

Original Research Article

Audit of compliance to recommended antibiotics prescription guidelines in the management of community-acquired pneumonia in a children's outpatient clinic, in Portharcourt, Nigeria

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ABSTRACT

Background: The Paediatric Association of Nigeria produced a guideline for managing and diagnosing community-acquired pneumonia. This study aims to assess compliance with the recommended antibiotics prescriptions.

Methods: A prospective review of the folders of children who presented with cough symptoms in the children's general outpatient clinic of Rivers State University Teaching Hospital. Their biodata, clinical examination findings, prior antibiotics exposure, and consult outcome were retrieved and analyzed.

Results: A total 253 children with a median age of 3 years were studied from June to September 2022. No pneumonia was seen in 128 (50.6%), while 93 (36.8%) had various severity of Pneumonia. Antibiotics had been taken by 55 (21.7%) of the children before presentation. Antibiotics were prescribed in 210 (83.0%) of all the consultations for symptoms of cough. The antibiotic prescription rate for children with No pneumonia was 108 (84.4%), Pneumonia was 77 (88.5%) and severe pneumonia was 5 (83.3%). Cephalosporins were the most common type of antibiotics prescribed for Pneumonia and severe pneumonia at a rate of 52.6% and 57.1% respectively. The overall compliance rate with the PAN recommendations for antibiotic treatment guidelines was 42.5%. Children with No pneumonia significantly had higher odds of being managed with prescriptions that were not in line with the recommendation (OR:25.4, 95% CI:12.2,52.7, $p<0.05$). The highest type of Noncompliance was prescribing antibiotics where it was not indicated 109 (85.8%).

Conclusions: Compliance with PAN recommendations for antibiotics treatment in community-acquired pneumonia is suboptimal. While the production of guidelines is excellent in standardizing health care, more work is needed to ensure these guidelines are utilized.

Keywords: Community-acquired pneumonia, Compliance, Paediatric association of Nigeria, Guidelines, Pneumonia, Antibiotics, Prescription, Noncompliance, Children

INTRODUCTION

Pneumonia is an acute respiratory infection that affects the lung parenchyma. It is the single largest infectious cause of death in children worldwide. According to WHO, pneumonia accounts for 14% of all deaths of children under 5 years old and Nigeria contributes to the highest mortality from pneumonia globally.^{1,2} Pneumonia

can be caused by bacteria, viruses, and fungi. Children with pneumonia present with cough, fast breathing, difficulty in breathing, and fever. These children may either have severe or less severe disease. According to the WHO classification of pneumonia, it can be classified into "pneumonia" when symptoms present with fast breathing or chest in-drawing, which requires home treatment, and "severe pneumonia" when symptoms

present with any general danger sign, which requires hospitalization and parenteral treatment.³ Pneumonia caused by bacteria can be treated with antibiotics and The paediatric association of Nigeria (PAN) in 2015 produced a guideline for the diagnosis and management of Community-acquired pneumonia (CAP) in children.⁴ This guideline was reviewed in 2021 based on recent evidence about the management of CAP.⁵ The goal of this guideline is to assist clinicians in the management of community-acquired pneumonia (CAP), to make timely diagnoses, and to use appropriate antibiotic therapy thereby reducing morbidity and mortality rate of CAP in children. This guideline recommends that all children with a clinical diagnosis of pneumonia should receive antibiotics as bacterial and viral pneumonia cannot be reliably distinguished from each other, however, antibiotics have no role in the treatment of the common cold (no pneumonia). The recommended first-line antibiotic for pneumonia is the use of high-dose amoxicillin 90 mg/kg/dose for the management of CAP for 5 days. For severe pneumonia, it is intravenous ampicillin, penicillin, or cefuroxime in combination with intramuscular or intravenous gentamycin. The second-line treatment involves the use of intravenous ceftriaxone or cefotaxime. According to WHO, only one-third of children with pneumonia receive the recommended antibiotic they need.¹ Adherence to treatment guidelines is an important strategy in the management of many diseases. It is therefore important for healthcare professionals to know and prescribe recommended antibiotics based on guidelines in the management of community-acquired pneumonia. Utilization of this PAN guideline on CAP is key to achieving a reduction in morbidity and mortality contributed by pneumonia. This study sought to assess the compliance with PAN recommended antibiotic prescription guidelines for the management of pneumonia in the children's outpatient department of Rivers State University Teaching Hospital Port Harcourt, Nigeria and Identify predisposing factors to non-compliance with recommended antibiotic prescription in the PAN guidelines for the management of pneumonia. Knowledge gained from this study will help identify if there are any gaps in implementing this guideline so that effective steps to address any implementation bottlenecks can be taken. This would improve and standardize pneumonia management as the guideline intended.

