

# Comparison of Dexamethasone with Prednisolone in Treatment of Acute Asthma

Madiha Fayyaz<sup>1</sup>, Shahzad Haider<sup>2</sup>, Sidra Shafiq<sup>3</sup>, Sajid Nazir<sup>4</sup>, Kiran Israr Shah<sup>5</sup>, Sundus Noor<sup>1</sup>

<sup>1</sup>Department of Paediatrics, Rashid Latif Khan University (RLKU) Medical College, Hameed Latif Teaching Hospital Lahore;

<sup>2</sup>Department of Paediatrics, Shamshad Aslam Uppal Hospital Wah Cantt; <sup>3</sup>Department of Paediatrics, Muzaffar Khan Medical and Surgical Hospital Wah Cantt; <sup>4</sup>Department of Paediatrics, Umar Medical Centre Wah Cantt.; <sup>5</sup>Department of Paediatrics, Wah Medical College

## ABSTRACT

**Objective:** To compare the efficacy of single dose oral dexamethasone and single dose oral prednisolone in managing acute episodes of asthma in children.

**Methodology:** The study was held in the paediatrics department of Hameed Latif Teaching Hospital Lahore. It was conducted from March 2023 to November 2023. Through a randomized controlled trial, 160 children less than 12 years of age were selected. A random assortment was done in two groups. Group A was subjected to oral dexamethasone and in group B oral prednisolone was prescribed. Efficacy was assessed in terms of relapse of symptoms within 10 days of discharge from hospital.

**Results:** In group A, average age of patients was  $7.53 \pm 2.23$  years. In group B, mean age of patients was  $8.1 \pm 2.3$  years (p value 0.107). In group A we had 65% (52) males and 35% (28) females. In group B there were 55% (n44) males and 45% (n36) females with p value of 0.197. Relapse rate in group A was 85% and relapse rate of group B was 70%, (p-value=0.023).

**Conclusion:** In conclusion, oral dexamethasone is equally good when compared to oral prednisolone for the treatment of severe asthma and showed better outcomes in terms of relapse rate, fewer doses and a smaller number of sick leaves from schools. In order to develop consolidated guidelines in the management of severe asthma in paediatric population, we recommend further research using different combinations of medications.

**Keywords:** Acute Asthma, dexamethasone, steroid, prednisolone, relapse

### Authors' Contribution:

<sup>1,2</sup>Conception; Literature research; manuscript design and drafting; <sup>3,4</sup>Critical analysis and manuscript review; <sup>5,6</sup>Data analysis; Manuscript Editing.

### Correspondence:

Madiha Fayyaz  
Email: drmadiha62@gmail.com

### Article info:

Received: October 24, 2024  
Accepted: December 25, 2024

**Cite this article.** Fayyaz M, Haider S, Shafiq S, Nazir S, Shah KI, Noor S Comparison of Dexamethasone with Prednisolone in Treatment of Acute Asthma. J Islamabad Med Dental Coll. 2024; 13(4). 617-622. DOI: <https://doi.org/10.35787/jimdc.v13i4.1163>

**Funding Source:** Nil  
**Conflict of interest:** Nil

## Introduction

Asthma in children is a frequently occurring condition of the respiratory system which is known by repeated episodes of cough and wheeze. The symptoms of asthma evolve as a result of inflammation and exaggerated responsiveness of smaller airways, causing restriction of expiratory airflow. It usually begins in early childhood and almost one half of all the children exhibit wheezing

during infancy, who mostly progress to persistent asthma in succeeding six years.<sup>1</sup> Exacerbation of asthma is characterized by sudden worsening of symptoms leading to respiratory distress, when asthma action plan is insufficient for home management and patients need to visit the hospital emergency.<sup>2</sup> According to a report by the asthma and allergy foundation of America (AAFA), in the year 2021 about 39% of children under 18 years of

age had asthma episodes once or more in the past year. More over 63% of asthmatic children under five years of age had an acute episode. It has been observed that the incidence of asthma is more in boys (8.4%) as compared to girls (5.5%).<sup>3</sup> Asthma is more common in male children than female children. Around 8.4% of male children have asthma, compared to 5.5% of female children.<sup>3</sup>

