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Association between Nutritional Status and Severity Of Pneumonia among Children under Five Years attending Wangaya District Hospital

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Abstract

Pneumonia is still a major health problem in the world, with high morbidity and mortality rates among children under 5 years old, especially in developing countries. In Indonesia, especially Bali, nutritional problem is one of the infection risk factors in children, thus, it is necessary to know the correlation between nutritional status and severity of pneumonia among children under 5 years old at Wangaya District Hospital. This study was based on secondary data. The subjects of this study were paediatric patients diagnosed with pneumonia aged 2 months to 5 years who were treated in Kaswari Room of Wangaya District Hospital from July to December 2019, and were selected by consecutive sampling. The total subjects were 41children with male subjects were more than female (58.5% versus 41.5%). The subjects were mostly in the age groups of 2-10 and 11-20 months old (29.3%); 73.2% of the subjects had good nutrition status, and 73.2% of the cases were non-severe pneumonia. Bivariate analysis between nutritional status and severity of pneumonia obtained p=0.015 and PR of 3.27 (95% CI:1.247-8.590). This study concluded that there was association between nutritional status and severity of pneumonia among children under 5 years old attending Wangaya District Hospital.

Keywords: Pneumonia, Nutritional Status, Children under Five Years

Abstrak

[Hubungan Status Gizi dengan Tingkat Keparahan Pneumonia pada Balita Di RSUD Wangaya]

Pneumonia masih menjadi masalah kesehatan utama di dunia, dengan angka kesakitan dan kematian yang tinggi pada balita terutama di negara berkembang.Di Indonesia khususnya Bali, gangguan nutrisimerupakan salah satu factor risiko terjadinya infeksi pada balita. Sehingga diperlukan studi untuk mengetahui hubungan status gizi dengan tingkat keparahan pneumonia pada balita di RSUD Wangaya.Penelitian ini dilakukan dengan menggunakan desain cross-sectionalberdasarkan data sekunder. Subyek pada penelitian ini adalah pasien anakterdiagnosa pneumonia berusia 2 bulan sampai 5 tahun yang dirawat di Ruang Kaswari RSUD Wangaya pada bulan Juli hingga Desember 2019 yang dipilih secara consecutive sampling.Total subyek pada penelitian ini sebanyak 41 orang dengan laki-laki lebih banyak dibanding perempuan (58,5% berbanding 41,5%). Kelompok umur terbanyak adalah 2-10 bulan dan 11-20 bulan sebesar 29,3%, mengalami gizi baik sebesar 73,2%, dan tingkat keparahan pneumonia berupa pneumoni tidak berat sebesar 73,2%. Analisis bivariat terhadap status gizi dan tingkat keparahan pneumonia mendapatkan nilai p=0,015 dan PR IK95% 3,27 (1,247-8,590). Sehingga dapat disimpulkan dari studi ini bahwa terdapat hubungan antara status gizi dengan tingkat keparahan pneumonia pada balita di RSUD Wangaya.

Kata Kunci:*Pneumonia, Status Gizi, Balita*

INTRODUCTION

Pneumonia is an acute infection of respiratory tract which affects pulmonary parenchyma and is a leading cause of mortality in children under five years in the world. According to WHO data of 2017, pneumonia caused fatalities in 808.694 cases or 15% of the total mortality in children under five years old.(1)

Incidence of pneumonia in children under five years old in developing countries is 151.8 million cases, while in developed countries is around four million cases per year. Approximately, 1.1 million children under five years died each year because of pneumonia, especially in Africa and South East Asia.(1) The prevalence of pneumonia in Indonesia was 4.0%, while in Bali was 3.3%. In 2015, incidence of pneumonia in children under five years old in Denpasar City was 1.54%.(3)

Pneumonia is classified into two types based on the location of infection, which are Community Acquired Pneumonia (CAP) and Hospital Acquired Pneumonia (HAP). Pneumonia according to the severity can be classified into non pneumonia, non-severe pneumonia, and severe pneumonia which are distinguished based on the clinical symptoms.(4)

Pneumonia can be caused by virus, bacteria, or fungi. The most common bacteria causing pneumonia are *Streptococcus pneumoniae* and *Haemophilus influenzae type B(Hib)*. Whereas, the most common virus causing pneumonia is *Respiratory syncytial virus*. Pneumonia is affected by several factors, which are environment and host. Environmental factors affecting pneumonia incidence are air pollution, crowded residential areas, and cigarette smoke. While, host factor is impaired immune system in children under five years old caused by previous disease and malnutrition.(1,4)

