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Appropriateness of Antibiotics Prescribed to Children and Adolescence with Bronchopneumonia during 2016 at a Hospital in Bangkalan, Indonesia

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ABSTRAK

Bronkopneumonia seringkali muncul sebagai manifestasi dari pneumonia pada anak yang dapat mengancam jiwa. Antibiotik seringkali diresepkan untuk mengobati bronkopneumonia. Ketidaksesuaian penggunaan antibiotik dapat menyebabkan resistensi bakteri dan tidak tercapainya tujuan terapi. Penelitian ini bertujuan untuk mengobservasi kesesuaian persepahan antibiotik pada pasien rawat jalan bronkopneumonia anak dan remaja. Persepahan antibiotik selama 2016 di salah satu rumah sakit Kabupaten Bangkalan pasien rawat jalan bronkopneumonia anak dan remaja usia 0-14 tahun dianalisis secara retrospektif pada kesesuaiannya berdasarkan *British Thoracic Society guidelines* melalui algoritma Gyssens. Selama periode penelitian sebanyak 101 resep pasien rawat jalan dengan diagnosa bronkopneumonia usia 0-14 tahun. Dari jumlah tersebut, sebanyak 69 resep yang mengandung antibiotik dilibatkan dalam penelitian ini. Antibiotik yang paling sering diresepkan adalah golongan sefalosporin dan seluruhnya merupakan antibiotik empiris. Dari 69 resep yang dianalisis hanya 5 resep (7,25%) yang sesuai dengan *guideline*. Seluruh bentuk ketidaksesuaian antibiotik adalah ketidaksesuaian pilihan obat (100.00%). Berdasarkan hasil, sebagian besar persepahan antibiotik tidak sesuai dengan *guideline*. Maka dari itu, langkah perbaikan persepahan antibiotik guna menghindari masalah terkait antibiotik seperti timbulnya efek merugikan, kegagalan terapi dan resistensi masih perlu dikembangkan.

Kata Kunci : antibiotik, bronkopneumonia, algoritma Gyssen, anak, remaja.

ABSTRACT

Bronchopneumonia commonly occur as life threatening pneumonia manifestation in children. Antibiotics are frequently prescribed to treat bronchopneumonia. Inappropriate antibiotics usage can lead to bacterial resistance and inadequate treatments outcome. This study aimed to observe the appropriateness of antibiotics prescribed to outpatients children and adolescence bronchopneumonia. Antibiotic prescriptions during 2016 at a Hospital in Bangkalan for outpatients children and adolescence age 0-14 y.o suffered from bronchopneumonia were assessed retrospectively for its appropriateness against British Thoracic Society guidelines through Gyssens Algorithm. There were 101 prescriptions treating outpatients with bronchopneumonia aged 0-14 y.o.. Of these, a total of 69 antibiotic prescriptions were included in this study. The most common prescribed antibiotics in the treatments were cephalosporins group and all of which were applied

for empirical purposes. Of the 69 prescriptions analyzed, only 5 (7.25%) prescriptions were assessed as appropriate. All of inappropriate use of antibiotics was in the form of wrong drug of choice (100.00%). Based on these results, related to the high of antibiotic prescriptions inappropriateness in Bronchopneumonia outpatients treatments, an improvement action in antibiotic prescribing to prevent antibiotic-associated problems like unnecessary adverse effects, treatment failure and bacterial resistance still need to be developed.

Keywords : antibiotics, bronchopneumonia, Gyssen algorithm, children, adolescence

INTRODUCTION

Pneumonia is one of the highest mortality infectious disease in children worldwide. In 2015, it caused death in 920.136 children under 5 years and decrease slightly in 2016 at 880.000 (WHO, 2019; United Nations Emergency Children's Fund, 2019). In Indonesia, 511.434 children under 5 years suffered with pneumonia in 2017 and the mortality rate caused by pneumonia in 2016 was 0.22% and slightly higher in 2017 at 0.34% (Kemenkes RI, 2018). A number of infectious agents such as bacteria, viruses, and fungi transmitted via air-borne droplets from a cough or sneeze are the etiological factors of pneumonia. The most common form of pneumonia in children is bronchopneumonia (Zec *et al*, 2016).