According to a global study on asthma (GAN), it was prevalent in 11% children under seven years of age and 9% in teen age group.<sup>4</sup> It was observed that 16-60% Asian, 34-68% European and 43% American children missed their schools because of asthma episodes. These children were also reported to have a compromised school performance.<sup>5</sup>

Acute exacerbations of asthma may prove fatal and recurrence of these episodes have a negative impact on the lung functions over the period of time. They have also a psychological impact in the form of impaired quality of life.<sup>6</sup>

The Royal College of Pediatrics' and Child Health (RCPC) recommends that asthma attacks should be managed aggressively within the first hour of presentation, because usually the children reach hospital late.<sup>7</sup> The British thoracic society recommendations on asthma management comprise of early administration of oral prednisolone to children experiencing asthma exacerbations and complete three days of course after discharge from hospital.<sup>8</sup>

It has been observed that there is recurrence of symptoms in patients receiving prednisolone. This may be due to various reasons including patient noncompliance, unpleasant taste and medicine related adverse effects such as vomiting. Asthma needs to be treated in a step wise approach in the outpatient departments and the treating physicians should be well educated with the recent advances in the management of this common clinical condition in children.<sup>9</sup> Dexamethasone is equally effective in pediatric patients with acute exacerbations of

asthma. It has a comparatively longer half-life therefore variable dosage schedules including single intramuscular dose or divided doses are used.<sup>10</sup> Dexamethasone is now being preferred due to this advantage of long half-life, fewer doses and more compliance.<sup>11</sup>

It is important to find out the difference in effectiveness of two treatment regimens of oral steroids (dexamethasone versus prednisolone) in episodes of severe asthma with respect to symptom recurrence. It will help to improve the treatment strategies and achieve efficient control of disease symptoms.

## Methodology

The aim of this research was to compare two different steroid regimes i.e., prednisolone and dexamethasone used in children with exacerbations of asthma once they were discharged from the hospital.

**Acute asthma exacerbation:** It is defined as a previously known case is defined as an episode of acute narrowing of air passages which occurs in a background of hyperactive airways. There are usually some aggravating factors which act as triggers, leading to constriction of bronchioles and excessive production of secretions which manifest as symptoms of breathing difficulty, cough and wheezing.<sup>12</sup>

**Efficacy** was measured in terms of not having relapse within 10 days after initiation of therapy.

**Relapse** was un-scheduled visit to hospital or need for admission due to acute asthma exacerbation within 10 days of discharge from hospital.

**Study design:** Randomized controlled trial

**Setting:** Department of Pediatrics', Hameed Latif Teaching Hospital, Lahore

**Study period:** The study period was from March, 2023 to November, 2023.

**Sampling technique:** non-Probability purposive sampling

**Group A:** Subjects who received once daily dose of dexamethasone given orally (0.6 mg/kg -18 mg) for 5 days.

**Group B:** Subjects who received once daily dose of prednisolone given orally (1 mg/kg -40 mg) given for 5 days.

**Sample size:** WHO sample size calculator was used to calculate the sample size as follows:

Confidence level = 95%

Power of test = 80%

Significance level = 5%

P1 = 4.1% <sup>13</sup>

P2 = 16% <sup>14</sup>

Sample size = n = 80 in each group

**Data collection:** The study was conducted after taking approval from institutional review committee included all known cases of asthma under the age of 12 years who presented with acute severe asthma. Patients who had life threatening symptoms of impending respiratory failure, temperature of 103°F or more, any chronic pulmonary disease other than asthma and those who had taken steroids in past one month were not included in the study. Written permission was ensured from caregivers of all eligible patients. Patients who were received in the ER and accomplished the inclusion criteria were randomly given either oral prednisolone (1 mg/kg/dose, ax 40 mg) or dexamethasone (0.6 mg/kg/dose, ax 18 mg). The steroid therapy was advised for a period of five days. Disease specific treatment was pursued as per departmental protocols. Once improved, patients were discharged from hospital. Post discharge follow-up was advised after 10 days. Outcome was measured in terms of relapse of symptoms within 10 days. All the data was recoded in a particularly designed form.