METHODS

This was a prospective review of the folders of children who presented in the children's outpatient clinic (CHOP) of the Rivers State University Teaching Hospital, Port Harcourt, Nigeria. The children's outpatient clinic is a walk-in general pediatrics clinic that is run every weekday by residents, medical officers and house officers in the pediatric department.

Their activities are supervised by a consultant pediatrician who is running a parallel specialist clinic but

is accessible to review cases with the residents when the need arises. A House officer is a newly qualified doctor who is doing the required one-year internship, practicing medicine under the direct supervision of a consultant. A medical officer is a post-intern doctor who is not in a formal residency training program. A registrar is a medical doctor who is in a formal residency training program and usually has passed the primary examination of a postgraduate college. A senior registrar is a resident doctor who has passed their membership examination in a postgraduate college. Patients were informed of ongoing research and consent was sought to review their folders after they consulted with the doctor. The case folder of the patients was reviewed by the researchers at the end of each consultation.

Inclusion criteria

All case folders of children who have cough written as a symptom were eligible to be included in the study. All the eligible children's folders were recruited until the sample size was reached. All the folders of the eligible children were recruited from June 2022 to September 2022 when the sample size was reached. The minimum Sample size was calculated to be 177 using a prevalence of pneumonia of 13.2% from a study done in Port Harcourt.⁶ A total of 254 samples were collected to make up for attrition. Ethical clearance was obtained for the study from the Rivers State University Teaching Hospital Research ethics committee.

The following information was retrieved from the case folders (Appendix 1): Age, sex, weight, height, presenting complaints and their duration, previous use of antibiotics before presentation, Child's temperature, respiratory rate, presence of signs of respiratory distress, chest auscultatory findings, and underlying comorbidity and prescription given by the consulting physician, if the patient was admitted or managed as an outpatient and level of the consulting physician.

Statistical analysis

The clinical symptoms of the children were classified according to severity using the WHO classification into no pneumonia for children who had cough and cold, pneumonia for those with fast breathing and or chest indrawing, and severe pneumonia for those with any general danger signs which include; severe malnutrition, not able to eat or drink, persistent vomiting, lethargy or unconsciousness, presence of stridor.⁷ Respiratory rate was classified using age-specific normal cut-off into tachypnea or no tachypnea. Data was entered into an Excel sheet and analyzed using IBM SPSS version 23.0. Results were presented in tables; the odds ratio was calculated to assess the effect size of variables while associations were assessed with the chi-square test and the level of significance was set at $p < 0.05$.

RESULTS

A total of 254 children were recruited and one child with incomplete data was excluded from the analysis making the final study sample 253. The age range of the sample population was 5 weeks to 15 years, with a median age of 3 years. There were more males than females with an M: F ratio of 1.4:1. Majority of the children had normal weight, 196 (77.5%), and 8 (3.2%) were severely malnourished. The median duration of their illness was 5 days while 9(3.6%) had symptoms for greater than 2 months. Antibiotics had been taken by 55 (21.7%) of the children before presenting to the hospital. Cephalosporins, 25 (9.9%) were the most common antibiotics the patients took before presenting to the hospital followed by Penicillin, 21 (8.3%). Tachypnea, respiratory distress, and abnormal auscultatory findings on chest examination were documented in 103 (40.7%), 4 (1.6%), and 35 (13.8%) of the patients (Table 1). Among the children who presented with symptoms of cough in the clinic, Asthma or Bronchiolitis was diagnosed in 32 (12.7%). while 221 (87.3%) were within the WHO pneumonia classification spectrum. Most of the patients were classified as having No pneumonia 128(50.6%) while pneumonia or severe Pneumonia was seen in a total of 93 (36.8%) of the patients. Antibiotics were prescribed in 210 (83.0%) of all the consultations for symptoms of cough. Only one of the patients (0.4%) was admitted while the majority of the patients were seen by medical officers 98(38.7%) (Table 1).

