway inflammation is adequately controlled.

Inhaled corticosteroids have key role in the long-term management of asthma by reducing airway inflammation, but they are not used for rapid symptom relief, and their effects are not seen within seconds or minutes¹⁹. According to the meta-analysis by Su et al²⁰ the use of ICS in the emergency department might lead to a 56% reduction in admission rates. This suggests that children with acute asthma exacerbations who are treated with ICS may be less likely to be admitted to the hospital.

5. CONCLUSION

The use of nebulized steroids and systemic steroids can both be effective in the treatment of acute exacerbation of asthma, but their specific roles and benefits may vary depending on the individual patient's condition and the severity of the exacerbation. Specific outcomes of hospital stay and severity of disease are much better in inhaled steroids as compare to systemic steroids.

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