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Duration of Hospitalization and Risk factors of Readmission of Community- Acquired Pneumonia Incidence In Hospitalized Toddlers

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Abstract

Background: Indonesia Health Profile Report 2020 stated that pneumonia, is one of the causes of high infant and toddler mortality in Indonesia. Length of stay and readmission are crucial indicators of service quality for hospitalized pneumonia patients.

Aim: to determine the duration of hospitalization and identify risk factors for readmission among toddlers hospitalized with CAP

Methods: This cross-sectional study was conducted with subjects of pneumonia toddlers hospitalized in Sarila Husada Hospital Sragen from November 2021 to Januari 2023

Results: A total of 357 toddlers were hospitalized with CAP (median age, 17 months; IQR 7–24); the majority were under 36 months old (309; 86%); male 54%; female 46%. Median duration of hospitalization for CAP: 2 days; IQR: 3,0-5,0. Readmission events were only 5, higher among toddlers 2-36 months but not significant statistically. Factors associated with readmission in CAP toddlers were the history of previous hospitalizations during the past year due to infection (adjusted odds ratio [OR], 13,6; confidence interval [CI], 1,49–12,34; P = 0.012).

Conclusion: Readmission rate was very low in our study. Toddlers 2–36 months of age and those with previous hospitalizations with infections are at higher risk of readmission in CAP.

11 A. INTRODUCTION

Community-acquired pneumonia (CAP) or community pneumonia is defined as an acute infection of the lung parenchyma, with initial transmission or symptoms occurring in the community, not due to hospitalization. (1). The prevalence of CAP in children is very high, based on data from the 2013 Riskesdas (Riset Kesehatan Dasar) the prevalence rate of toddlers with pneumonia in Indonesia is 4.5 per 100 toddlers (2,3). In 2018, the prevalence of pneumonia decreased by 2.1% with the highest prevalence in the group of children aged 12 to 23 months (4).

Not only is the prevalence high, but childhood pneumonia is a significant contributor to death in the world, especially in developing countries, with approximately one-fifth of under-five deaths worldwide (5,6). Pneumonia, apart from diarrhea, is still one of the causes of high infant mortality (14.5%) and toddlers (5.05%) in Indonesia (7).

15 The cause of pneumonia is infection with bacteria, viruses, fungi, or exposure to chemicals that cause physical damage to the lungs, which can also be an indirect result of other diseases (8). A prospective multisite study characterized the current epidemiology of CAP

in children 2–59 months in Indonesia found that mixed bacterial and viral infection is the most frequent cause of childhood CAP in Indonesia (9,10).

Many factors influence the increase in the incidence of pneumonia in toddlers, including individual aspects of toddlers such as malnutrition, and history of low birth weight (LBW). The behavior of parents, especially mothers, previous illness, comorbid condition such as congenital heart disease, cerebral palsy, asthma, also increase risk factors that can increase the vulnerability of toddlers to pneumonia (11–14). Incomplete immunization basic also contributes to the high cases of childhood pneumonia (15).

Clinical symptoms of CAP by WHO are classified based on clinical characteristics into mild and severe pneumonia. Mild pneumonia characterized by cough or difficulty breathing associated with rapid breathing or chest indrawing in children aged 2-59 months (5,16). Severe pneumonia is a symptom of pneumonia accompanied by difficulty drinking, repeated vomiting, seizures, lethargy, stridor, or severe malnutrition(5). Studies show that the clinical definition of severity correlates with case fatality rates. (17)

Presenting late to a hospital, the presence of co-morbidity especially being malnourished, and not being immunized were factors that can increase duration of hospitalization and (17,18). Within 30 days of being released from the hospital with pneumonia, 8% of children require a readmission. Young children and people with chronic medical issues are more likely to experience readmissions, which are associated with high cost (19) Hospital readmission have become a measure of healthcare quality, it

accounted for a large proportion of health care expenditure (20).

The importance of identifying risk factors associated with readmission events of pneumonia, and duration of hospitalization are necessary for the evaluation management of patients with pneumonia and for measuring healthcare quality and reducing cost (21–23). Readmissions are a sign of poor disease management during the initial visit (23)

How to reduce cost expenses while achieving maximum outcomes is a challenge in the current world, particularly when it comes to funding at the Healthcare and Social Security Agency (BPJS) (18,24,25).

The purpose of this study was to analyze the duration of hospitalization and readmission events in order to identify risk factors that may affect pneumonia readmission rates and estimate the overall disease burden caused by pneumonia.

B. METHODS

This study was a cross-sectional study design, with a study population of all under-five patients with a diagnosis of pneumonia or bronchopneumonia according to WHO criteria (2014) who were hospitalized at pediatric ward of Sarila Husada General Hospital, a private hospital in Sragen. The data collected during the period November 2021 to Januari 2023.

The inclusion criteria were hospitalized pneumonia or bronchopneumonia in children aged 2-59 months. Exclusion criteria were a history of hospitalization for the previous 48 hours at another hospital, and incomplete medical record data. The sample size is the total sampling of all patients who meet the inclusion and exclusion criteria.

The observed variables include the toddlers' health history and the mother's

conditions. These variables include duration of hospitalization and readmission events within 30 days, history of prematurity, low birth weight babies (LBW), and basic immunization status based on age. Toddlers' comorbid factors include cerebral palsy, asthma, autoimmune disease, congenital heart disease, and previous hospitalizations during a year due to infection in patients observed in this study (21,25). Being underweight or wasting are nutritional conditions also studied due to their

association with pneumonia (26). The mother's age, occupation, and economic status were also studied.

The data obtained in this study were analyzed with SPSS. Bivariate analysis used the chi-square test. The magnitude of the role of risk factors will be displayed in the form of an adjusted odds ratio (Adj. OR), 95% confidence interval (CI), and significance value (P). The results of the study were considered significant if the P value was 0.05.

C. RESULT

Table 1 . Subject Characteristic

Characteristic	n	%	Characteristic	n	%
Age			Previous Hospitalization		
2-36 month	309	86%	Yes	84	24%
4-5 yo	48	13%	No	273	76%
Sex			Comorbid Factor		
Female	163	46%	Yes	86	24%
Male	194	54%	No	271	76%
Stunting Status			Immunization Status for age		
Stunting	64	18%	Complete	303	85%
Not Stunting	293	82%	Not Complete	54	15%
Nutritional Status			History of Birth Weight		
Normal	262	74%	LBW*	14	4%
Underweight	95	26%	NBW**	343	96%
Mother's Age			Prematurity		
<19 yo	2	1%	Prematur	10	3%
>20 yo	355	99%	Aterm	347	97%
Mother's Occupation			Readmission		
Working mother	166	46%	Yes	5	2%
Non-working	191	54%	No	352	98%
Anemia Status			Duration hospitalization		
Anemia	86	24%	average(day)	4,38	
Not anemia	271	76%			

*Low Birth Weight **Normal Birth Weight

During the 15-month study period, 365 toddlers were admitted to the pediatric ward of Sarila Husada General Hospital. Eight patients were excluded because their medical record data was incomplete or referred to other hospitals, leaving 357 eligible subjects.

The median of duration of hospitalization in this study 2 days; interquartile range (IQR) of 3,0 – 5,0 (Table 1). The majority of the subjects were under 36 months old (309;86%) with a

slight male preponderance (54% male to 46% female). The subject's age range 2-59 months with a median 17.0; interquartile range (IQR) of 7,0 – 24,0. Most of the subjects were not stunting (height-for-age at -2.0 z score), but the prevalence of stunting subjects in this study was 64 (18%) or lower than national standard 2022 (SSGI 2022) 21,6 %. The nutritional status (weight-for-height z score, WHZ) of most of the subjects was within normal limits, the

prevalence of underweight was 95 (26%) or higher than national standard 17% according to SSGI (Survei Status Gizi Indonesia 2022)

In terms of mothers ages, 355 (99%) were more than 20 years old, and 191 (54%) subjects had an non-working mother. Most of the subjects, 303 (85%), had complete immunization status for their age, according to the Indonesia National Programme on Immunization. The baseline demo-graphic and clinical characteristics of the study population are shown in Table I.

The risk factors for readmission are presented in Table 2. Only five readmission events were reported for the total sample. But in this study, toddlers ages 2–36 months were more likely to experience a readmission after

hospitalization due to CAP, as were toddlers from non-working mothers, but statistically, this were not significant.

The readmission (Table 2) event was not associated with gender, nutritional status, mother's age and occupation, economic status, the presence of stunting, anemia, or immunization. status, history of low birth weight, history of prematurity, also comorbid factors.

Factors associated with readmission in CAP toddlers were the history of previous hospitalizations during the past year due to infection (Table 2). Toddlers who had a history of previous hospitalization experienced nearly fourteen times the odds of readmission (adjusted odds ratio [OR], 13,6; confidence interval [CI], 1,49–12,34; P = 0.012).

