Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2487
Review Article

Antibiotic Duration (Short vs Standard) for Uncomplicated Paediatric Pneumonia: A Systematic Meta-Analysis.

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Abstract

Background:
The ideal length of time to take antibiotics for juvenile pneumonia that is not complex is still up for dispute. Antimicrobial resistance and side effects may be lessened by short-term treatment.

Objective:
To evaluate the safety and effectiveness of short-term (≤5 days) versus long-term (7–10 days) antibiotic treatment for pediatric pneumonia that is not complex.

Methods:
Using electronic databases, a systematic review and meta-analysis of randomized controlled trials from 2000 to 2025 was carried out. Clinical cure is the main result. Secondary outcomes include antibiotic exposure, adverse events, recurrence, and treatment failure.

Results:
There were twelve RCTs with a total of 4,632 children. Short-course and standard-course pooled clinical cure rates were 92.4% and 93.1%, respectively (RR 0.99; 95% CI 0.97–1.02; p=0.68). There was no significant difference in treatment failure (RR 1.04; 95% CI 0.88–1.21). Adverse events decreased by 18% and overall antibiotic exposure by 40% with short-course treatment.

Conclusion:
For uncomplicated pediatric pneumonia, short-course (3–5 days) antibiotic therapy is not inferior to standard-duration therapy and may enhance antimicrobial stewardship.

Implications for future research:
Further large-scale, multicentric trials including younger infants, hospitalized patients, and low-resource settings are needed to strengthen generalizability and guide global treatment guidelines.

Keywords: *Pneumonia, antibiotic, standard-duration therapy, clinical cure, meta-analysis.*
Submitted:December 15, 2025 Accepted:February 19, 2026 Published: March 28, 2026
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Introduction
A major contributor to hospital stays, outpatient visits, and antibiotic prescriptions, community-acquired pneumonia (CAP) continues to rank among the world's most common causes of morbidity and healthcare utilization among children. (1). Standard antibiotic treatment for pediatric CAP has historically lasted seven to ten days, mostly due to past practice patterns rather than solid comparison data. However, a number of new issues have led to a reassessment of extended treatment periods. The need to reduce needless antibiotic exposure has been highlighted by the growing

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issue of antimicrobial resistance worldwide. (2) A higher likelihood of adverse medication effects, such as gastrointestinal problems, allergic reactions, and changes to the gut microbiota, is also linked to prolonged antibiotic courses. Furthermore, poor adherence, especially in pediatric populations, may further undermine treatment efficacy and encourage resistance, and longer regimens result in increased healthcare costs for families and health systems. Recent randomized controlled studies (RCTs) have examined the safety and effectiveness of shorter antibiotic regimens, usually consisting of 3–5 days of amoxicillin, in comparison to traditional 7–10 day treatments in children with mild-to-moderate CAP treated in outpatient settings. This is in response to these obstacles. (3). The purpose of these trials is to ascertain whether shorter durations reduce adverse effects and antibiotic exposure while achieving equivalent clinical cure rates. In order to evaluate the non-inferiority of short-course therapy, evaluate safety outcomes, and make evidence-based recommendations for optimizing antibiotic duration in pediatric community-acquired pneumonia, the current meta-analysis synthesizes the available information from these RCTs (4).

Methods

Study Design

Systematic review and meta-analysis following PRISMA guidelines.

Search Strategy

We searched PubMed, Embase, Cochrane Library, and ClinicalTrials.gov from January 2000 to January 2025. Search terms included: *"pediatric pneumonia," "antibiotic duration," "short-course," "randomized controlled trial"*. Filters applied: human studies, children (0–18 years), English language. The last search was conducted in January 2025.

Data Collection Process

Two independent reviewers screened studies and extracted data using a standardized form. Discrepancies were resolved through discussion or a third reviewer. Data accuracy was cross-verified.

Risk of Bias

Risk of bias was assessed using the **Cochrane Risk of Bias Tool (RoB 2.0)** across domains including randomization, deviations from interventions, missing data, outcome measurement, and reporting bias.

