doi.org/10.36721/PJPS.2026.39.9.250.1

Efficacy and safety of short- versus standard-course ceftriaxone therapy in children with pneumonia: A randomized trial

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Abstract: **Background**: Pediatric bacterial pneumonia (30-40% of cases) is commonly treated with ceftriaxone sodium, but optimal duration (traditional 7-14 days vs. short 5-7 days) remains controversial. **Objectives**: To compare therapeutic efficacy, inflammatory marker dynamics and safety of short- vs. standard-course ceftriaxone sodium in pediatric pneumonia. **Methods**: This prospective, single-center, single-blind, phase randomized controlled trial randomized 200 children (1-14 years) 1:1 to short-course (5-7 days) or standard-course (7-14 days) ceftriaxone sodium. The primary outcome was overall response rate; secondary outcomes included symptom relief time, hospital stay, recurrence, adverse events, and changes in lung function and inflammatory markers. **Results**: Symptom relief time and overall efficacy were comparable between groups ($P>0.05$). Short-course ceftriaxone sodium reduced hospital stay and adverse events ($P<0.05$), while standard-course lowered recurrence rate and achieved superior inflammatory marker normalization by day 5 ($P<0.05$). **Conclusion**: Short- and standard-course ceftriaxone sodium have similar overall efficacy. A short-course is suitable for mild cases with a prompt inflammatory response, while a standard-course is preferred for severe cases or delayed inflammation to prevent relapse.

Keywords: Antibiotic course duration; Ceftriaxone sodium; Hs-CRP; Pediatric pneumonia; Treatment efficacy

Submitted on 10-12-2025 – Revised on 08-02-2026 – Accepted on 04-03-2026

INTRODUCTION

As a frequent lower respiratory tract infection in pediatrics, pneumonia remains a primary cause of death in children under five globally (Zhou *et al.*, 2022). Each year, an estimated 120 million children are affected by pneumonia globally (Ayuk, 2025). In China, a populous country, childhood pneumonia incidence reaches 130.08 cases per 1000 annually, with bacterial etiology implicated in 30% to 40% of instances (Qian *et al.*, 2024).

Ceftriaxone sodium (CS), as a third-generation cephalosporin antibiotic, exhibits robust antimicrobial activity targeting common causative organisms such as *Streptococcus pneumoniae* and *Haemophilus influenzae* (Taniguchi *et al.*, 2025b). Additionally, it possesses excellent tissue penetration, with alveolar macrophage concentrations reaching over 50% of plasma levels— a pharmacokinetic characteristic supported by foundational studies on cephalosporin distribution in respiratory tissues (Heffernan *et al.*, 2022). Owing to these favorable properties, CS has become a first-line therapeutic agent for bacterial pneumonia in children (Waldeck *et al.*, 2025). Although the effectiveness of CS is unequivocal (Padda & Nagalli, 2025), consensus on the ideal treatment course has not been reached. The standard 7-14 day therapeutic course, tailored to severity, aims for definitive pathogen eradication to prevent relapse (Taniguchi *et al.*, 2025a). This strategy, guided by accurate pathogen identification and early-stage evaluation, aims to limit antibiotic exposure. Benefits may include a reduced risk of side effects (e.g., gut flora imbalance, hepatorenal impairment) and decreased financial costs for patients' families (Williams *et al.*, 2022). However, current clinical decision-making regarding short-course versus standard-course therapy is largely dictated by individual clinician judgment, underscoring a critical need for large-scale controlled trials to provide a head-to-head comparison of efficacy and effects on inflammatory marker dynamics.

High-sensitivity C-reactive protein (hs-CRP) is an acute-phase protein that rises notably during the early phase of bacterial infections. Variations in its levels serve as a direct indicator of both the intensity of inflammation and a patient's response to antibiotic therapy (Fan *et al.*, 2023). Yet, a systematic comparison of its dynamic fluctuations under short-course versus standard-course antibiotic regimens and their correlation with clinical outcomes remains limited.