Bronchopneumonia affects both the alveoli in the lungs and the bronchi. In most cases, the treatment of bronchopneumonia in children is clinical rather than ethiological because of the difficulty in distinguishing bacterial bronchopneumonia from non-bacterial bronchopneumonia. Hence, all children with a clear clinical diagnosis of pneumonia should receive antibiotics (Harris *et al*, 2011).

On the other hands, frequent and innappropriate use of antibiotics will contribute to the increased antibiotic resistance. The occurrence of bacterial resistance along with the difficulty in classifying infectious causative

agents often leads to inadequate treatments which has consequences in prolonged therapy, higher medical costs, and increased mortality.

The aim of this study was to analyzed the accordance of antibiotics use in broncopneumonia treatments for children and adolescence outpatients with the British Thoracic Society guidelines.

METHODS

A crosssectional study was conducted using antibiotic prescriptions during 2016 at a Hospital in Bangkalan for outpatients children and adolescence age 0-14 yr with diagnosis of bronchopneumonia. However, total prescriptions for bronchopneumonia were counted for calculating rate of antibiotics usage. Prescription of the patients who had other infection for which antibiotics could be administered were excluded. The antibiotics prescribed were assessed retrospectively for its appropriateness against British Thoracic Society guideline through Gyssens Algorithm. The difference between choice, duration, dose, and route of antibiotics prescribed and guideline recommendation were considered as appropriateness and then classified into 4 categories of inappropriateness antibiotics treatments: Improper choice, improper duration, improper dose, and improper route (Figure 1).

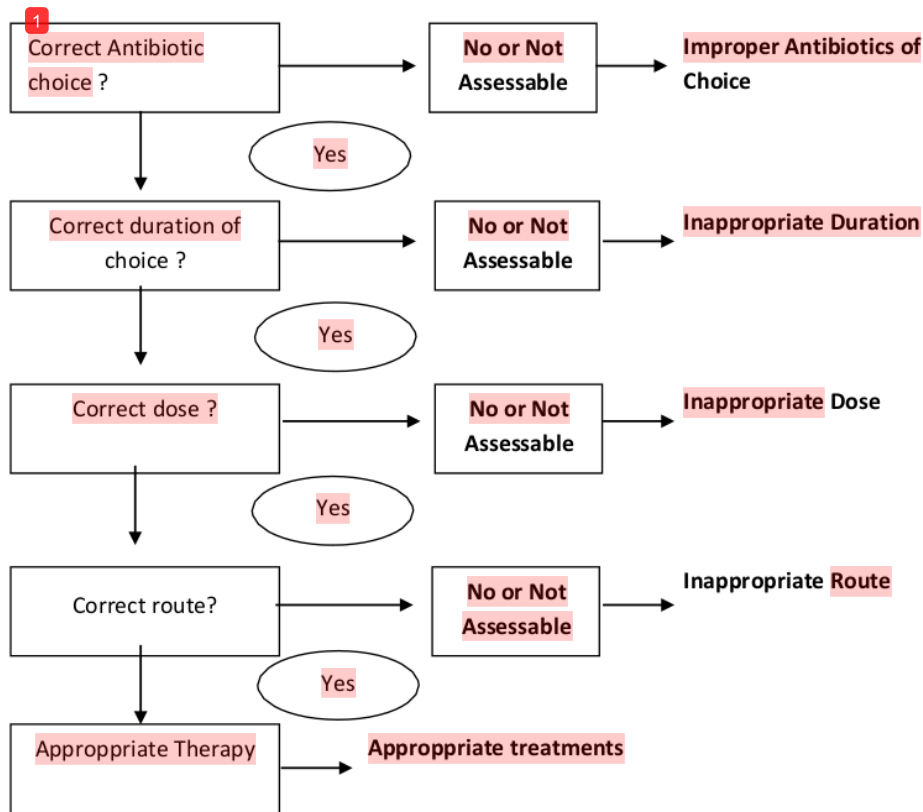


Figure 1. Modified Gyssens Algorithm (Baktygul *et al*, 2011)

RESULTS

A total of 101 outpatients children diagnosed with bronchopneumonia and 69 of them were treated with antibiotics (68,00%) (Figure 2).

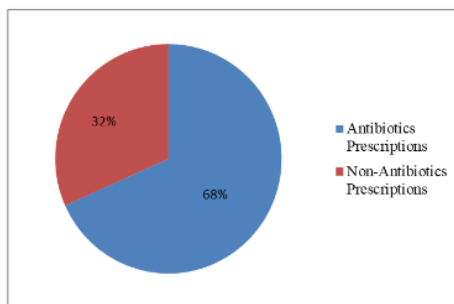


Figure 2. Proportion of Prescriptions

69 outpatients who received antibiotics therapy for bronchopneumonia were then analyzed in this study. Of them, male patients were slightly higher than female subjects (55.07% versus 44.93%). According to the age groupa classification, subjects were dominated with children age 0-4 yr (72.46%), followed by age 5-9 yr (23.19%), and adolescence age 10-14 yr (4.35%). The youngest patients observed was 4 months old and the oldest was 11 years old (Table 1).

Table 1. Patients' Characteristics

Characteristics	Amount of Patients	Percentage (%)
Gender		
Female	31	44.93
Male	38	55.07
Total	69	100.00
Age (years)		
0-4	50	72.46
5-9	16	23.19
10-14	3	4.35
Total	69	100.00

were given orally with various dose depend on patients' body weight. The most common antibiotics prescribed was cephalosporins which administered to 58 subjects (84.06%) while penicillins and macrolides only prescribed to 8 (11.59%) and 3 patients(4.35%). The were two oral cephalosporins prescribed. However, third-generation cephalosporin cefixime was the most frequent antibiotics prescribed in 46 patients. The average duration of antibiotics therapy was 5,09 ± 0,92 days with the shortest length of treatments was 3 days (Table 2).

Among patients analyzed, there were three groups of antibiotics used and all of them

Table 2. Profile of Antibiotics Prescribed

Antibiotics	Route	Mean of Duration of use (days)	Freq. (daily)	Mean Dose (mg/kg/day)	n (%) N=69
Penicillins					
Amoxicillin (J01CA04)	Oral	4	3	27.62	3 (4.35)
		5	3	28.57	4 (5.80)
CoAmoxiclav (J01CR02)	Oral	6	2	86.21	1 (1.45)
Total Penicillins					8 (11.59)
Cephalosporins					
Cefadroxil (J01DB05)	Oral	3	2	24.87	3 (4.35)
		4	2	21.74	1 (1.45)
		5	3	37.41	5 (7.25)
		6	2	20.00	3 (4.35)
Cefixime (J01DD08)	Oral	3	2	9.71	4 (5.80)
		4	2	12.58	1 (1.45)
		5	2	6.39	10 (14.49)
		6	3	8.37	10 (14.49)
			2	6.06	21 (30.44)
Total Cephalosporins					58 (84.06)
Macrolides					
Erythromycin	Oral	5	2	29,59	1 (1.45)
Spiramycin	Oral	5	3	31,48	2 (2.90)
Total Macrolides					3 (4.35)
Total					69(100.00)

Among 69 antibiotics treatments analyzed for it appropriateness to the British

Thoracic Society guidelines through modified Gyssens Algorithm there were only 4 (5.80%) treatments appropriate in all of parameters (drug

of choice, duration, dose, and route of administration). All of appropriateness recorded were improper antibiotics of choice (100.00%) (Table 3 and Table 4).