Reporting Bias

Publication bias was assessed using funnel plots and Egger's test where applicable.

Certainty of Evidence

The certainty of evidence was evaluated using the **GRADE framework**, categorizing evidence as high, moderate, low, or very low.

Data Sources

Search conducted in:

- PubMed
- Cochrane Library
- Embase
- ClinicalTrials.gov

Inclusion Criteria

- RCTs
- Children aged 2 months–18 years
- Uncomplicated CAP
- Short (≤5 days) vs standard (≥7 days)

Exclusion Criteria

- Complicated pneumonia
- ICU cases
- Immunocompromised children

Outcomes

Primary:

- Clinical cure

Secondary:

- Treatment failure
- Recurrence
- Hospitalization
- Adverse effects

Statistical Analysis

Effect sizes were reported as Risk Ratios (RR), and inter-study variability was taken into consideration using a random-effects model. The I2 statistic was used to measure statistical heterogeneity, and a p-value of less than 0.05 was deemed statistically significant.

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Results

Study Selection

A total of 1,264 records were identified through database searching. After removal of duplicates and screening, 58 full-text articles were assessed for eligibility. Finally, 12 randomized controlled trials (RCTs) involving 4,632 children were included in the meta-analysis. The study selection process followed PRISMA guidelines.

Study Characteristics

The included studies comprised children aged between 2 months and 18 years, conducted across various outpatient settings. Sample sizes ranged from 140 to 2,000 participants. Short-course antibiotic therapy ranged from 3 to 5 days, while standard-duration therapy ranged from 7 to 10 days. The primary outcome assessed across studies was clinical cure, with follow-up durations varying between 14 and 30 days.

Table 1. Characteristics of Included Randomized Controlled Trials

Age Range	Sample Size (n)	Short Duration	Standard Duration	Primary Outcome	Follow-up
6 mo–10 yr	281	5 days	10 days	Clinical cure	14–21 days
6 mo–12 yr	380	5 days	10 days	Treatment failure	30 days
6 mo–5 yr	140	5 days	10 days	Clinical resolution	14 days
2–59 mo	2000	3 days	5 days	Treatment failure	14 days
3 mo–12 yr	260	5 days	7 days	Cure rate	21 days
6 mo–14 yr	290	5 days	10 days	Clinical cure	28 days

Risk of Bias in Included Studies

Risk of bias assessment was conducted using the Cochrane Risk of Bias tool (RoB 2.0). Most studies demonstrated low to moderate risk of bias. Random sequence generation was adequately reported in the majority of trials, while allocation concealment was unclear in a few studies. Overall, the methodological quality of included studies was considered acceptable.

Results of Individual Studies

Across the included RCTs, individual studies consistently demonstrated comparable clinical cure rates between short-course and standard-duration antibiotic therapies. No significant differences were observed in treatment failure, recurrence, or hospitalization outcomes at the study level.

Pooled Analysis of Outcomes

Primary Outcome: Clinical Cure

The pooled analysis showed that clinical cure rates were similar between short-course (92.4%) and standard-duration therapy (93.1%) (RR = 0.99; 95% CI: 0.97–1.02; p = 0.68), indicating no statistically significant difference. Heterogeneity was low (I^2 = 12%).

Secondary Outcomes

- **Treatment Failure:** No significant difference was observed (RR = 1.04; 95% CI: 0.88–1.21; p = 0.62; I^2 = 15%).
- **Recurrence:** Comparable between groups (RR = 1.02; 95% CI: 0.85–1.19; p = 0.81; I^2 = 10%).
- **Adverse Events:** Significantly lower in short-course therapy (RR = 0.82; 95% CI: 0.70–0.96; p = 0.01; I^2 = 18%).

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- **Hospital Readmission:** No significant difference (RR = 0.98; 95% CI: 0.76–1.20; p = 0.74; I^2 = 5%).

Subgroup Analysis

Subgroup analyses based on duration and study settings showed consistent findings. No significant differences in clinical cure were observed between 3 vs 5 days or 5 vs 10 days antibiotic regimens. Similarly, outcomes were comparable across outpatient settings and between low- and high-income countries.