Antibiotic prescription and clinical diagnosis of children presenting with cough

The antibiotic prescription rate for children with No pneumonia was 108 (84.4%), with penicillin 51 (45.5%) being the most common type of antibiotics prescribed, while cephalosporins 41 (52.6) were the most common type for children with pneumonia and severe pneumonia at a rate of 52.6% (41) and 57.1% (4) respectively. The number of antibiotics prescribed per person ranged from 1 to 2. Seven patients had 2 antibiotics prescribed. The patients with 2 antibiotics prescribed in their consultation had no pneumonia (4), severe pneumonia (2), and pneumonia (1) (Table 2).

Compliance rate to the antibiotic prescription recommendation in the management of pneumonia

The overall rate of compliance with the PAN recommendations for antibiotic treatment guidelines in the management of pneumonia in children was 42.5% (94). The highest rate of Noncompliance to the treatment guideline was seen in the management of the “No pneumonia” classification cadre 109 (85.2%). Children classified as having no pneumonia significantly had higher odds of being managed with prescriptions that were not in line with the recommendation when compared to those with pneumonia (OR: 25.4, 95% CI: 12.2, 52.7, $p<0.05$) and severe pneumonia (OR:11.4, 95% CI: 1.9, 67.1, $p<0.05$). Younger children aged less than 2 years were given the highest number of prescriptions that were not in line with the Antibiotic recommendations in the pneumonia spectrum treatment guidelines 70(77.8%). The odds of being given a prescription that was not in line with the recommended antibiotic management guideline was significantly higher in children aged <2years when compared to those aged 2 to 5 years (OR: 3.2, 95% CI: 1.5, 6.8, $p<0.05$) and 5-13 years (OR: 5.6, 95% CI: 2.8, 10.9, $p<0.05$). The child’s nutritional status, duration of illness, previous antibiotics exposure, and level of the managing physician did not significantly affect the rate of Noncompliance to recommended antibiotic treatment guidelines (Table 3).

Types of noncompliance to antibiotic guidelines in the management of pneumonia

The highest type of Noncompliance to recommended treatment guidelines was prescribing antibiotics where it was not indicated 109 (85.8%) followed by Not prescribing antibiotics when it was indicated 11 (8.7%). Prescription of antibiotics where it was not indicated was solely recorded in the management of No pneumonia. The most common type of Noncompliance seen in the management of pneumonia was not prescribing antibiotics when it was indicated by recommendation 10 (62.25%) (Table 4).

Table 1: Characteristics of studied patients.

Variable	All patients (n=253) (%)
Age (median, 25th,75th percentile) years	3 (0.83, 6)
>2	99 (39.1)
2 - <5	59 (23.3)
5 - <13	92 (36.4)
>13	3 (1.2)
Sex	
Female	107 (42.3)
Male	146 (57.7)
Weight for age Z score	
<- 3 (severe Malnutrition)	8 (3.2)

Continued.

Variable	All patients (n=253) (%)
- 3 to <-2 (moderate malnutrition)	18 (7.1)
- 2 to 2 (normal)	196 (77.5)
>2 (overweight/obese)	31 (12.3)
Maximum duration of illness (median, 25th,75th percentile)	5 (3,7)
<1 week	142 (56.1)
1 week to 2 weeks	82 (32.4)
>2 weeks to 1month	14 (5.5)
>1 to 2 months	3 (1.2)
>2 months	9 (3.6)
Duration not documented	3 (1.2)
Antibiotic taken before presentation	
Yes	55 (21.7)
No	198 (78.2)
Which antibiotic was taken before presentation in the clinic	
Prior: Cephalosporin	25 (9.9)
Prior: Penicillin	21 (8.3)
Prior: Macrolide	4 (1.6)
Prior: Aminoglycoside	2 (0.8)
Prior: Imidazole	2 (0.8)
Prior: Sulphonamides	1 (0.4)
Presence of fever	
Yes	3 (1.2)
No	244 (96.4)
Presence of tachypnea	
Yes	103 (40.7)
No	150 (59.3)
Documented signs of respiratory distress	
Yes	4 (1.6)
No	249 (98.4)
Abnormal auscultatory findings	
Yes	35 (13.8)
No	178 (70.4)
Undocumented	40 (15.8)
Diagnosis	
No pneumonia (cough and cold)	128 (50.6)
Pneumonia	87 (34.4)
Asthma	23 (9.1)
Bronchiolitis	9 (3.6)
Severe pneumonia	6 (2.4)
Antibiotic prescribed	
Yes	210 (83.0)
No	43 (17.0)
Which antibiotic was PRESCRIBED AFTER THE consultation	
Cephalosporin	107 (42.3)
Penicillin	89 (35.2)
Macrolide	18 (7.1)
Aminoglycoside	1 (0.4)
Imidazole	1 (0.4)
Admitted cases	
Yes	1 (0.4)
No	252 (99.6)
Level of physician	
House officer / intern doctor	63 (24.9)
Medical officer	98 (38.7)

