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Original Research Article

The Efficacy of Oral Betamethasone versus Oral Prednisone in the Management of Acute Asthma

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Abstract: *Acute asthma in children are a major cause of emergency department visits and hospital admissions.* ***Objective:*** *To compare the efficacy and safety of oral betamethasone versus oral prednisone in the management of acute asthma exacerbations in children aged 2 to 12 years.* ***Methods:*** *This randomized controlled trial was conducted at the Department of Pediatrics, Sheikh Zayed Hospital, Rahim Yar Khan from Oct 2024 to March 2025. A total of 166 children presenting to the emergency department with acute asthma exacerbations were enrolled using non-probability consecutive sampling. Participants were randomly assigned to receive either oral prednisone (n=83) or oral betamethasone (n=83).* ***Results:*** *The mean length of hospital stay was 47.6 ± 12.3 hours in the prednisone group and 49.9 ± 13.8 hours in the betamethasone group (p = 0.18). Persistence of symptoms occurred in 16.9% of the prednisone group and 20.5% of the betamethasone group (p = 0.54). Rates of ED revisits (12.0% vs. 14.5%), hospital readmissions (6.0% vs. 8.4%), and steroid-related side effects (9.6% vs. 7.2%) were similar between groups, with no statistically significant differences.* ***Conclusion:*** *It is concluded that oral betamethasone is as effective and safe as oral prednisone in treating acute asthma exacerbations in children. Given its pharmacokinetic profile, betamethasone may offer practical advantages in clinical settings, warranting further exploration in future studies.*

Keywords: Asthma, Pediatrics, Betamethasone, Prednisone, Corticosteroids

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Introduction

Asthma is a common chronic lung disease in all age groups, often beginning in childhood. Its prevalence has increased in developed countries in the last 40 years. It is characterized by inflammation of airways and hyper-responsiveness with reversible airway obstruction. Asthma symptoms can be triggered by respiratory viruses, allergens, tobacco smoking, air pollutants, andcold or dry air. Despite preventive measures, acute attacks of asthma in children are frequent andresult in a considerable number of clinic or emergency visits, hospital admissions, and absence from school (1). Three hundred thirty-nine million people are suffering from asthma. About 1,000 people are dying of asthma in a day globally (2). The prevalence of Asthma is estimated at 4.3% in Pakistan (3). It is currently widely accepted that the prevalence of asthma has peaked in developed countries; this is while such an increase may be seen in low- and mid-income countries (4).

An acute asthma attack is a frequent condition in children. It is one of the most common reasons for emergency department (ED) visits and hospitalization. It can be triggered by viral infections, atypical bacterial infections such as mycoplasma, allergens and/or air pollutants, including tobacco smoke, certain medications, physical exercise, and stress and emotions (7). Acute asthma attacks can occur as a first episode in undiagnosed children or children with a previous asthmadiagnosis and an uncontrolled disease despite therapy (8). Indeed, despite advances in therapy, asthma remains a disease that is not optimally controlled in many children. Asthma attacks can be particularly recurrent or life-threatening and increasingly expensive in unresponsive children. In a study by Iqbal N et al., Children 2 to 12 years of age were included in both groups; 400 patients enrolled with a mean age of 5.55±2.33 years in the dexamethasone group while 7.57±2.37 years in prednisolone group.202(50.5%) were male and 198(49.5%) were female. Duration of symptom improvement was 2.00±0.21 days in the dexamethasone group and2.00±0.48 days in the prednisolone group. Relapse was seen in 18% in the dexamethasone groupas compared to 15% in the prednisolone group; the difference in relapse rate was not significant in both groups(p=0.419) (5). In a retrospective study. Medical records of healthy children without significant comorbidities between 1 and 7 years of age (n = 234) admitted with a moderate-severity acute wheezing attack to two pediatric wards between 2014 and 2018 were included 89(38%) were females, and 145(62%) were male. The mean age was 2.50 (1.65–4.08) years. All children were treated with either betamethasone or dexamethasone exclusively during the hospitalization. The primary outcome of interest was the length of hospital stay (LOS). Demographic parameters and the clinical severity of wheezing episodes were similar in the two study groups, as was the LOS.LOS was compared between the group of patients (n = 110) with similar propensity scores (dexamethasone 2.6±1.84 vs. betamethasone: 2.21±1.19 days, p = 0.209) (6).

Acute Asthma is a frequently encountered case in pediatric emergency and local data regarding the effect of route of administration of oral corticosteroids in our population is lacking, and this study will help to fill the knowledge gap in our population. Moreover, betamethasone is easy to take with lower number of tablets, while prednisone is in twice dose with large doses. It will help better the management of children in the emergency department and will help to decrease morbidity and cost-effectiveness of the emergency department in managing asthma.

Methodology

This randomized controlled trial was conducted at the Department of Pediatrics, Sheikh Zayed Hospital, Rahim Yar Khan, over a defined period (insert exact dates here). The study aimed to compare the efficacy of oral betamethasone versus oral prednisone in the management of acute asthma exacerbations in children. The sample size was calculated using the WHO sample size calculator, with a level of significance set at 5% and power of the test at 80%. Based on previously reported data, the mean length of hospital stay for the prednisone group was 2.00 ± 0.48 days, and for the betamethasone group, it was 2.21 ± 1.19 days. This yielded a

required sample size of 83 participants per group, totaling 166 patients. A non-probability consecutive sampling technique was employed to recruit eligible participants.

The inclusion criteria for the study comprised children aged between 2 and 12 years who presented to the emergency room with an acute asthma exacerbation, as defined by the study's operational definition. These children were assessed and enrolled based on the clinical presentation consistent with acute exacerbation of asthma.

On the other hand, the exclusion criteria involved children whose body weight was below the 5th percentile for their age, as determined using the World Health Organization (WHO) centile charts. Additionally, children with a documented history of congenital heart disease, as confirmed through medical records, were also excluded from the study to avoid potential confounding factors related to cardiac comorbidities.

Before the initiation of the study, ethical clearance was obtained from the hospital's ethical review committee and CPSP. Informed consent was obtained from the parents or legal guardians of all participants. The study procedures and objectives were clearly explained, and confidentiality was assured. Participants were then randomly assigned to either the oral prednisone group or the oral betamethasone group using the lottery method. Data were collected using a structured proforma that included demographic variables such as age, gender, and weight, as well as clinical outcomes including length of hospital stay, persistence of asthma symptoms, emergency department revisits, hospital readmission, and adverse effects of steroid treatment. All assessments were recorded during the hospital stay and, where relevant, during follow-up. Each child received treatment as per the assigned group, and standard care protocols were followed throughout. The primary outcome of the study was the length of hospital stay measured in hours. Secondary outcomes included persistence of symptoms after treatment, any revisit to the emergency department, hospital readmission, and occurrence of side effects related to corticosteroid therapy. These outcomes were assessed during hospitalization and at follow-up visits as per protocol.

Statistical analysis was conducted using SPSS version 25.0. Quantitative variables such as age, weight, and hospital stay duration were presented as mean ± standard deviation. Qualitative variables such as gender, ED revisits, hospital readmission, symptom persistence, and steroid side effects were summarized as frequencies and percentages. The normality of quantitative data was assessed using skewness. To evaluate the difference in mean hospital, stay between the two groups, an independent samples t-test was applied. Chi-square or test was used to compare categorical variables. To control for potential confounding variables such as age and weight, data were stratified accordingly. A p-value less than 0.05 was considered statistically significant.

Results

Data were collected from 166 patients, with mean age in the prednisone group was 6.8 ± 2.9 years, while in the betamethasone group it was 7.1 ± 3.1 years, showing a comparable age distribution. The average weight was 20.3 ± 4.2 kg in the prednisone group and 19.8 ± 4.5 kg in the betamethasone group. Gender distribution was also similar, with 54.2% males and 45.8% females in the prednisone group, and 50.6% males and 49.4% females in the betamethasone group. (Table 1)

The mean length of hospital stay was 47.6 ± 12.3 hours in the prednisone group and 49.9 ± 13.8 hours in the betamethasone group. The difference between the two groups was not statistically significant, with a p-value of 0.18. (Table 2)

Persistence of symptoms was observed in 16.9% of patients in the prednisone group and 20.5% in the betamethasone group, with a p-value of 0.54, indicating no significant difference. Emergency department revisits occurred in 12.0% of children treated with prednisone compared to 14.5% in the betamethasone group (p = 0.65). Hospital readmissions were recorded in 6.0% of the prednisone group and 8.4% of the betamethasone group (p = 0.55). Steroid-related side effects were slightly higher in the prednisone group (9.6%) than in the betamethasone group (7.2%), but this difference was not statistically significant (p = 0.58). (Table 3)

Table 1: Demographic Characteristics of Study Participants

Variable	Prednisone Group (n=83)	Betamethasone Group (n=83)
Mean Age (years)	6.8 ± 2.9	7.1 ± 3.1
Mean Weight (kg)	20.3 ± 4.2	19.8 ± 4.5
Male	45 (54.2%)	42 (50.6%)
Female	38 (45.8%)	41 (49.4%)

Table 2: Primary Outcome – Length of Hospital Stay

Outcome	Prednisone Group	Betamethasone Group	p-value
Length of Hospital Stay (hours)	47.6 ± 12.3	49.9 ± 13.8	0.18

Table 3: Secondary Outcomes

Outcome	Prednisone Group	Betamethasone Group	p-value
Persistence of Symptoms	14 (16.9%)	17 (20.5%)	0.54
ED Revisits	10 (12.0%)	12 (14.5%)	0.65
Hospital Readmission	5 (6.0%)	7 (8.4%)	0.55
Steroid Side Effects	8 (9.6%)	6 (7.2%)	0.58

Stratified analysis by age revealed that in children aged 2–6 years, the mean length of hospital stay was 46.8 ± 11.2 hours in the prednisone group and 50.1 ± 12.7 hours in the betamethasone group, with a p-value of 0.21. Among those aged 7–12 years, the hospital stay was 48.3 ± 13.4 hours for prednisone and 49.6 ± 14.3 hours for betamethasone, with a p-value of 0.19. Similarly, weight-based stratification showed that children weighing less than 20 kg had a mean stay of 48.5 ± 13.1 hours with prednisone and 51.2 ± 14.8 hours with betamethasone (p = 0.16). In those weighing 20 kg or more, the mean hospital stay was 47.0 ± 11.6 hours in the prednisone group and 48.5 ± 12.9 hours in the betamethasone group (p = 0.22). (Table 4). The adverse events observed during the study were generally mild and comparable between the two groups. Irritability was reported in 3 patients (3.6%) in the prednisone group and 2 patients (2.4%) in the betamethasone group (p = 0.65). Nausea occurred in 2 patients (2.4%) in the prednisone group and 1 patient (1.2%) in the betamethasone group (p = 0.56). Abdominal pain was equally reported in both groups, affecting 2 patients each (2.4%), with a p-value of 1.00. Vomiting was observed in 1 patient (1.2%) in each group (p = 1.00). (Table25)

Table 4: Age-Wise Stratified Analysis of Length of Stay

Age Group	Prednisone – Mean LOS (hrs)	Betamethasone – Mean LOS (hrs)	p-value
2–6 years	46.8 ± 11.2	50.1 ± 12.7	0.21
7–12 years	48.3 ± 13.4	49.6 ± 14.3	0.19
Weight Category			
<20 kg	48.5 ± 13.1	51.2 ± 14.8	0.16
≥20 kg	47.0 ± 11.6	48.5 ± 12.9	0.22

Table 5: Detailed Adverse Events Profile

Adverse Event	Prednisone Group (n=83)	Betamethasone Group (n=83)	p-value
Irritability	3 (3.6%)	2 (2.4%)	0.65
Nausea	2 (2.4%)	1 (1.2%)	0.56
Abdominal Pain	2 (2.4%)	2 (2.4%)	1.00
Vomiting	1 (1.2%)	1 (1.2%)	1.00

Discussion

This randomized controlled trial compared the efficacy of oral betamethasone and oral prednisone in the management of acute asthma exacerbations in children aged 2 to 12 years. The study results showed that corticosteroids worked equally well to minimize hospital stays and make people better, and neither group differed significantly in the key study results. The average time spent in the hospital was slightly lower for those given prednisone (47.6 ± 12.3 hours) compared to those given betamethasone (49.9 ± 13.8 hours), but the difference did not reach statistical significance (p = 0.18) (9). While prednisone can show a benefit in responding faster, both medicines offer similar control over the symptoms of acute asthma. This agrees with earlier research that suggests equally effective therapeutic outcomes from corticosteroids, regardless of their dose or influence on inflammation (10).

Patients in both groups had the same rates of ongoing symptoms, emergency department revisits, hospital readmissions, and side effects from steroid use. In both the prednisone and betamethasone groups, 16.9% continued to have symptoms after 48 hours (p = 0.54) (11). Additionally, neither group had a significant difference in ED revisit or hospital readmission rates. Since there are very few and very mild side effects with both SIAC and GLPG1205, they can be used interchangeably (12). There was no evidence of effect modifiers during the analysis by age and weight, meaning the treatment effects of prednisone and betamethasone do not vary in different groups of children (13). Because of this, the results can be used with confidence for children of all ages and weights, regardless of the type of corticosteroid used. According to the pharmacologic literature, one potential advantage of betamethasone is that it has a longer half-life and is more potent per milligram, allowing for less frequent dosing (14). Although not directly assessed in this study, this factor may contribute to improved adherence in outpatient settings and deserves further exploration (15). There are some drawbacks to be aware of with this study, including its age-appropriate stratification, randomized design, and clear outcome measures. The study used non-probability consecutive sampling, which may introduce selection bias. Additionally, long-term outcomes beyond seven days post-discharge were not assessed, limiting insights into delayed relapses or sustained symptom control.

Conclusion

It is concluded that oral betamethasone is as effective and safe as oral prednisone in the management of acute asthma exacerbations in children aged 2 to 12 years. Both corticosteroids showed comparable outcomes in terms of length of hospital stay, symptom resolution, emergency department revisits, hospital readmissions, and incidence of adverse effects. The findings suggest that either medication can be used interchangeably in clinical practice, allowing flexibility based on availability, patient tolerance, and dosing preferences.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-RYKAN-089-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

AI (PGR), TS (WMO)

Review of Literature, Data entry, Data analysis, and drafting article. Manuscript drafting, Study Design,

RI (Assistant Professor), FL (WMO)

Study Design, manuscript review, critical input.

Conception of Study, Development of Research Methodology Design

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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