Table 2. Patients Characteristics and Their Ascociation with Readmission

Category		Readmission				p-value	OR
		Readmission		Not Readmission			
		n	%	n	%		
Age	2-36 mo	5	1,6%	305	98,4%	1,000	0,984
	4-5 yo	0	0%	47	100%		
Sex	Male	3	60%	191	54,3%	1,000	1,264
	Female	2	40%	161	45,7%		
Stunting Status	Stunting	1	20%	63	17,9%	1,000	1,147
	Not Stunting	4	80%	289	82,1%		
Nutritional Status	Normal	2	0,8%	260	99,2%	0,120	0,236
	Underweight	3	3.2%	92	96,8%		
Mother's Age	<19 yo	0	0%	2	100%	1,000	0,984
	>20 yo	5	1,4%	350	98,6%		
Mother's Occupation	Working	0	0%	166	47,2%	1,000	1,264
	non-Working	5	100%	186	52,8%		
Economic Status	Middle low	3	60%	246	69,9%	1,000	1,147
	Middle upper	2	40%	106	30,1%		
Anemia Status	Anemia	1	20%	85	24,1%	0,120	0,236
	Not Anemia	4	80%	267	75,9%		
Previous Hospitalization	Yes	4	80%	80	22,7%	1,000	0,984
	No	1	20%	272	77,3%		
Comorbid Factors	Yes	1	20%	85	24,1%	1	0,785
	No	4	80%	267	75,9%		
Immunization Status for age	Complete/	3	60%	300	85,2%	0,166	0,260
	Not Complete	2	40%	52	14,8%		
History of Birth Weight	LBW*	0	0%	14	4%	1,000	1,015
	NBW**	5	100%	338	96%		
History of Prematurity	Prematur	1	20%	9	2,6%	0,133	9,528
	Aterm	4	80%	343	97,2%		

* Low Birth Weight **Normal Birth Weight

D. DISCUSSION

This study explores readmission and length of stay (LoS) as quality aspects in CAP patients' hospitalization care. In Indonesia, study about readmission rates were limited. Meanwhile, in other countries, more studies about readmission rates and interventions to reduce the rate of readmission for some medical conditions have also identified several potentially modifiable factors that can be targeted for interventions. Several studies have analyzed the hospital readmission rates for pediatric pneumonia, which vary substantially based on the population, area being studied, and other variables.

In this study, only five cases of readmission were reported, which was less than 1%. The possibility of lower readmission in this study was limited by the number of subjects studied. We need to perform longer research with a larger pediatric population as a representative sample of admissions from community hospitals within our country. This condition is different from other research. Neuman et al stated that pneumonia-specific readmission rates were 7.7% and 3.1%, respectively (21). In a study in 2022 by Lewis et al found that the rate of 30-day all-cause readmissions for pneumonia was 5.9% for the total sample (23). Readmission serves as an indicator of inadequate disease management during an initial visit. Readmission rates were higher among younger children (21). This also confirms that in this study, all the readmission events happened in toddlers younger than 36 months.

Readmission is also associated with a history of previous hospitalizations, a longer index of hospitalizations, and the severity of pneumonia. This study only proved that previous hospitalizations were important as

predictor of readmission in toddlers with CAP. Although this study could not prove the association between gender, nutritional status, stunting, anemia, comorbid factors, history of prematurity, and low birth weight on readmission events, many studies did. Wang et al. 2022 said that hospitalized patients who experience adverse events are at greater risk of readmissions. Not only as risk factors, comorbidity, malnutrition, and immunization status were significantly predictive factors for recovery in pneumonia patients.

The average duration of hospitalization in this study was 4,38 days. This result is similar to Toomey et al. 2016 (27), who mentioned that the research readmission rate for the hospital was 6.5%, and Rozenbaum et al. 2015 (28), with an average length of stay (LOS) 6,7 days (3,6-7,7 days).

This study shows that the LoS of CAP patients is quite short. The average length of hospitalization is also considered a measure of efficiency. According to the US Centers for Disease Control and Prevention, the average LoS for pneumonia in children is five days. A hospitalization lasting longer than five days is considered a longer duration of hospitalization and is associated with severe pneumonia. The brief hospital stay could reflect the good quality of the patient care and the adherence of the service provided to standard treatment. Median time to recovery and duration time of hospitalization which last longer also as predictors among severity CAP (29). Longer LOS during hospitalization contributed to a greater risk of readmission.

E. CONCLUSION

Less than 1% of toddlers experience a readmission within 30 days of CAP

hospitalization, and the readmission rate was very low in our study. Toddlers 2-36 months of age and those with previous hospitalizations with infections are at higher risk of readmission. The average duration of hospitalization for CAP toddlers was also considered within the normal limit in our study. Our results may help target interventions and provide anticipatory guidance for clinicians and patients at greatest risk of hospital readmission, but they need further improvement.

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