**Data analysis:** We used SPSS version 26 for analysis of data. The mean and standard deviations were used for numerical variables like age etc. Frequency and percentages were recorded for the categorical variable like gender and efficacy. Chi square test was

used to compare the efficacy in terms of relapse between the two groups. A P-value of  $\leq 0.05$  is taken significant.

## Results

The study comprised of 160 children between 02 to 12 years of age. Eighty children in group A were subjected to single-dose oral Dexamethasone (0.6 mg/kg) while eighty children in group B received once daily oral dose of prednisolone (1 mg/kg) for five days.

The mean age of all the patients was  $7.82 \pm 2.27$  years. Mean age of children in group A was  $7.53 \pm 2.23$  years. Mean age of all patients in group B was  $8.1 \pm 2.3$  years. The difference was not statistically different (p value of 0.107).

**Table I: Patient distribution into groups with respect to age (n = 80 per group)**

Age (years)	Treatment Groups	
	Dexamethasone Group n (%)	Prednisolone Group n (%)
≤6	36 (45.0%)	20(25.0%)
6 to 9	24(30.0%)	32 (40.0%)
9 to 12	20 (25.0%)	28 (35.0%)
Total	80(100.0%)	80 (100.0%)

**Table II: Comparison between group A and B with respect to gender (n = 80 per group)**

Gender	Dexamethasone Group n (%)	Prednisolone Group n (%)	p-value
Male	52 (65%)	44 (55%)	
Female	28 (35%)	36 (45%)	0.197
Total	80 (100%)	80 (100.0%)	

Table III: Comparison between the two groups with respect to efficacy (n = 80 each)			
Efficacy of Treatment	Treatment Groups		p-value
	Oral Dexamethasone Group	Oral Prednisolone Group	
Yes	68 (85.0%)	56 (70.0%)	0.023
No	12 (15.0%)	24 (30.0%)	
Total	80(100.0%)	80(100.0%)	

We noticed that there were 65% (n=52) males and 25% (n=28) females in group A. In group B there were 55% (n=44) 45% (n=36) females. This distribution was not statistically significant (p value 0.197). Table II

All the patients were given either prednisolone or dexamethasone according to their respective treatment group. Upon clinical improvement patients were discharged from hospital and called for outpatient visit on 10<sup>th</sup> day to evaluate for relapse of symptoms. It was observed that 15% patients in group A (dexamethasone group) had a relapse of symptoms, whereas 30% of patients in group B (prednisolone group) had the relapse of symptoms noted within the ten days of discharge from hospital. Hence it can be inferred that the efficacy of group A (dexamethasone group) was 85% and efficacy of group B (prednisolone group) was 70% with p value of 0.023 (Table III).

## Discussion

The current study involved 160 children between ages of 2 to 12 years who were diagnosed with exacerbation of bronchial asthma with mild to moderate severity where we compared the efficacy of oral dexamethasone against oral prednisolone in the treatment of acute exacerbation of asthma. In our study the age of patients ranged from 2 to 12

years. Another similar study was conducted on the same age group of asthma affected children.<sup>15</sup> We observed that there were more male patients as compared to females in both groups. The percentage of males and females was 65% and 35% in dexamethasone group. It was 55% and 45% in the prednisolone group. Similar male predominance was observed in an Egyptian study conducted by Larwill et al.<sup>15</sup> In the current study we compared the efficacy of dexamethasone and prednisolone in acute asthma with respect to relapse of symptoms. We observed that 15% patients in group A (dexamethasone group) had a relapse of symptoms, whereas 30% of patients in group B (prednisolone group) had the relapse of symptoms noted within the ten days of discharge from hospital. Hence it can be inferred that the efficacy of group A (dexamethasone group) was 85% and efficacy of group B (prednisolone group) was 70% with p value of 0.023. Various studies have been identified which have done a similar comparison. Another study found that there were no noticeable differences between dexamethasone and prednisolone groups on the basis of rates of hospital admission, length of emergency department stays and relapse of symptoms, however dexamethasone was superior in terms of better compliance and fewer vomiting episodes as compared to prednisolone.<sup>16</sup> Hemant et al conducted a retrospective cohort study involving about 1400 children and concluded that patients who received dexamethasone had comparatively short duration of hospital stay than those who received prednisolone (24.43 hours vs. 29.38 hours; P = 0.03)<sup>17</sup> Another similar analysis by Hoeffel et al. involved over 1100 patients, concluded that there was no significant difference among dexamethasone and prednisolone groups in terms of relapse of symptoms and hospital visits requiring readmissions.<sup>18</sup> A meta-analysis by Cai et al. comprising of about 3000 children concluded that dexamethasone is more suitable as compared to

prednisolone because of less incidence of vomiting and similar clinical outcomes as prednisolone (RR 0.29;  $P < 0.00001$ ).<sup>19</sup> A study in Colombia conducted by Rodriguez-Martinez et al. concluded that prednisolone is more economical than dexamethasone while considering the treatment of acute asthma exacerbations in children. However, the efficacy of both drugs was found similar in reducing recurrent hospital visits and relapse of symptoms.<sup>20</sup> De Filippo et al. advocated the use of dexamethasone due to better taste and compliance which are important contributory factors to treatment in younger patients.<sup>21</sup> The cumulative impression from numerous studies shows that oral dexamethasone and prednisolone share similar efficacy in management of pediatric asthma exacerbations. The primary outcomes, including relapse rates, emergency department visits and hospital admission rates are almost same in both groups. Dexamethasone has advantage of fewer vomiting episodes and better compliance, while prednisolone is more cost effective. The treating physicians should keep these factors in mind when choosing corticosteroid therapy for acute asthma exacerbations in children.

## Conclusion

In conclusion, oral dexamethasone is equally good when compared to oral prednisolone for the treatment of severe asthma and showed better outcomes in terms of relapse rate, fewer doses and a smaller number of sick leaves from schools. In order to develop consolidated guidelines in the management of severe asthma in pediatric population, we recommend further research using different combinations of medications.

## References

1. Lizzo JM, Goldin J, Cortes S. Pediatric asthma. In: Stat Pearls. Treasure Island (FL): Stat Pearls Publishing; 2024. PMID: 31869095.

2. Canadian Pediatric Society. Managing an acute asthma exacerbation in children [Internet]. Cps.ca. [cited 2024 Nov 18]. Available from: <https://cps.ca/documents/position/managing-an-acute-asthma-exacerbation>
3. What Is Asthma. Asthma Facts and Figures [Internet]. Aafa.org. [cited 2024 Nov 18]. <https://aafa.org/wp-content/uploads/2022/08/aafa-asthma-facts-and-figures.pdf>
4. García-Marcos L, Asher MI, Pearce N, Ellwood E, Bissell K, Chiang C-Y, et al. The burden of asthma, hay fever and eczema in children in 25 countries: GAN Phase I study. *Eur Respir J* [Internet]. 2022;60(3). <http://dx.doi.org/10.1183/13993003.02866-2021>
5. Triassic R, Citywire D, Nurani N, Satiata A. Prevalence, Management, and Risk Factors of Asthma Among School-Age Children in Yogyakarta, Indonesia. *J Asthma Allergy*. 2023 Jan 5; 16:23-32. <https://doi.org/10.2147/JAA.S392733>.
6. Griffiths D, Gian cola LM, Welsh K, Maculating K, Thayer C, Unloosen S, Stamatakis NP, Sierra GC, Hammond A, Greco KF, Simone au T, Basi SN, Gaffing JM. Asthma control and psychological health in pediatric severe asthma. *Pediatric Pulmonal*. 2021 Jan;56(1):42-48. <https://doi.org/10.1002/ppul.25120>.
7. Is P, Malhotra N, Gupta N. GINA 2020: what's new and why? *J Asthma*. 2021 Oct;58(10):1273-1277. <https://doi.org/10.1080/02770903.2020.1788076>.
8. Bantom B, Verma A, Bhalla K, Khanna A, Holla S, Yadav S. Comparative effectiveness of oral dexamethasone vs. oral prednisolone for acute exacerbation of asthma: A randomized control trial. *J Family Med Prim Care*. 2022 Apr;11(4):1395-1400. [https://doi.org/10.4103/jfmpc.jfmpc\\_1210\\_21](https://doi.org/10.4103/jfmpc.jfmpc_1210_21).
9. Hoch HE, Hou in PR, Stillwell PC. Asthma in Children: A Brief Review for Primary Care Providers. *Pediatric Ann*. 2019 Mar 1;48(3): e103-e109. <https://doi.org/10.3928/19382359-20190219-01>.
10. Nottingham D, Harcott D, Fernandes R, Kapteyn B, Andrew L, Grice J, et al. Dexamethasone or prednisolone for acute asthma exacerbations in children: a meta-analysis. In: *Pediatric asthma and allergy*. European Respiratory Society; 2019. p. PA952.
11. Wei J, Lu Y, Han F, Zhang J, Liu L, Chen Q. Oral dexamethasone vs. Oral prednisone for children with acute asthma exacerbations: A systematic review and meta-analysis. *Front Pediatric* [Internet]. 2019; 7:503. <http://dx.doi.org/10.3389/fped.2019.005>
12. BMJ Best Practice. [online] [cited on July, 2018]. <https://bestpractice.bmj.com/topics/en-us/1098>

