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Study on Use of Antibiotics for the Treatment of Acute Respiratory Infections (ARIs) in Children at a Clinic in Bandung, Indonesia

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ABSTRACT

Acute Respiratory Infections (ARIs) is the upper and lower respiratory disease that are caused by agents of infection transmitted from human to human. It often occurs in children who have a low immune system. This study aims to assess antibiotics prescribing for treatment of ARIs in children at a Clinic in Bandung, Indonesia in 2015 using several parameters; appropriate indication, appropriate medication, appropriate dose, duration of administration, and potential interaction. This study was a descriptive observational retrospective method. Data retrieval was done by the search of medical records and prescription of pediatric patients received antibiotic from January to December 2015. The results of 308 patient in children diagnosed with ARIs in 425 visits obtained showed there were 202 cases (47.53%) used amoxicillin and 178 cases (41.88%) used cefadroxil, 100% of cases were appropriate indication, 411 cases (96.48%) were appropriate medication, 180 cases (42.25%) were appropriate dose, 225 cases (52.82%) were appropriate duration of therapy, and there no potential drug interaction between antibiotic and other drugs were found. 15 cases (3.5%) of antibiotics prescribed based on the diagnosis of patients with ARIs were not in accordance with the treatment guidelines
Keywords: Antibiotics, ARI, Children, Clinic.

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INTRODUCTION

Acute Respiratory Infections (ARIs) are the most common causes of both illness and mortality in children under five. Estimates indicate that in 2000, 1.9 million of them died because of ARIs, 70 percent of them in Africa and Southeast Asia. ARIs is one of the leading causes of death in infants In Indonesia (22.8%). [1,4]

ARIs was the most infection cases in children. It's because of their immune system has not formed optimally. So, ARIs in children usually very bad and show severe clinical manifest. ARIs was one of tenth the most disease in hospital. The average prevalence reach 25% (17.5% – 41.4%) in Indonesia in 2013. [5]

The high prevalence of ARIs disease and its effect has infflict to the high consumption of OTC drugs (cough and flu medicine, multivitamin, etc.) and antibiotics. Antibiotics often prescribed for ARIs eventhough mostly ARIs was because of viral infection. The selection and use of appropriate antibiotics will determine the success of treatment and can avoid the occurrence of antibiotics resistance.[14]

Antibiotics that are used incorrectly may cause several health problems including the increased of health cost, antibiotics resistance, and potential side effects. [15]

Resistance bacterial infection to antibiotics will lead to increased morbidity and mortality that required second or even third line antibiotics that has lower effectiveness, may have more side effects and more expensive.[13]

This prompted the researchers to conduct further studies on the use of antibiotics for ARIs at a Clinic in Bandung, Indonesia. The studies was include the appropriateness of indication, medication and dose, duration of treatment, and the route of drug administration.

MATERIALS AND METHODS

This research is non-experimental research with a descriptive method using retrospective data. The purpose of this study was to determine the use of antibiotic in pediatric patients with Acute Respiratory Infections (ARIs) at a clinic in Bandung, Indonesia. It was conducted in several stages, i.e : the establishment patients' criteria, drugs' criteria, data collection and processing, data analysis and conclusions.

Patient included in the study was all pediatric patients aged 1-12 years in both boys and girls, which positively diagnosed ARIs with no comorbid condition and get antibiotics therapy from January to December 2015. The data was retrieved from patient medical record at one clinic in Bandung. The used of antibiotics were analyzed descriptively using non analytic univariat analysis in several parameters i.e ; right indication, right medication, appropriate dose, duration of administration, and any potential drug-drug interaction between antibiotics and symptomatic drug.

RESULTS AND DISCUSSION

Quantitative Data

Quantitative data includes patient characteristics (gender and age group), symptomatic drug, and type of antibiotics are obtaine in table below.