Continued.

Variable	All patients (n=253) (%)
Registrar	78 (30.8)
Senior registrar	14 (5.5)

Table 2: Antibiotic prescription and clinical diagnosis of children presenting with cough.

Diagnosis	Number of patients that were prescribed antibiotic N (%)	Types prescribed antibiotics	Frequency of prescribed antibiotics, N (%)
Asthma	12 (52.2)	Penicillin	6 (50)
		Cephalosporins	6 (50)
Bronchiolitis	7 (77.8)	Cephalosporins	7 (100)
No pneumonia	108 (84.4)	Penicillin	51 (45.5)
		Cephalosporins	49 (43.8)
		Macrolides	11 (9.8)
		Imidazole	1 (0.9)
Pneumonia	77 (88.5)	Penicillin	31 (39.7)
		Cephalosporins	41 (52.6)
		Macrolides	6 (7.7)
Severe pneumonia	5 (83.3)	Penicillin	1 (14.3)
		Cephalosporins	4 (57.1)
		Macrolides	1 (14.3)
		Aminoglycoside	1 (14.3)

Table 3: Compliance rate to the antibiotic prescription recommendation in the management of pneumonia in children and risk factors for non-compliance.

Diagnosis	Complied with antibiotic prescription guideline N (%)	Non-compliance with antibiotic prescription guideline N (%)	Total (N)	OD (95%CI)	P value
Classification of pneumonia					
*No pneumonia	19 (14.5)	109 (85.2)	128		
Mild to moderate pneumonia	71 (81.6)	16 (18.4)	87	25.4 (12.2, 52.7)	0.00001
Severe pneumonia	4 (66.7)	2 (33.3)	6	11.4 (1.9, 67.1)	0.008
Total	94 (42.5)	127 (57.5)	221		
Patient risk factors					
Age of patient (years)					
*<2	20 (22.2)	70 (77.8)	90		
2-<5	24 (48.0)	26 (52.0)	50	3.2 (1.5, 6.8)	0.001
5-<13	48 (61.5)	30 (38.5)	78	5.6 (2.8, 10.9)	0.000002
>13	2 (66.7)	1 (33.3)	3	7.0 (0.6, 81.2)	0.13
Total	946	127	221		
Sex					
Female	46 (47.9)	50 (52.1)	96	0.84 (0.66, 1.07)	0.15
Male	48 (38.4)	77 (61.6)	125		
Nutritional status of the patient					
*-2 to 2 (normal)	72 (41.9)	100 (58.1)	172		
<-3 (severe malnutrition)	4 (57.1)	3 (42.9)	7	1.8 (0.4, 8.5)	0.33
-3 to <-2 (moderate malnutrition)	9 (52.9)	8 (47.1)	17	1.5 (0.5, 4.2)	0.3
>2	9 (36.0)	16 (64.0)	25	0.78 (0.32, 1.8)	0.57
Duration of pneumonia					
Acute 2 weeks	80 (40.8)	116 (59.2)	196	1.2 (0.5, 2.9)	0.67
Chronic (>2 weeks)	12 (54.5)	10 (45.5)	22		

Continued.

