

Effect of Intravenous Hydrocortisone While Treating Children Under 5 Years of Age for Pneumonia

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ABSTRACT

Objective: To determine the effect of intravenous hydrocortisone while treating children younger than 5 years age for Pneumonia.

Methods: A retrospective cross-sectional study was conducted in the Pediatric emergency department of Abbasi Shaheed Hospital, Karachi, from November 2023 to October 2024. The study included 730 children aged 2 months to 5 years diagnosed with pneumonia based on clinical signs and symptoms. Patients with seizures, respiratory failure, severe malnutrition, loose stools, poisoning, or submersion were excluded. Data regarding demographics, vital signs, vaccination status, clinical history, diagnosis, intravenous hydrocortisone use, length of stay, outcome, and disposition were retrieved from the hospital electronic database and medical records.

Results: A total of 730 children aged 2 months to 5 years with clinically diagnosed pneumonia were included. Antibiotics were prescribed to 688 patients (94.2%), while 42 patients (5.8%) did not receive antibiotics. Intravenous hydrocortisone was prescribed to 591 patients (81.0%), whereas 139 patients (19.0%) did not receive hydrocortisone. Among children who received hydrocortisone, 44% were admitted, 27% were discharged home, 14% were DOR, 14% were referred, and 1% left against medical advice; among those not receiving hydrocortisone, discharge home was more common (41%) compared with admission (30%).

Conclusion: Overall, admission was more frequent among children prescribed hydrocortisone compared with those not prescribed hydrocortisones, whereas discharge home was more common among children who did not receive hydrocortisone.

Keywords: Pneumonia, Hydrocortisone, Children, Retrospective, Emergency Service

INTRODUCTION

Pneumonia, defined as inflammation of the lung parenchyma, is the leading infectious cause of death globally among children younger than 5 years. Most cases are caused by microorganisms, noninfectious causes include aspiration, hypersensitivity reactions, and drug or radiation induced pneumonitis. *S. pneumoniae* is the most common bacterial pathogen in children 3 week to 4 years of age. *S. pneumoniae*, *H. influenzae*, and *S. aureus* are the major causes of hospitalization and

death from bacterial pneumonia among children in developing countries. Treatment of suspected bacterial pneumonia is based on the presumptive cause and the age and clinical appearance of the child. Children who are fully immunized against *H. influenzae* type b and *S. pneumoniae* and are not severely ill should receive ampicillin or penicillin G for children who do not meet these criteria, cephalosporin (ceftriaxone or cefotaxime) may be used. Oral zinc may decrease mortality among children in developing countries with clinically defined severe pneumonia. Bubble CPAP improves

mortality from pneumonia with hypoxemia compared with standard oxygen therapy in settings without access to ventilator derived CPAP or mechanical ventilation.

A significant percentage of children as high as 45% show symptoms of asthma five years after being hospitalized with pneumonia. This could be due to undiagnosed asthma at previous hospitalization or a new predisposition for developing asthma after pneumonia.¹

Streptococcus pneumoniae from 2 months of age and throughout childhood is the commonest cause of bacterial pneumonia. Patchy consolidation in younger children and lobar pattern in older children. Small pleural effusions may occur. Rusty sputum or haemoptysis.⁶

A serial study was conducted in children <2 years in Pakistan vaccinated for Pneumococcal Conjugate Vaccine. Overall *S. aureus* carriage prevalence was low in children receiving Pneumococcal conjugate vaccine 10 valent whereas MRSA carriage and antimicrobial resistance was high in less than 2 years age warranting continuous monitoring for invasive infections.³

Asthma is lower airway obstruction resulting from triad of inflammation, bronchospasm, and increased secretions.⁶ Asthma exacerbations are acute or subacute episodes of progressively worsening symptoms and airflow obstruction. Systemic corticosteroid therapy is recommended for use in moderate to severe asthma exacerbations to hasten recovery and prevent recurrence of symptoms. Corticosteroids are effective as single doses administered in the ED.¹ Children at significant risk of having asthma symptoms later in life, children with early onset asthma less than 3 years of age: who had 3 or more episode of wheezing per year and atleast 1 major criterion (Eczema or parental eczema), or atleast 2 minor criteria (allergic rhinitis, wheezing unrelated to colds, or blood eosinophil count >4%).⁴ Asthma has multifactorial inheritance where heritability is 80% and is associated with HLA-A₂.⁵