Table 1: Patient Characteristic by Gender

Gender	Total (Patient)	Percentage (%)
Boys	160	51.95
Girls	148	48.05
Total	**308**	**100.00**

Source: pediatric patient medical records in 2015

Data showed a tendency boys more often to get ARIs than girls, but unknown factors that influence it. Boys prefer to play in a dirty, dusty, and a lot of playing outside the house, so this is facilitate the transmission/contact with patients/children with ARIs.[12]

Table 2: Patient Characteristic by Age (The British Pediatric Association, 2003)

Age Group (Years Old)	Total (Patient)	Percentage (%)
< 5 (Toddler)	158	51.30
5-6 (pre school))	44	14.29
> 6 (school age)	106	34.42
Total	**308**	**100.00**

Source: pediatric patient medical records in 2015

Younger children more frequent to get ARIs. Children under 5 years old (infant-toddler) has the greatest risk exposed to ARIs because their immune system still low. The channel that connects nose, ear and pharynx (eustacius tuba) has not yet completely formed in infant and toddler, so they are particularly vulnerable to infectious diseases, especially respiratory infection.

Table 3: Visit frequent of patients with ARI in 2015

Number of visits (times)	Total (patient)	Total visits
1	231	231
2	47	94
3	22	66
4	6	24
5	2	10
Total	**308**	**425**

Source: pediatric patient medical records in 2015

ARIs are the most common causes of both illness and mortality in children under five, who average three to six episodes of ARIs annually regardless of where they live or what their economic situation is.[1]

Symptomatics drugs for fever, cough, flu, multivitamin, etc. beside antibiotics are often prescribed for ARIs.[14] According to the retrieved data, it was known that symptomatic drugs included with antibiotics in ARIs therapy at the clinic were Antacid, Bomhexin, Ambroxol, Glyceryl Guaiacolat, Salbutamol, Chlorferaminmaleat, Siproheptadin, Dexamethasone, Methyl prednisolon, Domperidon, Metoclopramid, Paracetamol, Diazepam, Ibuprofen, and B complex vitamins.

Table 4: Antibiotics being used

Class of Antibiotics		Total	Percentage (%)
Beta-lactam and Derivates	Amoxicilin	202	47.53
	Cefadroxil	178	41.88
	Cefixime	2	0.47
Sulfonamide Trimetoprim	Cotrimoxazol	28	6.57
Chloramfenicol	Thiamfenicol	15	3.53
Total		**425**	**100.00**

Source: pediatric patient medical records in 2015

Based on data in table 4, beta-lactam and derivatives was the class of antibiotics that most widely used, specifically amoxicillin (47.53%) and cefadroxil (41.88%). It is in accordance with the guideline because the spectrum of activity of beta-lactam especially Amoxycillin include the E. Coli, Streptococcus pyogenes, Streptococcus pneumoniae, Haemophilus influenzae, Neisseria gonorrhoeae. And empirical antibiotic recommended for respiratory tract infections is amoxicillin or amoxicillin-clavulanate.[7]

Qualitative Data

Qualitative data analysis includes the number of prescribed antibiotics based on three parameters, spesifically : the right indication, the right medication and the proper of administration (dosing and duration of treatment). Drug interaction between antibiotics and symptomatic medication was also analysed.

1. Appropriate Indication

Appropriate indication determines proper drug selection. Appropriate indication is based on an accurate diagnosis, for example, an antibiotic is given only when proven cause of disease is bacterial. Diagnosis can be confirmed by examination of clinical symptoms and physical examination.[4]

The data showed that all patients (100%) were diagnosed with ARIs. Beta-lactam and derrivates were most widely used to treat ARIs. This is in accordance with standard guidelines stating that the penicillins and cephalosporins is the first-line treatment of respiratory diseases.[1]

2. Appropriate Medication

Selection of appropriate drugs/antibiotics can affect the success of therapy. Based on the guidelines, Antibiotics that suitable for ARIs are beta-lactam and derivates as well as sulfonamide-trimetoprim. According to table 4, there 15 visits/patients (3.52%) were get Thiamphenicol which is not include in the antibiotics standard for ARIs.[3]

3. Proper Dose and Duration of Antibiotics Administration

Dose is an important factor in the successful treatment of infection. Excessive dose may cause toxicity and side effects event. In the other hand if the dose of antibiotic is given under standard may cause the healing process will not be optimal. The calculation of the dose in pediatric patient is based on body weight. Data in table 6 showed that some of dose regiment not accordance to standard, it can happen because of the patient's condition is different so that phsycian calculate dose according to the circumstances and the condition of the patient.