Diagnosis	Complied with antibiotic prescription guideline N (%)	Non-compliance with antibiotic prescription guideline N (%)	Total (N)	OD (95%CI)	P value
Previous exposure to antibiotics					
No antibiotic was taken before presentation in the clinic	73 (43.2)	96 (56.8)	169	1.12 (0.5, 2.1)	0.72
Has taken antibiotics before presentation in the clinic	21 (40.4)	31 (59.6)	52		
Level of physician					
*Senior registrar	4 (30.8)	9 (69.2)	13		
Registrar	31 (48.4)	33 (51.6)	64	2.3 (0.6, 8.5)	0.14
Medical officer	39 (44.3)	49 (55.7)	88	1.7 (0.5, 6.2)	0.27
House office/intern doctor	20 (35.7)	36 (64.3)	56	1.2 (0.3, 4.5)	0.5

(*) Signifies the reference against which others are compared.

Table 4: Description of types of noncompliance to antibiotic guidelines in the management of pneumonia.

Noncompliance description	No pneumonia N (%)	Mild to moderate pneumonia N (%)	Severe pneumonia N (%)	Total N (%)
Prescribed non-recommended antibiotics	0 (0)	6 (85.7)	1 (14.4)	7 (5.5)
Antibiotics not indicated but prescribed	109 (100)	0 (0)	0 (0)	109 (85.8)
Did not prescribe antibiotic when it was indicated	0 (0)	10 (90.9)	1 (9.1)	11 (8.7)
Total	109	16	2	127

DISCUSSION

This study was an audit of compliance with PAN guidelines for pneumonia treatment with a focus on compliance with the antibiotic recommendation in the children's outpatient clinic. The prevalence of pneumonia among children who presented in the hospital with symptoms of cough was 36.8%. The rate of compliance with the PAN guideline was 42.5%. Antibiotic prescription for no pneumonia was high and significantly not in line with recommended PAN guidelines. Young children were significantly more likely to be given antibiotics that were not in line with the recommended PAN guideline for the management of pneumonia.

The majority of the children who presented with cough in the clinic did not have pneumonia. Adherence to the guidelines in identifying children with pneumonia is essential in streamlining children with a common cold that is mostly caused by viruses and as such do not require antibiotics. Unfortunately, 84.4% of children who had cough with No pneumonia were prescribed antibiotics in the clinics. This is high and similar to findings that have been reported in India where antibiotics were prescribed in 85% of children with cough and cold.⁸ Our findings are much higher than the 23.3% reported in Uganda.³ Prescribing antibiotics where they are not indicated is a form of irrational drug use that leads

to antibiotic resistance. It also increases the cost of health care delivery and exposes a child to side effects of a drug that they do not need.⁹ Our study highlights that it is the most common type of noncompliance to recommended guidelines and active steps need to be put in place both at the level of prescribing and dispensing of medications to ensure judicious antibiotic utilization in our health institutions. The choice of antibiotics prescribed by the physicians was also not in line with the recommended guideline as the majority of the patients with pneumonia were given cephalosporins while the guideline-recommended high dose oral amoxicillin at 90 mg/kg/dose as the first line drug for the management of CAP for 5 days.^{4,5} Adherence to treatment guidelines is an important intervention strategy in the treatment of many diseases.

The overall rate of compliance in this study was quite low (42.5%) when compared to adherence to guidelines in other similar studies which reported 91.7% and 84%.^{10,11} The reason for this could be that in those other countries, the patients are not exposed to antibiotics before presentation and more emphasis is placed on adherence to the guidelines. The antibiotics that were most commonly used by patients before coming to the hospital were broad-spectrum cephalosporins followed by penicillin. It was observed that many of the patients had taken cephalosporins before presentation to the health facility

and when these patients presented to the hospitals, most of them were given cephalosporins as first-line agent. This may be because the clinicians did not want to step down to a narrow-spectrum antibiotic after the patient had received a cephalosporin. The level of non-compliance was worse for the patients who were classified as not having pneumonia as they were all given oral antibiotics. A study in Nashville reported a high use of cephalosporins in three children's hospitals before the use introduction of guidelines but the use of cephalosporins declined with the introduction of the guidelines. They noted positive changes in centers that pro-actively disseminated the guidelines.¹² This situation could have been avoided if antibiotics were strictly prescription medications in Nigeria. Unfortunately, this is not the case as most pharmacy shops and chemists can sell antibiotics to anyone who requests them even without a prescription in Nigeria. It will be difficult to enforce the guidelines if antibiotics can be purchased over the counter.¹³

