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Short communication

Clinical Audit of Antibiotic Prescribing for Pediatric Community-Acquired Pneumonia at Zawia Medical Center, Libya

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Abstract
Community-acquired pneumonia (CAP) remains a major cause of pediatric morbidity and antibiotic exposure in low- and middle-income settings. This prospective clinical audit evaluated antibiotic prescribing patterns, pathogen distribution, and short-term outcomes among 300 children aged 3 months to 5 years managed for CAP at Zawia Medical Center, Libya, during 2025. Fever (93.3%), cough (89.0%), and difficulty breathing (72.7%) were the predominant presenting features; 34.3% met the World Health Organization criteria for severe pneumonia. When microbiology was available, Streptococcus pneumoniae (38.0%) and Haemophilus influenzae type b (22.0%) were the leading pathogens. Amoxicillin was the most frequently prescribed empirical antibiotic (39.0%), followed by amoxicillin-clavulanic acid (18.7%) and ceftriaxone (14.0%). Oral therapy was used in 68.0% of children and intravenous therapy in 32.0%. Treatment duration was 6–10 days in 61.0% of cases. Prescribing was considered rational in 70.7% of records, while 29.3% showed deviations from preferred practice. Clinical improvement was documented in 88.3% of patients, readmission within 30 days occurred in 9.3%, and mortality was 2.3%. The findings suggest generally acceptable adherence to pediatric CAP treatment principles, but they also identify a substantial opportunity to strengthen antimicrobial stewardship, reduce unnecessary broad-spectrum use, and standardize duration of therapy.
Keywords. Community-Acquired Pneumonia, Children, Antibiotic Prescribing, Clinical Audit.

Introduction

Community-Acquired Pneumonia (CAP) is one of the most common serious infections encountered in childhood and remains a leading contributor to hospital attendance and antibiotic prescribing worldwide [1,2]. Although many cases are self-limited or viral in origin, bacterial CAP continues to cause substantial morbidity, particularly in younger children and in health systems with delayed presentation or limited diagnostic support. Appropriate antibiotic prescribing is central to pediatric CAP care. The selection of a suitable first-line agent, the route of administration, and the duration of treatment all influence recovery, hospital stay, cost, and antimicrobial resistance pressure [3,4]. International guidance generally favors narrow-spectrum therapy, particularly amoxicillin for uncomplicated disease, while reserving broader-spectrum agents for severe illness or special clinical circumstances [3,5].

In Libya, published data suggest persistent variability in antibiotic use and inadequate stewardship across pediatric respiratory infections. Auditing local practice is therefore important to determine how closely routine care aligns with evidence-based standards and to identify targets for improvement [6]. This study assessed antibiotic prescribing patterns, rationality, and early outcomes among children treated for CAP at Zawia Medical Center.

Methods

This prospective clinical audit included 300 consecutive children aged 3 months to 5 years with clinically and radiologically confirmed community-acquired pneumonia managed at Zawia Medical Center during January–December 2025. Children with hospital-acquired pneumonia, aspiration pneumonia, major chronic pulmonary disease, immunodeficiency, or incomplete treatment data were excluded.

The audit evaluated demographic characteristics, presenting features, identified pathogens when microbiological testing was available, empirical antibiotic choice, route of administration, duration of therapy, and short-term outcomes. Prescribing decisions were assessed against accepted pediatric CAP management principles emphasizing amoxicillin as first-line therapy for uncomplicated cases, intravenous treatment for severe disease or inability to tolerate oral therapy, and avoidance of unnecessary broad-spectrum agents or prolonged courses.

Data were summarized using frequencies and percentages. Associations between selected categorical variables were explored using the Chi-square test, and a p-value <0.05 was considered statistically significant.

Results

Among the 300 audited children, males slightly outnumbered females, and the largest age group was 1–3 years. Most children were from urban areas, and complete immunization was documented in the majority of cases.

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Respiratory and systemic symptoms were highly prevalent, with fever and cough representing the dominant presenting features. Indicators of respiratory compromise were also common, including difficulty in breathing, chest indrawing, and hypoxemia. Severe pneumonia, according to WHO criteria, was documented in approximately one-third of the cohort (34.3%).