METHODS

This cross-sectional study was conducted retrospectively at the pediatrics emergency department of Abbasi shaheed hospital Karachi included patients visiting emergency department from November 2023 to October 2024. Altogether 660 patients fulfilled the inclusion criteria : Age 2 months to 5 years, diagnosed with pneumonia using a combination of signs and symptoms (fast breathing or chest indrawing, cough , fever or difficulty in breathing) and evaluation of respiratory distress and failure using a combination of signs and symptoms i.e. head nodding, or nasal flaring or grunting or severe tachypnea (respiratory rate ≥ 20 breaths per minute above the age-specific cut-off)² or hypoxemia. Seizures, respiratory failure, severe malnutrition (-3 Z score for weight for age WHO growth charts), loose stools, poisoning and submersion were excluded. Data characteristics including patients' demographics, vital signs', vaccination status, SAMPLE history, diagnosis, prescription, length of stay, outcome and disposition were collected by the triage nurse and physicians of ED.

Descriptive statistics in which Frequency distribution was calculated. The representation of how often each characteristic occurs in a dataset, shown by Graphical representation. The data can also be visualized using graphs like histograms, tables or pie charts.

Informed consent regarding treatment, severity of the disease, interventions and possible outcome was taken for every pediatric patient visiting the emergency department. The ethical review committee was not established at the time of study, so approval was taken by the head of the Pediatrics department.

A retrospective data collection procedure was used that includes hospital's electronic data base storage system. It involves analyzing collected data from medical database record of patients visiting emergency department during the studied duration. Data characteristics including patients'

demographics, vital signs', vaccination status, sample history, diagnosis, prescription, length of stay, outcome and disposition were initially collected by the triage nurse and physicians of ED and retrieved by the electronic data base and medical record and analyzed.

RESULTS

The age of the patients' studied were from 2 months to 5 years. On the basis of their presenting complain, vital signs and clinical parameters they were initially diagnosed as pneumonia. Total patients with initial diagnosis of pneumonia which fulfilled the inclusion criteria during the studied duration were 730.

688 (94.2%) patients received standard treatment of pneumonia i.e. antibiotic (91.86% ceftriaxone and 7.27% co-amoxiclav along with supplemental oxygen required by 275 patients (40%) either via nasal prongs 90 patients (13%) or CPAP 186 patients (27%) and 412 (60%) patients did not require O₂. 42 (5.8%) patients received no antibiotic.

A total of 730 children aged 2 months to 5 years with an initial clinical diagnosis of pneumonia fulfilled the inclusion criteria during the study period. Most patients received standard treatment for pneumonia. Antibiotics were prescribed to 688 patients (94.2%), while 42 patients (5.8%) did not receive antibiotics. Among those receiving antibiotics, ceftriaxone was the most commonly prescribed antibiotic, followed by co-amoxiclav.

Intravenous hydrocortisone was prescribed to 591 patients (81.0%), whereas 139 patients (19.0%) did not receive hydrocortisone. Supplemental oxygen support was required in a considerable proportion of patients, including oxygen through nasal prongs or continuous positive airway pressure, while the remaining patients were managed without oxygen support.

Patient disposition varied according to hydrocortisone prescription status. Among children who received hydrocortisone, 44% were admitted,

27% were discharged home, 14% were discharged on request, 14% were referred to another hospital, and 1% left against medical advice. No mortality was reported in this group. In comparison, among children who did not receive hydrocortisone, 41% were discharged home, 30% were admitted, 11% were discharged on request, 16% were referred, and 1% left against medical advice. No mortality was reported among patients who did not receive hydrocortisone.

Overall, admission was more frequent among children prescribed hydrocortisone compared with those not prescribed hydrocortisones, whereas discharge home was more common among children who did not receive hydrocortisone. However, duration of emergency department stay of patients with initial diagnosis of pneumonia was found to be decreased in patients receiving only antibiotic and increased in receiving steroids i.e. hydrocortisone.

DISCUSSION:

The standard treatment of pneumonia including antibiotics and supplemental oxygen is adequate for management and improved outcome whereas steroids cause increased duration of hospital stay. Our findings highlight the substantial impact of bronchopneumonia; 6.2% patients did not receive antibiotic as it was already administered from other medical center and with nearly 76% of cases receiving steroids. This shows the significance of clinical diagnosis and prescription in evaluating patients with suspected pneumonia. This study also emphasizes on clinical diagnosis utilizing history and examination and relevant medication according to diagnosis and to avoid over utilization of unnecessary medications like corticosteroids in the management of pneumonia.