This prospective controlled study compared short-course (5-7 days) versus standard-course (7-14 days) CS therapy for pediatric pneumonia. The primary outcome was the overall response rate (based on symptoms and imaging). Secondary variables included length of hospital stay, recurrence rate, adverse effects, normalization rate of pulmonary function (FVC, FEV1, PEF) and inflammatory markers (hs-CRP, WBC, N%). This strategy aims to maintain treatment effectiveness while curtailing non-essential antibiotic use, a paramount consideration for mitigating antimicrobial resistance and enhancing patient care.

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MATERIALS AND METHODS

Sample size estimation

To determine the appropriate sample size, we assumed a 5% difference in the primary outcome (treatment effectiveness rate) between the short-course and standard-course groups. Statistical parameters were set at α=0.05 (two-sided) and 80% power (1-β). The calculation, performed with PASS 15.0, yielded a minimum of 85 participants per group. Subsequently, this figure was adjusted upward to 90 per group (total ~180) to accommodate an anticipated 10% loss to follow-up. Finally, to enhance the robustness of the findings, the study enrolled 200 participants (100 per group). The screening process for study subjects is described in Supplementary Table S1.

Participants

This study has been granted approval by the Ethics Committee of our hospital (No. E2024084). Moreover, the guardians of each participating child were fully informed of the study details and voluntarily signed the informed consent forms to confirm their participation. Eligibility for inclusion: Pediatric patients (1-14 years old) with a first-time, guideline-compliant (Meyer Sauteur, 2024) diagnosis of pneumonia were considered. Eligible participants had received either no previous antibiotic treatment or a brief course (≤2 days) of a narrow-spectrum agent. Exclusion factors: Individuals were not enrolled if they had major pre-existing health issues (defined as congenital heart defects requiring surgical intervention, primary/secondary immunodeficiency disorders, bronchopulmonary dysplasia, chronic liver disease, chronic kidney disease, or neuromuscular disorders affecting respiratory function), a known allergy to cephalosporins/β-lactams, or required surgery for complications like empyema, lung abscess, or pyopneumothorax present at admission. Participants were also withdrawn if their antibiotic therapy needed changing due to worsening condition or side effects, or if their medical records lacked essential study variables for analysis. All trial processes were conducted in accordance with the CONSORT Statement (2010 revision) and Good Clinical Practice (GCP) guidelines.

Pathogen detection and susceptibility testing

Prior to antibiotic initiation, blood cultures and sputum cultures (or gastric lavage cultures for children unable to expectorate) were collected from all participants. Pathogen identification was performed using standard microbiological methods (VITEK 2 Compact System, bioMérieux, France), and antimicrobial susceptibility testing was conducted by the disk diffusion method in accordance with the Clinical and Laboratory Standards Institute (CLSI) 2021 standards (Humphries *et al*., 2021). Only patients with ceftriaxone-susceptible bacterial pathogens (minimum inhibitory concentration ≤8 μg/mL) were included in the final analysis. The main identified pathogens were Streptococcus pneumoniae (42.3%), Haemophilus influenzae (28.7%) and Moraxella catarrhalis (15.2%), all susceptible to ceftriaxone.