Table 1. Demographic characteristics of the audited children (n=300)

Variable	Category	n	%
Age group	3–12 months	81	27.0
	1–3 years	135	45.0
	3–5 years	84	28.0
Residence	Urban	195	65.0
	Rural	105	35.0
Immunization	Complete	271	90.3
	Incomplete	29	9.7

When microbiological testing was available, Streptococcus pneumoniae and Haemophilus influenzae type b were the most frequently identified pathogens. Mycoplasma pneumoniae, Staphylococcus aureus, and Klebsiella pneumoniae were less common, while no pathogen was identified in 15.0% of cases.
Amoxicillin was the most frequently prescribed empirical antibiotic, followed by amoxicillin-clavulanic acid and ceftriaxone. Oral therapy was used more often than intravenous therapy, and treatment duration was most commonly 6–10 days. Prescribing was considered rational in 70.7% of cases.
Outcomes were generally favorable. Clinical improvement was documented in 88.3% of children; most hospital stays were 3–7 days, readmission within 30 days occurred in 9.3%, and mortality was 2.3%.

Table 2. Clinical presentation, microbiology, and antibiotic prescribing

Domain	Item	n	%
Symptoms/signs	Fever	280	93.3
	Cough	267	89.0
	Difficulty in breathing	218	72.7
	Chest indrawing	190	63.3
	O_2 saturation <90%	84	28.0
	Severe pneumonia (WHO)	103	34.3
Pathogens	Streptococcus pneumoniae	114	38.0
	Haemophilus influenzae type b	66	22.0
	Mycoplasma pneumoniae	33	11.0
	Staphylococcus aureus	24	8.0
	Klebsiella pneumoniae	18	6.0
	No pathogen identified	45	15.0
Antibiotics	Amoxicillin	117	39.0
	Amoxicillin-clavulanic acid	56	18.7
	Ceftriaxone	42	14.0
	Azithromycin	35	11.7
	Ciprofloxacin	27	9.0
	Cefotaxime	23	7.7

Table 3. Treatment route, duration, rationality, and outcomes

Domain	Category	n	%
Route	Oral	204	68.0
	IV	96	32.0
Duration	≤5 days	76	25.3
	6–10 days	183	61.0
	>10 days	41	13.7
Rationality	Rational	212	70.7
	Irrational	88	29.3
Outcome	Clinical improvement	265	88.3
	Readmission within 30 days	28	9.3
	Mortality	7	2.3

Outcome variables are reported as separate clinical indicators and are not mutually exclusive.

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Discussion

This audit indicated that empirical management of pediatric community-acquired pneumonia (CAP) at Zawia Medical Center was broadly aligned with accepted treatment principles. The predominance of fever, cough, respiratory difficulty, and chest indrawing was consistent with the usual clinical phenotype of CAP in this age group and with prior pediatric series from low- and middle-income settings [1,2,7].

Amoxicillin was the most frequently prescribed empirical antibiotic, an encouraging finding because narrow-spectrum beta-lactam therapy remains the preferred first-line treatment for most uncomplicated pediatric CAP cases [3,5]. At the same time, nearly one-third of prescriptions were considered irrational, suggesting that broader-spectrum therapy or longer-than-necessary treatment still occurred in a meaningful minority of patients. This pattern identifies a relevant target for antimicrobial stewardship and quality-improvement interventions.

The microbiological pattern, with Streptococcus pneumoniae and Haemophilus influenzae type b accounting for most documented pathogens, was biologically plausible and supported continued focus on guideline-based empiric coverage. The use of ceftriaxone, cefotaxime, and ciprofloxacin in selected children may have reflected severe disease, prior antibiotic exposure, or concern about resistance, but these agents should remain restricted to clearly justified indications.

Outcomes were generally favorable. More than eighty-eight percent of children improved clinically, most hospital stays were limited to 3–7 days, and mortality remained low. The mortality rate of 2.3% in the present study was relatively low. Direct comparison with global estimates should, however, be interpreted cautiously, because major international analyses often report population-level pneumonia mortality among children younger than 5 years rather than in-hospital case-fatality among audited CAP cohorts [2]. Nevertheless, the finding suggests generally favorable short-term outcomes in the studied setting. Global evidence has shown that pneumonia remains a major cause of death in children younger than 5 years despite substantial declines in mortality over time, underscoring the importance of timely diagnosis, appropriate antibiotic selection, and supportive care [2]. Overall, these findings suggest that current practice was effective in most cases; however, improving prescribing rationality could further reduce unnecessary antimicrobial exposure and support future antibiotic effectiveness.

Conclusion

Antibiotic prescribing for pediatric community-acquired pneumonia at Zawia Medical Center showed generally acceptable adherence to recommended practice, with amoxicillin remaining the leading first-line agent and most children experiencing favorable short-term outcomes. Nevertheless, the proportion of irrational prescriptions remains clinically important. Regular audit, clinician feedback, local treatment protocols, and antimicrobial stewardship interventions are needed to improve prescribing precision and reduce avoidable broad-spectrum antibiotic use.

Conflict of interest. Nil

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