Table 5: Antibiotic dose administration compare to standards

Antibiotic	Standard dose (mg/kg/day)	Administration dose (mg/kg/day)	∑	%	Note
Amoxicilin	25 - 50	25 - 49	148	34.82	Right dose
		13 - 24	52	12.24	Under dose
		51 - 75	2	0.47	Over dose
Subtotal			202	47.53	
Cefadroxil	30 - 50	30 - 33	3	0.71	Right dose
		8 - 27	175	41.18	Under dose
Subtotal			178	41.89	
cefixime	5 - 10 years old : 200 mg/day	5 - 10 years old : 200 mg/day	**2**	**0.47**	Right dose
Cotrimoxazol	6 months- 6 years old : 240 mg 2x/day	1 - 5 years old : 240 mg 2x/day	26	6.12	Right dose
	> 6 years old : 480 mg 2x/day	7 - 10 years old : 240 mg 2x/day	2	0.47	Under dose
Subtotal			30	6.59	
Thiamfenicol	30 - 100	37,5	1	40.24	Right dose
		17 - 29	14	3.29	Under dose
Subtotal			15	3.53	
Total			425	100.00	

Note :2

∑ = number of prescription

Table 6: Summary of Antibiotic dose administration compare to standard

Antibiotics	Under dose		Right dose		Over dose	
	Σ	(%)	Σ	(%)	Σ	(%)
Amoxicilin	52	12,24	148	34,82	2	0,47
Cefadroxil	175	41,18	3	0,71	0	0
Cefixime	0	0	2	0,47	0	0
Cotrimoxazol	2	0,47	26	6,12	0	0
Thiamfenicol	14	3,29	1	0,23	0	0
Total	**243**	**57,18**	**180**	**42,35**	**2**	**0,47**

Note :

∑ = number of prescription

The data showed there 180 (42.35%) visits patients were get the appropriate dose and 245 (57.65%) were get inappropriate dose.

Table 7: Duration of Antibiotic Treatment

Duration of therapy (days)	Total	Percentage (%)	Note
2	1	0.24	not accordance to the standard
3	18	4.24	
4	181	42.59	
Subtotal	**200**	**47.06**	
5	34	8.00	accordance to the standard
6	167	39.29	
7	23	5.41	
8	1	0.24	
Subtotal	**225**	**52.94**	
Total	**425**	**100.00**	

Source: pediatric patient medical records in 2015

According to the standard, antibiotic treatment duration of ARI is 5-10 days. The data in table 7 showed that only 225 cases (52.94%) of antibiotic treatment duration of ARIs were accordance to the standards. Inappropriate antimicrobial prescription include inappropriate duration of antibiotic treatment leads to the development of antibiotic resistance.

4. Drug-drug Interaction

An interaction is said to occur when the effects of one drug are changed by the presence of another drug. A reduction in efficacy due to an interaction can sometimes be just as harmful as an increase. The analysis result of drug-drug interactions between antibiotics with symptomatic medication in the treatment of respiratory infections, there no significant drug interactions were found.

CONCLUSIONS

From the result, it can be concluded that amoxycillin and cefadroxil are the most widely used antibiotics, it accodance to the standard althoug h there 3.5% antibiotics prescribed were not in accordance with the treatment guidelines. All cases were appropriate indication, 96.48% cases were appropriate medication, 42.25% cases were appropriate dose regiment, 52.82% cases were appropriate duration of therapy, and there no potential drug interaction between antibiotic and symptomatic drugs were found.

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