Nutritional deficiency can occur as a consequence of several causes such as low birth weight, protein-energy malnutrition (PEM), lack of breastmilk, vitamin A deficiency, and vitamin D deficiency. Babies with low birth weight have higher risk of pulmonary infection because of weak immunity status and impaired pulmonary function. PEM is a condition caused by inadequate intake of energy or protein in foods which leads to deficiencies of several vitamins and minerals. Malnourished children have weak immune response, thus, they can develop more severe infection. Breast milk is passive protection from mother which contains a lot of immune component against pathogens, thus, children under five years old who do not breastfed exclusively, have high risk to get infection. While, deficiency of vitamin A and D can cause disruption of proliferation and response of immune cell towards infection.(5)

Accordingly, a study of association between nutritional status and severity of pneumonia among children under five years in Wangaya District Hospital was needed. The study was conducted in Wangaya District Hospital because it is a type B referral hospital which accepts referral from a lot of type c hospitals in Denpasar. The aim of this study was to determine association between nutritional status and severity of pneumonia among children under five years in Wangaya District Hospital. In addition, this study also aimed to determine the frequency distribution of pneumonia in children under five years old based on pneumonia severity, nutritional status, age groups, and gender in Wangaya District Hospital.

METHODS

This was a cross-sectional study held in Wangaya District Hospital in January to February 2020. Data were obtained secondarily based on medical records of paediatric patients who were diagnosed with pneumonia. The patients included in this study were children of 2 months old to 5 years old who were admitted to Kaswari room of Wangaya District Hospital during a period of July to Desember 2019.

Subjects were sampled by consecutive sampling technique, where all subjects

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meeting the inclusion criteria were recruited consecutively until the number of subjects satisfied the minimum sample size. The minimum sample size was calculated based on formula of independent categorical variable analysis, which resulted in 35 samples. Paediatric pneumonia patients with incomplete medical record data, or with other disease such as human immunodeficiency virus and measles, or having history of low birth weight, or having smoking parents, were not included in this study.

Nutritional status was measured using body weight/age indicator according to growth chart of World Health Organization (WHO). Children were classified as well-nourished if body weight/age equal or more than 80%, while, malnourished children were characterized by body weight/age less than 80%. The severity level of the pneumonia was determined based on physical examination results stated in the medical record: classified as pneumonia if there was rapid breathing rate based on age with or without chest retraction, and classified as severe pneumonia if there was general danger signs.

Data analysis was conducted one step at a time, where univariate analysis was employed to obtain distribution and proportion of pneumonia severity, nutritional status, age group, and gender of the subjects. Later, a bivariate analysis by chi squared statistic was carried out to determine the association between nutritional status and severity level of pneumonia in children under five years old.

This study has met ethical principles, which are anonymity and confidentiality. This study has also passed the ethical clearance review and was approved by Research Ethic Committee of Wangaya District Hospital of Denpasar City.

RESULTS

During July until December 2019, there were 66 children diagnosed with pneumonia and admitted to Kaswari Room of Wangaya District Hospital, and among them, 41 children who met the inclusion criteria were recruited. Of these 41 samples, 30 (73.2%) children had non-severe pneumonia and 11 (26.8%) children had severe pneumonia. Whereas, frequency distribution of children under five years old diagnosed with pneumonia with well-nourished status was 30 children (73.2%), and frequency of children with malnourished status was 11 children (26.8%). In addition, the most frequent age groups were age group of 2 to 10 months old and age group of 11 to 20 months old. The frequency of both age groups was 29.3%. Characteristics of subjects based on gender were 59,5% male and 41.5% female (table 1).

Tabel 1. Characteristics of subjects

Characteristic	Frequency (N)	Percentage (%)
Age (Month)		
2-10	12	29.3
11-20	12	29.3
21-30	7	17.1
31-40	8	19.5
41-50	0	0.0
51-59	2	4.9
Gender		
Male	24	58.5
Female	17	41.5
Nutritional status		
Well-nourished	30	73.2
Malnourished	11	26.8
Severity level		
Non-severe pneumonia	30	73.2
Severe pneumonia	11	26.8
Total	41	100

Tabel 2. Association between Nutritional Status and Severity Of Pneumonia among Children under Five Years

Nutritional status	Severity level		Total	p	PR (95%CI)
	Severe pneumonia	Non-severe pneumonia			
Malnourished	6	5	11	0.015	3.27
Well-nourished	5	25	30		(1.247 – 8.590)
Total	11	30	41		

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The finding of six malnourished children who developed severe pneumonia has revealed a significant association between nutritional status and severity level of pneumonia with p value of 0.015 ($p<0.05$) and prevalence ratio of 3.27 (>1)) as shown in Table 2.

DISCUSSION

Result of our study on the sample characteristic based on age group has found that children under five years old with pneumonia were mostly in the age groups of 2-10 months and 11-20 months old. This finding is consistent with previous study which found that pneumonia patients are mostly under 24 months old.[6] This is because their respiratory tracts are relatively narrower.[7] Moreover, children under two years are in the growth and development period, and starting to interact with environment, thus, they need more nutrition intake.[8] While, children who start weaning period may have decreasing appetite.[9]

In this study, there were more male subjects diagnosed with pneumonia compared to female, which were 58.5%. This finding is in line with the profile of patients with community acquired pneumonia in paediatric unit of RSUP Dr. M. Djamil Padang Sumatera Barat which stated that there are more male children patient than female children patient with ratio 1.25:1.[6] Artawan, et.al also stated that 58.5% pneumonia patients were children under five years old who were male.[10] In contrary, Domili, et.al (2012) stated that there was no relationship between gender and pneumonia incidence in children under five years old.[11]

This study found that there were more non severe pneumonia cases in children under five years old, which was 73.2%. This finding is consistent with study in RS Dr. M. Djamil which found 77.15% pneumonia, and 22.85% severe pneumonia.[6] Study by Artawan, et al which employed previous WHO pneumonia classification, found that the number of severe pneumonia was 76.3% and very severe pneumonia was 23.7%.[10]

This study found pneumonia cases in children under five years with good nutrition in 73.2% of cases, and malnutrition children as much as 26.8%. Study by Artawan, et. al found that pneumonia patients with malnourished status was 43.9% and non-malnourished status was 56.1%.[10] Similar finding was also reported by which stated that children under five years with pneumonia who were well-nourished, less-nourished, and malnourished were 53.3%, 39.04%, and 7.61%, respectively.[6]

Bivariate analysis showed that there was significant association between nutritional status and severity level of pneumonia among children under five years old in Wangaya District Hospital ($p=0.015$). The prevalence ratio was 3.27, which means that nutritional status is a risk factor for severe pneumonia; children under five years old with malnutrition are 3.27 as likely to develop severe pneumonia compared to children with good nutrition. This finding is consistent with previous studies.

Study by Artawan, et.al revealed that there was relationship between nutritional status and severity level of pneumonia with p value $p=0.02$; malnutrition caused 2.176 times higher risk of developing severe pneumonia in children under five years old.[10] The same finding was also stated in a study conducted in RS. DR. M. Djamil involving children aged 13 – 59 months old ($p=0.001$).[6] In addition, study by Wiharjo, et.al, also observed the same result with $p <0.0001$ and OR 3.44, thus makes nutritional status as the major risk factor for developing severe pneumonia.[12]

Significant and consistent association between malnutrition and severity level of pneumonia shown by several studies is caused by some factors. Malnourished patients will have immunity problems, especially IgA. Malnutrition causes the decreased IgA level. IgA plays role as respiratory tract protection against pathogens.[10] Thus, declining IgA will affect humoral immune response against infection, and will exacerbate infection in respiratory tract, including pneumonia.

Malnutrition is the major cause of immunodeficiency in the world. There is

strong association between infection with malnutrition and mortality in children under five years old. In paediatric patients with malnutrition, there will be impairment in the regeneration of respiratory epithelium. Furthermore, there will be atrophy of tonsil and thymus glands which leads to T lymphocytes deficiency. This will invokes the decline in cellular immune response and allow for easy continuing infection process.[13]

It is not only malnutrition can cause risk for infection, but also that infection may cause the malnutrition. Infection can induce malnutrition in several ways, such as anorexia, malabsorption, and increased nutrition demand. Moreover, infection can also cause the change in gut microbiota, thus, it can cause chronic inflammation in the gastrointestinal tract and damage mucosal protection in the intestine.[14]

The limitation of this study is that this study used cross sectional design, where the data collection on risk factor and disease was carried out simultaneously at the same time, thus confounding variables could not be controlled and might affect the severity level of pneumonia among children under five years old.

CONCLUSION

There was association between nutritional status and severity level of pneumonia among children under five years old attending Wangaya District Hospital. Malnourished children are 3.27 times as likely to develop severe pneumonia compared to well-nourished children.

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