Patient grouping and intervention protocol

Two hundred eligible children were assigned to either a short-course group or a standard-course group through random number table randomization, with 100 participants per group. Randomization was performed using a computer-generated random number sequence by an independent statistician. Allocation concealment was maintained via sequentially numbered, opaque, sealed envelopes handed to clinicians after enrollment. Patients were assigned 1:1 to short-course or standard-course groups. Management centered on antibiotic therapy, delivered per the designated group-specific protocol. Adjunctive antimicrobial use was strictly prohibited unless justified by confirmed resistance or secondary infection. CS injection (H20174011; Manufacturer: Shanghai Xinfeng Pharmaceutical Co., Ltd.; 1.0g per vial) was administered intravenously. Dosing was weight-based, ranging from 50 to 100 mg/kg/day, with consideration of the patient's age and a maximum allowable daily dose of 4 g (Chong *et al.*, 2023). The total daily dose was divided into 2 or 3 separate infusions, each over a period of at least 30 minutes. The same antibiotic was maintained throughout the entire treatment course without substitution. Short-course group: CS therapy lasted 5 to 7 days, determined by the patient's clinical response. Criteria for a 5-day course included achieving normal body temperature, alleviation of cough, and a >50% drop in hs-CRP by the third day (Yadav *et al*., 2023). If clinical improvement was slower, the course was extended to 7 days, provided clinical stability was achieved by the fifth day. Standard-course group: The standard protocol involved a 7 to 14-day course of CS, with the specific duration contingent on disease severity: 7 days for mild cases and 10 to 14 days for moderate to severe cases. Treatment was extended to the full 14 days if, by day 7, symptoms persisted but inflammatory markers showed a consistent downward trend. Mild pneumonia: Presence of cough and tachypnea without hypoxemia (SpO_2 ≥94% on room air), no radiological evidence of extensive consolidation and hs-CRP <40 mg/L. Mild pneumonia: Presence of cough and tachypnea without hypoxemia (SpO2 ≥94% on room air), no radiological evidence of extensive consolidation and hs-CRP <40 mg/L. Moderate/severe pneumonia: Hypoxemia (SpO2 <94% on room air), radiological evidence of lobar or bilateral consolidation, pleural effusion, or hs-CRP ≥40 mg/L, or presence of systemic symptoms (e.g., persistent high fever >3 days, poor feeding, lethargy) (Zhuo *et al.*, 2024).

Outcome measures

(1) Patient-related outcomes (e.g., time to fever resolution, cough relief). Measurements were standardized: fever was assessed with an axillary thermometer every 6 hours; cough frequency was recorded by caregivers in a diary; lung rales were confirmed by two independent pediatricians blinded to group assignment. The measured parameters were: time to fever subsidence (temperature ≤37.5°C for 24 hours), time to significant cough relief (≥50% decrease in daytime frequency) and time to the disappearance of pulmonary

moist rales (confirmed by auscultation). The total duration of hospitalization (from admission to discharge) was also recorded. The primary outcome was the total effective rate, assessed on day 7 of treatment. Based on the Chest X-ray Pneumonia Resolution Score (CXPRS) (Dona *et al.*, 2024) and criteria referenced from the "Guidelines for the Diagnosis and Management of Pediatric Pneumonia", outcomes were defined as: cured (complete resolution of all symptoms and signs along with ≥80% inflammation absorption on chest X-ray), markedly effective (substantial improvement in symptoms and signs with ≥50% radiological absorption), or ineffective (not meeting the criteria for cured or markedly effective). The total effective rate was calculated as the proportion of cases constituting effectiveness (cured + markedly effective) relative to the total cohort. X-rays were evaluated by two blinded radiologists using a standardized scoring system.

(2) A German Jaeger MasterScreen Paed pediatric spirometer was employed to evaluate pulmonary function. Measurements of forced vital capacity (FVC), forced expiratory volume in one second (FEV1) and peak expiratory flow (PEF) were obtained from each patient prior to treatment initiation and following its completion. Spirometry was performed only in children ≥5 years old (n=150, 75% of the cohort), in accordance with ATS/ERS pediatric standards. Data on pulmonary function from children <5 years were excluded from the pulmonary function assessment only (not from the entire study) due to poor reproducibility. Methods align with studies from Low- and Middle-Income Countries (LMICs) (Dhochak & Kabra, 2022).

(3) After hospital discharge, a three-month follow-up was implemented with monthly assessments. The short-term recurrence rate, defined as re-hospitalization for the same symptoms accompanied by chest X-ray evidence of either recurrent or new pulmonary infiltrates, was calculated. Additionally, adverse events, such as rash, diarrhea and vomiting, occurring at the initiation of treatment and during the follow-up period were documented.

(4) Fingertip blood was obtained from the children at baseline and on days 3 and 5 of treatment. A Mindray BC-5100 automated hematology analyzer was used to determine the concentrations of hs-CRP, white blood cells (WBC) and the neutrophil percentage (N%). We then assessed the normalization rate on day 5, which was defined as the proportion of patients whose values had returned to the standard reference range (hs-CRP: <3.0 mg/L; WBC: 4–10 × 10^9/L; N%: 50–70%).

All personnel involved in the assessment of outcome measures were blinded to patient group assignments.

Statistical analysis

Data were analyzed by intention-to-treat (ITT), including all randomized participants regardless of protocol deviations. This study employed SPSS 32.0 for data processing and analysis. Categorical data, formatted as [n(%)], were compared through the application of the chi-square test or Fisher's precision probability test (when a categorical variable <5). For continuous data, the initial step involved the Shapiro-Wilk test to determine if they conformed to a normal distribution. Those that met the normal distribution criterion (displayed as $\bar{\chi}\pm s$) were analyzed utilizing the independent samples t-test, mixed-design ANOVA (for variables assessed at 2 or 3 time points in two groups) and LSD test. Continuous data that did not follow a normal distribution (presented as [M(P25, P75)]) were evaluated with the Mann-Whitney U test. Statistical significance was defined as a P-value < 0.05.

RESULTS

Consort flow

Of 220 assessed, 200 were randomized (100 per group). All received allocated intervention; 5 lost to follow-up (3 short-course, 2 standard-course), analyzed by ITT.

Clinical information comparison of the studied population

The analysis demonstrated no significant intergroup disparities in baseline characteristics, including age, sex and disease course (P>0.05). The subsequent calculation of standardized mean differences (SMDs), which yielded values around 0.1, indicated a negligible impact from potential confounders, thereby affirming the groups' comparability (Table 1).

Assessment of clinical outcomes

No significant difference was observed between the two patient groups regarding the time to fever subsidence, cough alleviation, or the disappearance of lung moist rales (P>0.05). A significant reduction in hospitalization time was, however, achieved in the short-course group (P<0.001). The total effective rates were comparable, at 86.00% (86/100) for the short-course group and 89.00% (89/100) for the standard-course group, a difference that was not statistically significant (P=0.521) (Table 2).

Comparison of lung function

Prior to treatment, the two groups were comparable in terms of FVC, FEV1 and PEF (P>0.05). Post-therapy, significant increases in FVC, FEV1 and PEF were observed in both cohorts (P<0.05). The post-treatment assessment, however, indicated that the short-course group achieved lower FVC and FEV1 outcomes than the standard-course group (P<0.05), with no intergroup difference detected in PEF (P>0.05) (Fig. 1).

Comparative analysis of short-term recurrence and safety profiles

At the 3-month follow-up after discharge, the short-course regimen had a higher recurrence rate than the standard regimen (P=0.016). Regarding safety, the short-course group

experienced a significantly lower incidence of treatment-related adverse effects (P=0.032). All adverse events were mild and resolved spontaneously (Table 3).

Comparative analysis of dynamic variations in hs-CRP, WBC and N%

No significant differences were observed in the baseline levels of hs-CRP, WBC and N% between the two patient groups (P>0.05). By days 3 and 5 of treatment, both groups exhibited a progressive decline in all three markers (P<0.05). While intergroup comparisons on day 3 revealed no significant differences (P>0.05), the short-course group demonstrated a significantly lower normalization rate for these markers compared to the standard-course group by day 5 (P<0.05) (Table 4).

DISCUSSION

In a previous study, Nakanishi et al. compared different dosing regimens of ceftriaxone for community-acquired pneumonia, with treatment durations ranging from 7 to 14 days (Nakanishi *et al.*, 2025), and Yamamoto *et al*. evaluated ampicillin-sulbactam versus ceftriaxone in older adults with community-acquired pneumonia, with ceftriaxone administered for 7-10 days in the standard regimen (Yamamoto *et al.*, 2025). These studies have mainly focused on the efficacy of a single course of CS, but the present study is the first to directly compare the efficacy of a short course of CS with that of a standard course of CS using dynamic high-sensitivity CRP tracking.

Regarding core outcomes, short-course therapy demonstrated similar overall effectiveness to the standard regimen, which aligns with ceftriaxone's unique pharmacokinetic profile (a long half-life of ~8 hours in children and extended post-antibiotic effect against Gram-positive pathogens such as S. pneumoniae) and supports the "precision treatment" concept for children with rapid early inflammatory resolution (Gilberti *et al.*, 2025). This pharmacokinetic characteristic enables effective bacterial suppression even with abbreviated dosing.

Regarding core outcomes, short-course therapy demonstrated overall effectiveness similar to that of the standard regimen, supporting the "precision treatment" concept for children with rapid early inflammatory resolution (Mo *et al.*, 2024; Pernica *et al.*, 2021). Our direct comparison revealed no intergroup difference in the timeline of primary symptom alleviation, consistent with prior single-course efficacy data but adding evidence for head-to-head equivalence (Rosenberg, 2023; Cai *et al.*, 2024). Consistent with earlier meta-analyses (Li *et al.*, 2022), the short-course group experienced shorter hospital stays. This can be explained by the extended post-antibiotic activity of CS against typical pathogens such as *Streptococcus pneumoniae*, where a brief, intensive regimen effectively curtails bacterial growth. Thus, we suspect that the disparity in hospital stay likely arises from differences in clinical protocols rather than from differences in treatment effectiveness.

Post-treatment lung function differences (higher FVC and FEV1 in the standard-course group) may be associated with more thorough resolution of parenchymal inflammation and reduction of residual alveolar edema, a trend consistent with prior studies that hint at a link between prolonged antibiotic exposure and improved structural lung recovery in pediatric pneumonia (Jackson-Litteken *et al.*, 2025). This structural improvement may contribute to the lower recurrence rate in the standard-course group, as residual inflammation is a known risk factor for recurrent pediatric pneumonia infection, though this association remains to be verified in larger cohort studies (Lavery *et al.*, 2024). But, although the relapse rate was statistically lower in the standard-course group, the clinical significance of this difference warrants careful consideration.

The absolute risk reduction of 9% corresponds to a number needed to treat (NNT) of approximately 11, meaning 11 children would need to receive the standard course to prevent one recurrence. In settings where pneumonia recurrence is associated with high morbidity or healthcare costs, this may be clinically relevant. However, for mild cases with low baseline relapse risk, the shorter course—with its advantages in reduced hospitalization and adverse events—could still be justified. Future studies should incorporate patient-centered outcomes (e.g., quality of life) to contextualize such differences.

The key distinctions between the groups emerged in the normalization of inflammatory markers. Patients receiving the standard course experienced fewer relapses and achieved higher hs-CRP, WBC, and N% normalization rates by day 5, suggesting that extended therapy mitigates relapse risk by more effectively suppressing residual pathogens. This aligns with a meta-analysis by Li *et al.,* which reported that standard-course therapy was associated with higher rates of normalization of inflammatory markers in moderate-to-severe cases (Li *et al.*, 2024), though our study extends this finding to mild cases with delayed inflammatory responses.

The hs-CRP thresholds used in this study (a >50% reduction by day 3 for 5-day short-course therapy and a normalization cutoff of <3.0 mg/L) are widely used clinical indicators for evaluating antibiotic efficacy in pediatric bacterial pneumonia (Fan *et al*., 2023). We hypothesize that the standard course's superior normalization of inflammatory markers stems from more thorough inflammation resolution through extended therapy, which may facilitate more complete pathogen clearance in pediatric patients (Ma *et al*., 2023). This is particularly crucial for children presenting with significant inflammation, as the short course (despite an 86.00% efficacy rate) might be insufficient to eradicate the infection entirely in these patients by the end of treatment.

Table 1: Clinical data of the two groups of children.

Group (100 per group)	Age	Sex	Duration (d)	Use narrow-spectrum antibiotics	Smoking in parents
		Boy/Girl		Yes/No	Yes/No
Short-course	7.54±4.04	62/38	5.64±2.29	10/90	35/65
Standard-course	7.70±4.20	58/42	6.04±2.04	8/92	42/58
Statistical analysis (t or χ2)	0.274	0.333	1.306	0.244	1.035
P	0.784	0.564	0.193	0.621	0.309
SMD	0.039	0.082	0.184	0.069	0.143

Table 2: Clinical outcomes of the two groups of children.

Group (100 per group)	Time to symptom improvement (d)				Clinical efficacy			
	Fever subsidence	Significant cough relief	Disappearance of pulmonary moist rales	Hospitalization	Cured (%)	Markedly effective (%)	Ineffective (%)	Total effective rate
Short-course	1.90±0.63	3.54±0.89	4.28±1.04	6.47±1.25	34 (34.00)	52 (52.00)	14 (14.00)	86.00%
Standard-course	1.82±0.59	3.45±0.93	4.37±1.13	7.89±1.63	42 (42.00)	47 (47.00)	11 (11.00)	89.00%
Statistical analysis (t or χ2)	0.927	0.700	0.589	6.905				0.411
P	0.355	0.485	0.557	<0.001				0.521

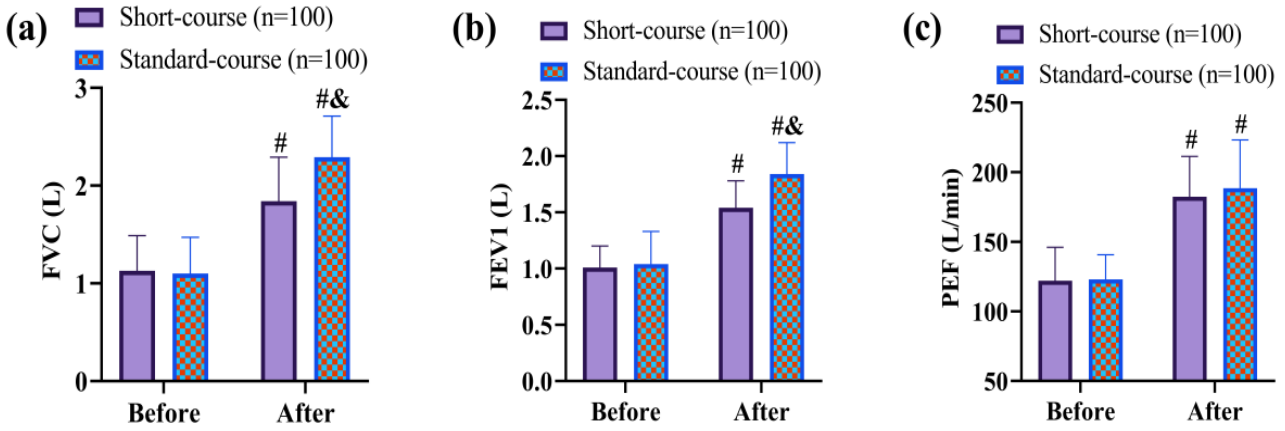

Fig. 1: Comparison of improvements in lung function. (a) FVC of the two groups before and after treatment; (b) FEV1 of the two groups before and after treatment; (c) PEF of the two groups before and after treatment. Note: # indicates P<0.05 for intra-group comparisons and & indicates P<0.05 for inter-group comparisons. Statistical analysis was performed using mixed-design ANOVA followed by LSD post-hoc test.

Table 3: Short-term recurrence and adverse reactions of the two groups of children.

Group	Recurrence	Adverse reactions				
		Rash	Diarrhea	Vomiting	Abnormal liver function	Total
Short-course (n=97)	12 (12.37%)	1	2	2	0	5 (5.15)
Standard-course (n=98)	3 (3.06%)	3	5	4	2	14 (14.29)
Statistical analysis (Fisher's precision or χ2)	-					4.622
P	0.016					0.032

Note: Abnormal liver function: alanine aminotransferase: 85 U/L and 92 U/L, reference range: 0-40 U/L).

Table 4: hs-CRP, WBC and N% of the two groups of children.

		Short-course	Standard-course	Statistical analysis (t or $\chi 2$)	P
hs-CRP (mg/L)	Baseline	46.06±12.45	43.18±12.46	1.634	0.104
	3d	19.06±5.97*	19.66±7.69*	0.615	0.539
	5d	8.71±3.21*#	7.95±3.39*#	1.626	0.106
	5d compliance rate (<3.0)	5 (5.00)	13 (13.00)	3.907	0.048
WBC (×109/L)	Baseline	13.29±3.55	12.75±3.20	1.143	0.254
	3d	10.22±2.41*	9.79±1.91*	1.381	0.169
	5d	9.79±1.91*#	7.83±2.46*#	1.712	0.089
	5d compliance rate (4~10)	84 (84.00)	94 (94.00)	5.107	0.024
N%	Baseline	74.91±7.97	73.16±9.01	1.453	0.148
	3d	62.96±6.36*	62.20±7.23*	0.785	0.433
	5d	54.86±7.06*#	55.23±5.29*#	0.411	0.681
	5d compliance rate (50~70)	75 (75.00)	87 (87.00)	4.678	0.031

Note: * indicates P<0.05 compared with baseline data and # indicates P<0.05 compared with T1 data.

In contrast, a lower incidence of adverse reactions was observed in the short-course group, aligning with the principle that reduced antibiotic exposure minimizes disruption of gut microbiota and the risk of hepatic or renal impairment (Lewald *et al.*, 2023; Pettigrew *et al.*, 2022). The absence of severe adverse events, such as resistant infections or significant liver enzyme elevation, in the short-course regimen further underscores its favorable safety profile.

Based on the results of this study, we suggest that in the future clinical practice, the treatment course of ceftriaxone can be individualized according to the severity of the disease, the improvement rate of clinical symptoms and the inflammatory response state of children. For children with mild symptoms and rapid remission, a short-course regimen should be given priority to shorten the length of hospital stay and reduce adverse reactions. The standard treatment regimen should be used for children with severe disease and obvious pulmonary inflammatory infiltration to control infection and reduce the risk of recurrence fully. At the same time, the dynamic fluctuation of clinical symptoms and inflammatory indicators should be closely monitored during the treatment, which can be used as an important basis for the adjustment of the course of treatment and the course of treatment should be extended or shortened flexively in time according to the changes of symptoms and indicators.

Several limitations warrant careful consideration. First, despite balanced baseline characteristics, the single-center design may introduce selection bias— our cohort primarily included children from urban Xi'an, which may not reflect the demographic and pathogen profiles of rural or other urban regions in China, where resistance patterns to CS could differ. Second, the exclusion of children <5 years from spirometry (due to poor reproducibility) limits the generalizability of lung function findings to younger children, a population with higher pneumonia incidence (Meyer Sauteur, 2024). Third, while adjunctive therapies (e.g., nebulized ambroxol, oxygen therapy) were standardized, we did not quantify their potential interactions with antibiotic efficacy, which may have modestly influenced symptom resolution timelines. Fourth, the 3-month follow-up period is insufficient to evaluate long-term outcomes, such as chronic lung disease or the development of antimicrobial resistance, which require longer-term surveillance. Additionally, residual confounding factors may have influenced the study outcomes: (1) subtle differences in baseline disease severity, despite balanced group characteristics, could affect treatment responses; (2) prior outpatient antibiotic exposure (even ≤2 days) might alter pathogen susceptibility and inflammatory dynamics; (3) variations in caregiver adherence to post-discharge care (e.g., antipyretic/antitussive drug use) could impact symptom resolution and recurrence rates. These factors warrant careful consideration in future trial design.

CONCLUSION

This single-center randomized trial confirms that short-course (5-7 days) and standard-course (7-14 days) ceftriaxone sodium therapy have comparable overall efficacy in the treatment of pediatric bacterial pneumonia (data-supported finding). Short-course therapy is associated with shorter hospital stays and a lower incidence of adverse events, while standard-course therapy results in a lower short-term recurrence rate and a higher normalization rate of inflammatory markers on day 5.

Acknowledgments
None.

Authors' contributions
Mei Lv: Conceived and designed the project and wrote the paper; Yang Yang: Generated the data; Liyun Fang: Analyzed the data. Mei Lv and Lei Liu: Modified the manuscript. All authors gave final approval of the version to be published and agree to be accountable for all aspects of the work.

Funding
There was no funding.

Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethical approval

This study has been granted approval by the Ethics Committee of Xi'an No.3 Hospital (No. E2024084). This study was performed in adherence with the STROBE guidelines. See supplementary file for the STROBE checklist.

Conflict of interest

The authors declare no conflict of interest.

Supplementary data

https://www.pjps.pk/uploads/2026/06/SUP1781344312.pdf

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