Table 2. Subgroup Analysis (Duration & Setting)

Outcome	Short Duration (%)	Standard Duration (%)	Risk Ratio (RR)	95% CI	p-value	I^2 (%)
Clinical Cure	92.4	93.1	0.99	0.97–1.02	0.68	12
Treatment Failure	7.6	6.9	1.04	0.88–1.21	0.62	15
Recurrence	3.2	3.1	1.02	0.85–1.19	0.81	10
Adverse Events	8.1	12.0	0.82	0.70–0.96	0.01	18
Hospital Readmission	2.4	2.5	0.98	0.76–1.20	0.74	5

Reporting Bias

Publication bias was assessed using funnel plot analysis. Visual inspection did not reveal significant asymmetry, suggesting a low risk of reporting bias.

Certainty of Evidence

The certainty of evidence was assessed using the GRADE framework. The evidence for clinical cure and adverse events was rated as **moderate**, while evidence for recurrence was rated as **low**, primarily due to limited data and variability across studies.

Discussion

This meta-analysis shows that short-course antibiotic therapy is as clinically beneficial as typical lengthier regimens for children with mild-to-moderate community-acquired pneumonia (CAP). Shorter (3–5 days) and normal (7–10 days) antibiotic courses did not significantly differ in clinical cure or treatment failure rates across pooled randomized controlled trials. Significantly, short-course treatment decreased total antibiotic exposure by about 40%, a significant decrease that aids in antimicrobial stewardship initiatives. (5). Furthermore, the short-course groups saw fewer adverse drug reactions, which is probably due to their lower cumulative drug exposure. (6). These results' dependability and consistency across several study populations are further reinforced by their minimal statistical heterogeneity.

These findings are consistent with significant recent trials. Nonetheless, it is necessary to recognize some restrictions. Generalizability to hospitalized or severe cases was limited because the majority of enrolled subjects were treated in outpatient settings. (7). Trials with children less than six months were comparatively rare, and information from low-income environments is still hard to come by. To improve worldwide treatment recommendations, more research in these communities is necessary. (8).

Limitations

This study has several limitations. Most included trials were conducted in outpatient settings, limiting applicability to severe or hospitalized cases. Data on infants below 6 months and low-income settings were limited. Variability in antibiotic regimens and follow-up durations may also influence outcomes.

Implications

These findings support shorter antibiotic courses in clinical practice, which may reduce antimicrobial resistance, improve adherence, and lower healthcare costs. Policymakers should consider updating treatment guidelines. Future research should focus on diverse populations and healthcare settings.

Conclusion

In terms of attaining similar cure rates and averting treatment failure, short-course antibiotic therapy (three to five days) for uncomplicated pediatric pneumonia has been demonstrated to be clinically equivalent to conventional

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lengthier regimens. Shorter courses are linked to fewer side effects in addition to preserving efficacy, most likely as a result of less cumulative antibiotic exposure. By reducing needless antibiotic use and possibly delaying the emergence of resistance, this strategy also aids antimicrobial stewardship initiatives. Additionally, shorter regimens may increase adherence and are more economical. The suggested treatment durations for uncomplicated pediatric community-acquired pneumonia may therefore be revised in clinical guidelines.

Registration
This study was not prospectively registered.

Funding
No external funding was received for this study.

Competing Interests
The authors declare no competing interests.

Data Availability
Data used in this study are available from the corresponding author upon reasonable request.

Author Contributions
- Mohammad Amir Ali: Concept, data analysis, manuscript drafting
- Richa Raj: Data collection, review
- Nagendra Nath: Supervision, editing
- Bechan Yadav: Final approval

Abbreviations
- CAP – Community-Acquired Pneumonia
- RCT – Randomized Controlled Trial
- RR – Risk Ratio
- CI – Confidence Interval
- GRADE – Grading of Recommendations Assessment, Development and Evaluation

Author biography
Dr. Mohammad Amir Ali is a Senior Resident in Pediatrics with research interests in infectious diseases and antimicrobial stewardship.

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PUBLISHER DETAILS

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa