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**Evaluation of antibiotic use in pneumonia treatment of pediatric and geriatric inpatients in Sultan Agung Islamic hospital Semarang**

Maria Caecilia N.Setiawati Hadirahardja<sup>1\*</sup>, Ebta Narasukma Anggraeny<sup>1</sup>, Diah Febbi Yanti<sup>1</sup>

<sup>1</sup> Sekolah Tinggi Ilmu Farmasi Yayasan Pharmasi Semarang 50193, Indonesia

**Abstract**

**Background:** Pneumonia is a lung inflammatory disease where the alveoli swell and there is an occurs fluid accumulation caused most by bacteria. Antibiotic is a first-line drug for pneumonia therapy. The purpose of this study aimed to determine the diference of antibiotic use in the treatment of pneumonia on geriatric and pediatric patients.

**Methods:** A retrospective design and purposive sampling technique were used to determine its samples. The data were based on the patient's medical record in the Inpatient Installation of Sultan Agung Hospital in Semarang in the period January-December 2018.

**Results:** There were 80 patients, 22 pediatric and 58 geriatric it that periode. The most antibiotic used in geriatric patients was ceftriaxone and levofloxacin as a single drug and in pediatric patients was cefotaxime as a single drug and in combination with other antibiotics. The length of stay of the pediatric patients was  $4.7 \pm 1.2$  and geriatric patients was  $3.8 \pm 1.3$  The difference between them was significant,  $p.0.01$

**Conclusion:** the antibiotic use in pediatric and geriatric were different

**Keywords:** *pneumonia, pediatrics, geriatrics, antibiotics, length of stay*

**Corresponding Author:**

Maria Caecilia Nanny SetiawatiHadirahardja Stifar Yayasan Pharmasi Semarang  
Letjen Sarwo Edi Wibowo km 1 Semarang 50193 Indonesia Email: caecil\_nanny@yahoo.co.id

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**Conclusion:** the antibiotic use in geriatric inpatients were more effective than in pediatric according to the patients' length of stay

**Keywords:** pneumonia, pediatrics, geriatrics, antibiotics, length of stay

Corresponding Author:

Maria Caecilia Nanny Setiawati Hadirahardja

Stifar Yayasan Pharmasi Semarang

Letjen Sarwo Edi Wibowo km 1 Semarang 50193 Indonesia

Email: caecil\_nanny@yahoo.co.id

**Running Head :** Evaluation of antibiotic use in pneumonia inpatients

## Evaluation of antibiotic use in pneumonia treatment of pediatric and geriatric inpatients in Sultan Agung Islamic hospital Semarang

### Introduction

Pneumonia is one of the most acute respiratory infections which causes death in children under five and geriatrics. Pneumonia is the main killer of children under five and has become the

major killer of young children or the main killer of children under five. Pneumonia most often occurs in children aged less than 5 years and elderly (seniors) who are more than 60 years old (Langke, 2016). Lack of attention to this disease can cause a very high mortality rate for children under five (WHO, 2013: 10).

In Indonesia, pneumonia is also the second leading cause of death in children under five and the fifth leading cause of death in geriatrics. The 2018 Basic Health Research (Riskesmas) reported that the incidence of pneumonia increased in 2013 by 1.6% to 2% in 2018 of the under-five population, while geriatrics increased in 2013 by 3.1% to 4.5% of the population. geriatric population. Pneumonia can be caused by bacteria, viruses, and fungi. Most of them are caused by bacteria (Misnadiarly, 2008: 85).

Antibiotic recommendations for the treatment of Pneumonia empirically, are based on selecting agents effective against the major treatable bacterial causes of pneumonia (Metlay, 2019). Pneumonia occurs from airborne infection which includes bacteria, virus, fungi, or other parasites. Pneumonia has been classified as either community or hospital-acquired pneumonia.

Pneumonia is a common and serious disease, with high rates of morbidity and mortality. Antibiotic is a first-line drug for pneumonia therapy. The recommendations for antibiotic choice are different based on the severity of the disease, distinguishing an antibiotic scheme.

The purpose of this study aimed to determine the difference of antibiotic use in the treatment of pneumonia on geriatric and pediatric patients.

## **Materials and Methods**

This study had already approved by the Health Research Ethics Committee of STIFAR YAYASAN PHARMASI SEMARANG, with reference No: 038/CN-SW/ KEPK/ STIFAR/ EC/XI/2019.

Sampling was done by purposive sampling. Data collection was carried out retrospectively according to the medical record data of pneumonia pediatric (< 5 years) inpatients and geriatrics (>60 years) at the Inpatient Installation of Sultan Agung Islamic Hospital Semarang for the period January-December 2018

## **Results**

Demographic data include gender, age, length of stay at the Inpatient Installation can be seen in Table 1. The length of stay and Payment can be seen in table 2.

## **Discussion**

This study was conducted to analyze the use antibiotic for pneumonia inpatient in Sultan Agung Islamic Hospital. Pneumonia occurs secondary to airborne infection which includes bacteria, virus, fungi, parasites, among others. The typical bacteria which cause pneumonia are *Streptococcus pneumoniae*, *Staphylococcus aureus*, Group A *Streptococcus*, *Klebsiella pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, anaerobes, and gram-negative organisms (Pahal, 2020)

Globally, pneumonia is a leading cause of morbidity and mortality in children younger than the age of 5 years (Gupta, 2012). Neonates should receive ampicillin plus an aminoglycoside or third-generation cephalosporin, however, not ceftriaxone, as it can displace bound bilirubin and lead to kernicterus. Atypical pneumonia is common in infants 1 to 3 months old, and this group should have additional antibiotic coverage with erythromycin or clarithromycin.

For infants and children over 3 months old, *S. pneumoniae* is the most common, for which the drug of choice is high-dose oral amoxicillin or another beta-lactam antibiotic (Matera MG, 2018). Optimal treatment to select an empiric antibiotic regimen (before knowing results of the microbiologic tests) that targets pathogens and avoiding drugs that extend the spectrum of organisms not causing infection (Jones BE, 2015)

The most single antibiotic used in paediatric patients was cefotaxime (31,82%) and Ceftriaxone (13,64%). The use of cefotaxime is recommended for the treatment of pneumonia in paediatric patients (Ruterlin, 2017). But the Widespread use of cefotaxime, may lead to increased incidence of resistance to this antibiotic. Several studies have reported on risk factors associated with resistance to cefotaxime (Sucipta, 2012).

The most single antibiotic used in geriatric patients was ceftriaxone (46,55%) and levofloxacin (31,03%). The Infectious Diseases Society of America (IDSA) guidelines recommend that either respiratory quinolone or beta-lactam plus azithromycin to be used as a first line therapy for Community Acquired Pneumonia; Ceftriaxone is one of the recommended regimens among beta-lactam antibiotics (Postma, 2015)

Ceftriaxone is an empirical antibiotic commonly used to treat pneumonia. However, its use to treat infections caused by methicillin-susceptible *Staphylococcus aureus* (MSSA) is controversial given limited evidence of its clinical efficacy (Eljaaly, 2019)

The treatment should include a respiratory fluoroquinolone (levofloxacin or moxifloxacin) as monotherapy or the combination of a  $\beta$ -lactamic (third-generation cephalosporin, ertapenem or ampicillin/sulbactam) medication and a macrolide (azithromycin or clarithromycin) (Stupka JE, 2010). Ceftriaxone is one of the treatment choices for Community Onset of Pneumonia (Hasegawa S, 2019)

Appropriate antibiotic use, in hospitalized adult patients with a suspected bacterial infection appears to be associated with a shorter LOS and therefore positively contributes to patient outcome and healthcare costs. (Bosch C, 2016). The mean LoS in geriatric patients ( $3.8 \pm 1.3$  days) is shorter than in paediatric ( $4.7 \pm 1.2$  days). The difference between them was significant,  $p < 0.01$

Greater lengths of stay in a hospital for patients results in a greater risk of patients experiencing nosocomial infections and an increased burden of patient care costs.

## **Conclusion**

The antibiotic used for pneumonia therapy in Sultan Agung Islamic Hospital is rational and its more effective in geriatric compared with in paediatric patients

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**Table 1:** Demographic data, pneumonia inpatients of Sultan Agung Islamic Hospital

Demographic data	Category	N	Percentage (%)
Gender	Male	55	68.75
	Female	25	31.25
Age (years)	< 1	16	20.00
	1-2	5	6.25
	3- 4	1	1.25
	60-69	35	43.75
	70-79	15	18.75
	80-89	7	8.75
	≥ 90	1	1.25
Insurance	BPJS	38	47.5
	General	42	52.5

**Table 2** Length of Stay and insurance of pneumonia inpatients of Sultan Agung Islamic Hospital

	Pediatric	Geriatric	Percentage (%)
Length of Stay (days)			
1-2	0	3	3.75
3-4	4	20	30.00
5-6	12	30	52.50
7-8	6	4	12.5
>8	0	1	1.25
Total	22	58	100
Insurance			
General	12	30	
BPJS	10	28	

Insurance	Total		Percentage (%)	
	Pediatric	Geriatric	Pediatric	Geriatric
General	12	30	54,55	51,72
BPJS	10	28	45,45	48,28
<b>Total</b>	<b>22</b>	<b>58</b>	<b>100</b>	<b>100</b>

**Table** Antibiotic used in pneumonia inpatients  
Pediatric

Antibiotic Therapy	Drug names	Patients	Percentage (%)
Single	Cefotaxime	7	31,82
	Ceftriaxone	3	13,64

	Meropenem		2	9,10
	Cefepime		1	4,54
Dual	Cefotaxime + Cefixime		4	18,20
	Ceftriaxone + Gentamysin		1	4,54
	Cefotaxime + Amoxiciline		1	4,54
	Gentamysin + Cefixime		1	4,54
	Cefotaxim + Gentamysin		1	4,54
Triple	Cefepime + Gentamysin + Cefixime		1	4,54
<b>Total</b>			<b>22</b>	<b>100</b>

Geriatric

<b>Antibiotic Therapy</b>	<b>Drug names</b>	<b>Total</b>	<b>Percentage (%)</b>
Single	Ceftriaxone	27	46,55
	Levofloxacin	18	31,03
	Cefotaxim	2	3,45
	Ciprofloxacin	1	1,72
	Ceftizoxim	1	1,72
	Cefixim	1	1,72
Dual	Ceftriaxon + Cefixim	2	3,45
	Levofloxacin + Ceftriaxon	1	1,72
	Levofloxacin + Meropenem	1	1,72
	Ceftriaxon + Azitromisin	1	1,72
	Cefotaxim + Meropenem	1	1,72
	Ceftazidim + Cefoperazon sulbactam	1	1,72
	Levofloxacin + Ampicillin	1	1,72
<b>Total</b>		<b>58</b>	<b>100</b>



KOMITE ETIK PENELITIAN KESEHATAN (KEPK)  
STIFAR "YAYASAN PHARMASI SEMARANG"  
Jl Letjend Sarwo Edic Wibowo Km 1 Plamongsari - Semarang, 50193  
Telp. (024) 6706147; 6725272; Fax : 024 - 6706148  
Email : kepkestifaryaphara@gmail.com

PERSETUJUAN ETIK  
*ETHICAL APPROVAL*

NOMOR : 038/CN-SW/KEPK/STIFAR/EC/XI/2019

Yang bertanda tangan di bawah ini, Ketua Komite Etik Penelitian Kesehatan Stifar "Yayasan Pharmasi Semarang", setelah dilaksanakan telaah, pembahasan dan penilaian, dengan ini memutuskan protokol penelitian yang berjudul :

*The undersigned, Chairperson of the Stifar "Yayasan Pharmasi Semarang" Health Research Ethics Committee, after a thorough review, discussion, and assessment, hereby decides on a research protocol entitled :*

**Evaluasi Penggunaan Antibiotik Dalam Pengobatan Pneumonia Pasien Balita Dan Geriatri Di Instalasi Rawat Inap RSI Sultan Agung Periode Januari - Desember 2018**

Ketua Peneliti : Diah Febbi Yanti  
*Chief Researcher*

Anggota : Dr. M. Caecilia NS. Hadirahardja, M.Sc., Apt.  
*Member*

**Telah menyetujui protokol tersebut dan disetujui pelaksanaannya**  
*Have agreed to the protocol and approved the implementer*

Pada Akhir penelitian, laporan pelaksanaan penelitian harus diserahkan kepada KEPK Stifar "Yayasan Pharmasi Semarang". Persetujuan ini berlaku selama 1 (satu) tahun setelah *Ethical Approval* dikeluarkan. Jika ada perubahan protokol dan /atau perpanjangan penelitian, harus mengajukan kembali permohonan kajian etik penelitian (amandemen protokol).

*At the end of the study, a report on the implementation of the study must be submitted to KEPK Stifar "Yayasan Pharmasi Semarang". This approval is valid for 1 (one) year after the Ethical Approval is issued. If there is a change in protocol and / or extension of research, you must re-submit a request for a study of research ethics (protocol amendment).*

Semarang, 29 November 2019  
Ketua Komite Etik Penelitian Kesehatan  
Stifar "Yayasan Pharmasi Semarang"

Dr. Maria Caecilia N. Setiawati H., M.Sc., Apt.