Table 3. Appropriateness of Antibiotics Prescribed

Appropriate n (%)	Inappropriate n (%)
4 (5.80)	65 (94.20)

Table 4. Inappropriateness Category of Antibiotics Treatments

n = 65				
Improper Choice n (%)	Improper Duration n (%)	Improper Dose n (%)	Improper Route n (%)	Total n (%)
65 (100.00)	- (0.00)	0 (0.00)	- (0.00)	65 (100.00)

DISCUSSION

In our study, antibiotics were frequently prescribed for treating bronchopneumonia (69 of 101 patients received antibiotics). This data revealed good therapeutic regimen as all children with pneumonia should receive antibiotics because of the difficulty in distinguishing bacterial and viral pneumonia (Harris *et al*, 2011). However, the appropriateness of antibiotics used should then be evaluated.

Antibiotics used in this study were cephalosporins, penicillins and macrolides group. According to the evaluation using Gyssens algorithm, a high inappropriateness antibiotics treatments for outpatients children with bronchopneumonia was observed. All of impropersness was improper of antibiotic choice (Table 4). Improper antibiotic of choice classified in this study were the usage of cephalosporins and macrolides as first choices or the usage of antibiotic to children under 2 yr. British Thoracic Society guidelines suggest amoxicillin as first choice while co-amoxiclav, cefaclor, erythromycin, azithromycin and clarithromycin as an alternatives. Also, the guideline suggest no antibiotic for children <2 with mild symptoms and a review if the symptoms persist (Harris *et al*, 2011).

Cephalosporins especially the third-generation are used to treat inpatients with community-acquired pneumonia (CAP). However, it might be avoided or replaced by

other antibiotics to prevent Extended Spectrum Beta Lactamase (ESBL) resistance. Third-generation cephalosporin usage were unavoidable if patients met both criteria age ≥ 65 yr or comorbid condition, and allergy or intolerance to penicillin, or failure of penicillin first-line therapy, or treatment with penicillin in three previous months (Goffinet *et al*, 2014). In addition, third-generation cephalosporins are recommended as relevant empirical antibiotic therapy in patients with CAP requiring ICU admission who evidencing risk factors for amoxicillin-clavulanate -resistant strains infection (Hariri *et al*, 2017). Hence, for children and adolescence with bronkopneumonia, the usage of cephalosporins still need a justification. Macrolide antibiotics is not considered as a first line antibiotic for pneumonia because the increase of *S. pneumonia*, *Streptococcus pyogenes*, and *M pneumoniae* macrolide resistance and the lack of clinical trial data that show a clear benefit of macrolides usage (Blyth *et al*, 2018). US surveillance data of respiratory isolates from 2000-2004 indicate 30% are stable macrolide resistant and an increasing proportion has high-level macrolide resistance (Farrel *et al*, 2007).

Study by Ambroggio *et al* who compared 1164 patient children with CAP who treated with β -lactam monotherapy with the same amount of children who treated with macrolide monotherapy. The result show no difference in hospitalization or relapse requiring

a change of drug within 14 days observed in children aged ≤ 5 years, but better outcomes pattern was seen in children aged >5 years. In addition, a large multicenter retrospective cohort study of children hospitalized with CAP performed by the same authors described outcomes for children given β -lactam–macrolide combination therapy compared with those for children prescribed β -lactam monotherapy. The length of stay was decrease 20% in those prescribed combination therapy, and the effect size was greatest in older children (Ambroggio *et al*, 2015). Therefore, macrolides may be added at any age of children with pneumonia if there is no response to first-line empirical therapy (Ambroggio *et al*, 2012). Also, it should be used in very severe disease or if either mycoplasma or chlamydia pneumonia is suspected (Harris *et al*, 2011).

CONCLUSION

In conclusion, the main finding of this study indicated the high discrepancy of antibiotics choice against the guideline. It is hoped that the prescriber will be more careful in choosing antibiotics, including determining the dose, route and the duration of treatments. Cephalosporin use should be considered carefully for bronchopneumonia treatments in children and adolescence since it can trigger ESBL-resistance.

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