13. Gordon S, Tompkins T, Dayan PS. Randomized trial of single-dose intramuscular dexamethasone compared with prednisolone for children with acute asthma. *Pediatric Emerge Care*. 2007; 23:521-7.
14. Greenberg RA, Kerby G, Roosevelt GE. A comparison of oral dexamethasone with oral prednisone in pediatric asthma exacerbations treated in the emergency department. *Limpidity (Phila)*. 2008; 47:817–23.
15. Larwill DA, Ibrahim OM, Elazar GA, Eltife SM. Two regimens of dexamethasone versus prednisolone for acute exacerbations in asthmatic Egyptian children. *Eur J Hosp Pharm Sci Pract [Internet]*. 2018;27(3):151–6. <http://dx.doi.org/10.1136/ejhpharm-2018-001707>
16. Daham E, El Ghazal N, Nakanishi H, El Haddad J, Matara RH, Tanovic D, et al. Dexamethasone versus prednisone/prednisolone in the management of pediatric patients with acute asthmatic exacerbations: a systematic review and meta-analysis. *J Asthma [Internet]*. 2022;60(8):1481–92. <http://dx.doi.org/10.1080/02770903.2022.2155189>
17. Hemant SA, Glover B, Ball S, Richler W, Wetzell M, Hames N, et al. Dexamethasone versus prednisone in children hospitalized for acute asthma exacerbations. *Hosp Pediatric [Internet]*. 2021;11(11):1263–72. <http://dx.doi.org/10.1542/hpeds.2020-004788>
18. Hoeffel ER, Huang B, Schuler CL, Kersaf CM, Murtagh-Karnowski E, Forten M, et al. Dexamethasone versus prednisone in children hospitalized with asthma exacerbation. *Hosp Pediatric [Internet]*. 2022;12(3):325–35. <http://dx.doi.org/10.1542/hpeds.2021-006276>
19. Cai K-J, Us S-Q, Wang Y-G, Zeng Y-M. Dexamethasone versus prednisone or prednisolone for acute pediatric asthma exacerbations in the emergency department: A meta-analysis. *Pediatric Emerge Care [Internet]*. 2021;37(12): e1139–44. <http://dx.doi.org/10.1097/PEC.0000000000001926>
20. Rodriguez-Martinez CE, Sossa-Briceño MP, Castro-Rodriguez JA. Dexamethasone or prednisolone for asthma exacerbations in children: A cost-effectiveness analysis. *Pediatr Pulmonol [Internet]*. 2020;55(7):1617–23. <http://dx.doi.org/10.1002/ppul.24817>
21. De Filippo M, Clark E, Fillard A, Diaferio L, Caimmi D. Oral corticosteroids and asthma in children: Practical considerations. *Pediatr Allergy Immunol [Internet]*. 2020;31 Suppl 24:43–5. <http://dx.doi.org/10.1111/pai.13151>