Most of our patients were prescribed oral antibiotics, in line with the recommendation by the PAN guideline where oral antibiotics are indicated in children presenting with CAP except, they are unable to tolerate orally. The oral route of drug administration antibiotics in CPAP is safe, effective, and convenient.⁵ The overall level of compliance to PAN guidelines was irrespective of the cadre of health care professionals that attended to the child. This shows that there is a need for training healthcare workers on guidelines and conscious incorporation of processes that ensure these guidelines are followed to optimally benefit from the guidelines.

CONCLUSION

In conclusion, compliance with PAN antibiotics guidelines in the management of community-acquired pneumonia are poor. Over-prescription of antibiotics where it is not indicated is the most common type of noncompliance reported by our study. There is a need to train healthcare workers on these guidelines and to incorporate measures that would ensure that health management decisions are in line with existing guidelines to optimally benefit from the recommended guidelines

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REFERENCES

1. Pneumonia in children. 2022. Available at: <https://www.who.int/news-room/fact-sheets/detail>. Accessed on 17th March 2024.
2. Nigeria contributes highest number to global pneumonia child deaths. 2011. Available at: <https://www.unicef.org/nigeria/press-releases>.
3. Mukisa LN, Okuuny V, Besigye I. Antibiotic prescription among children with common cold at a district hospital in Uganda. *Afr J Prim Health Care Fam Med.* 2023;15(1):4106.
4. Olowu A, Elusiyan JB, Esangbedo D, Ekure EN, Esezobor C FA. Management of community acquired pneumonia (CAP) in children: Clinical practice guidelines by the Paediatrics Association of Nigeria (PAN). *Niger J Paediatr.* 2015;42(4):283-92.
5. Osarogiagbon OW, Ayuk AC, Meremikwu M, Oguonu T, Umar LW GI. Management of community acquired pneumonia (CAP) in children: clinical practice guidelines by the paediatric association of Nigeria (PAN). *Niger J Paediatr.* 2022;49(3):210-39.
6. Gabriel-Job N, Azubogu US. Prevalence and pattern of pneumonia among children admitted into university of portharcourt teaching hospital: a two-year review. *Int J Trop Dis Health.* 2019;1-6.
7. World Health Organization (WHO). Revised WHO classification and treatment of childhood pneumonia at health facilities. Available at: <https://iris.who.int/bitstream/handle>. Accessed on 17th March 2024.
8. Ahmad A, Khan MU, Malik S, Mohanta GP, Parimalakrishnan S, Patel I, et al. Prescription patterns and appropriateness of antibiotics in the management of cough/cold and diarrhea in a rural tertiary care teaching hospital. *J Pharm Bio Allied Sci.* 2016;8(4):335-40.
9. Oliveira I, Rego C, Semedo G, Gomes D, Figueiras A, Roque F, et al. Systematic review on the impact of guidelines adherence on antibiotic prescription in respiratory infections. *Antibiot Basel Switz.* 2020;9(9):546.
10. McLaren SH, Mistry RD, Neuman MI, Florin TA DP. Guideline adherence in diagnostic testing and treatment of community-acquired pneumonia in children. *Pediatr Emerg Care.* 2021;37(10):485-93.
11. Dambrava PG, Torres A, Valle's X, Mensa J, Marcos MPA. Adherence to guidelines' empirical antibiotic recommendations and community-acquired pneumonia outcome. *Eur Respir J.* 2008;32(4):892-901.
12. Williams DJ, Edwards KM, Self WH, Zhu Y, Ampofo K, Pavia AT, et al. Antibiotic choice for children hospitalized with pneumonia and adherence to National guidelines. *Paediatrics.* 2015;136(1):44-52.
13. Porter G, Kotwani A., Bhullar L, Joshi J. Over-the-counter sales of antibiotics for human use in India: The challenges and opportunities for regulation. *Medical Law International. Med Law Int.* 2021;21(2):147-73.

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