This literature review summarizes the complex and evolving role of systemic corticosteroids as adjunctive therapy for pneumonia. Recent studies indicates that corticosteroids benefit certain patient subgroups, particularly adults with severe community-acquired pneumonia. However, the routine use of corticosteroids is not recommended

for all pneumonia patients due to variable efficacy, risk of side effects, and differences based on the patient's age and the type of pneumonia.

When compared with a study conducted to view clinical features and early corticosteroid treatment outcome of pediatric mycoplasma pneumoniae pneumonia. It determined that the initial dosage of corticosteroid therapy should be decided according to the severity of the disease. Mycoplasma pneumoniae patients with diffuse bronchiolitis-associated lesions/whole lobar consolidation on imaging might require high-dose corticosteroid therapy. Further studies should be conducted for beneficial role of steroids if any in the management of pneumonia. However, despite the high prevalence of respiratory disorders, access to high quality care remains limited in Pakistan, with very few ventilation and PICU settings available as compare to the demand of pediatrics patients visiting the emergency department and that also available only in a few major cities and a shortage of trained physicians and intensivists. Our study is one of the most comprehensive surveys, providing valuable insights into the prevalence and improves physician awareness.

A few limitations of our study include its retrospective design, which may have been affected by incomplete documentation or missing data. As this was a study conducted at a single tertiary care hospital, the similar evaluation may not be observable in other regions of Pakistan, particularly rural areas. Pediatric pneumonia cases are diagnosed clinically, and the use of POCUS and CXR in complicated cases may aid in diagnosis in emergency department. Technical difficulties in this group may have limited the diagnostic yield.

CONCLUSION:

In this retrospective study of children aged 2 months to 5 years presenting with clinically diagnosed pneumonia, antibiotics were prescribed in the majority of cases, and intravenous hydrocortisone was used in a large proportion of patients. Children who received hydrocortisone had

a higher frequency of hospital admission and a lower frequency of discharge from the emergency department compared with those who did not receive hydrocortisone. This pattern suggests that hydrocortisone was more commonly prescribed in children with relatively severe clinical presentation or those requiring further inpatient care. However, due to the retrospective cross-sectional design, the independent therapeutic effect of hydrocortisone on patient outcomes cannot be confirmed. Further prospective studies or randomized controlled trials are recommended to evaluate the clinical benefit, safety, and appropriate indications of intravenous hydrocortisone in pediatric pneumonia.

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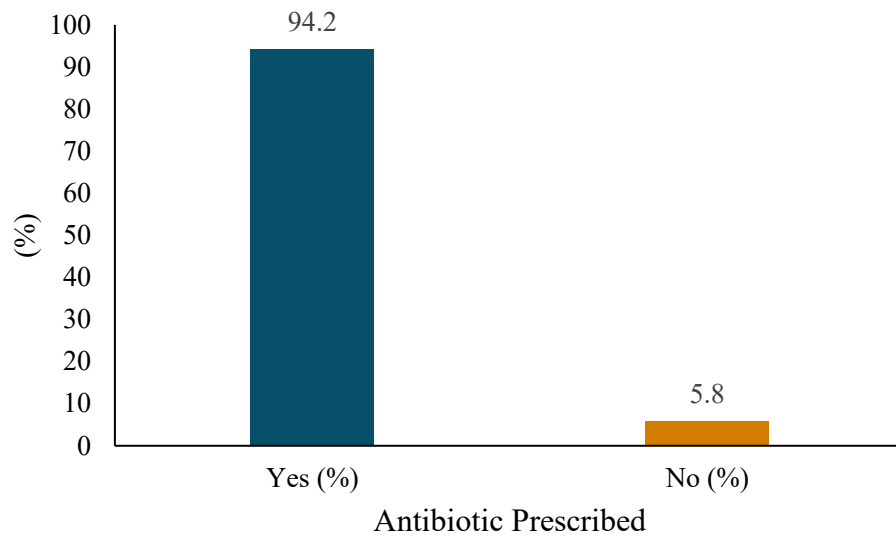


Figure 1. Distribution of antibiotic prescription among study participants (n=730)

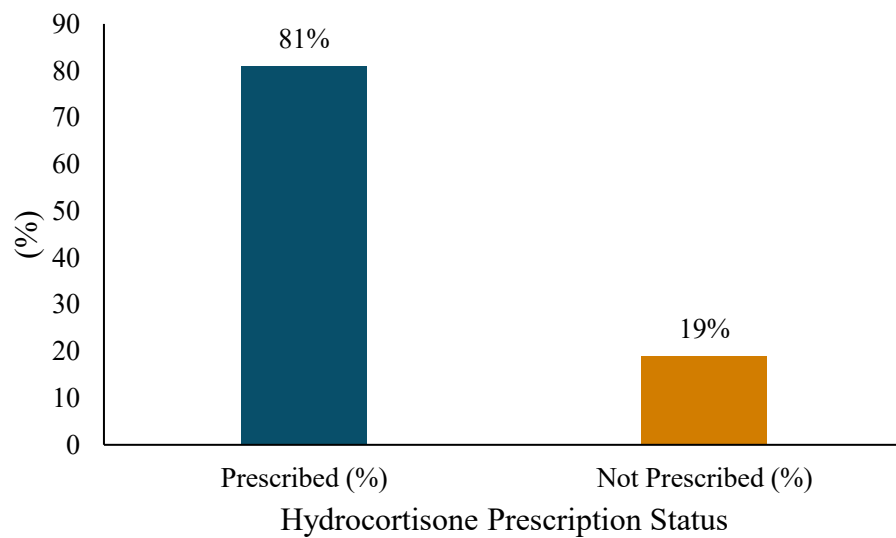


Figure 2. Distribution of hydrocortisone prescription among study participants (n=730)

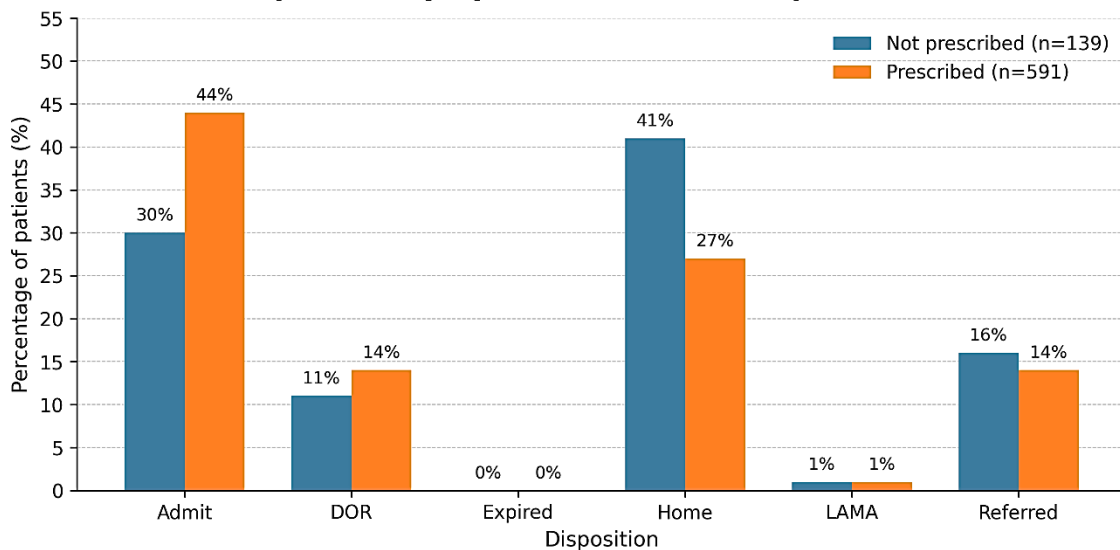


Figure 3. Distribution of patient disposition according to hydrocortisone prescription status among study participants (n = 730).

Conflict of Interest:

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Author's contribution:

Ariba Ahmed: Conception of the study, study design, methodology, overall supervision, critical revision, final approval, and accountability for all aspects of the work.

Ibrahim Shakoar: Contributed to study design, data collection, data interpretation, drafting of the manuscript, final approval, and accountability for all aspects of the work.

Muhammad Irfan Habib: Data collection, literature review, data organization, drafting of the manuscript, final approval, and accountability for all aspects of the work.

All the authors have approved the final version to be published and agree to be accountable for all aspects of the work.



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