Research

Risk Factors for Pneumonia in Toddlers During the Covid-19 Pandemic

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ABSTRACT

Background: Among the period 2019-2021, Ambacang Health Center has the highest frequency of pneumonia in toddlers in Padang City
Purpose: This study aims to determine thefactors associated with pneumonia in toddler in the Ambacang Public Health Center Work Area, Padang City, during COVID-19 pandemic.
Methods: Study used a case- control design with similar age groups. Population of toddler aged 11-59 months. Cases were sampled using a simple random sampling technique based on pneumonia registration in March 2020-March 2022, controls were sampled using purposive sampling. Interviews and questionnaires were used to collect data, which was then analyzed using univariate, bivariate, and multivariate analysis. The number of samples was 74 toddler with 37 samples for each group
Results: There is association between exclusive breastfeeding (OR=3.67), basic immunization (OR=2.8), air pollution (OR=5.0) and residential density (OR=3.0) on the incidence of pneumonia. Meanwhile, history of LBW, education level and maternal employment were not associated with pneumonia. Household air pollution was the dominant factor associated with incidence of pneumonia for toddler during COVID-19 pandemic in the Ambacang Public Health Center Work Area, Padang City
Conclusion: It is recommended for health workers to improve health promotion PHBS in the household and impact air pollution on the health of toddler.

INTRODUCTION

Pneumonia is an acute lower respiratory tract infection (ISPbA) that attacks the lungs' alveoli (Aulia I et al., 2017). The cause of pneumonia comes from bacterial, viral and fungal microorganisms (Hidayani WR, 2020). *Pneumonia* is an infectious disease that is a significant public health problem that contributes to the high mortality rate in children under five nationally and globally (Ministry of Health RI, 2021). Pneumonia is the cause of 15% of under-five deaths in the world, which is estimated at 922,000 under-fives in 2015 (Hidayani WR, 2020). Based on the 2020 Indonesia Health Profile, pneumonia is the most common cause of under-five mortality in Indonesia, which is 5.05%. During the pandemic, there was a stigma against people infected with COVID-19, which resulted in a decrease in the number of visits by infants with coughs or difficulty breathing and the discovery of cases of pneumonia at the Puskesmas (Ministry of Health, Republic of Indonesia 2021).

In 2020, in all healthcare facilities in Indonesia, the number of visits for infants with coughs or difficulty breathing was 4,972,553. The coverage of toddler pneumonia in West Sumatra Province reached 22.2% or as many as 4,471 toddlers, with the number of deaths of 4 toddlers (Ministry of Health RI, 2021). In 2020-2021, the city of Padang ranked fifth for the number of pneumonia discoveries in toddlers among 19 regencies and cities in West Sumatra (West et al. Office, 2022). Based on the Profile of the Padang City Health Office in 2020, the Ambacang Health Center occupies the top two positions for the number of

pneumonia cases with a prevalence of 4%, which means that 4 out of 100 toddlers in the area have pneumonia and the realization of pneumonia findings is 121 (102.8%) out of 118 estimates. Case. In 2021, the Ambacang Health Center ranked first for the number of pneumonia cases, with a prevalence of 3.31%, which means that 3 out of 100 toddlers in the area are infected with pneumonia. The realization of discovery of pneumonia is 143 (84.8%) out of 169 estimated cases (Health et al., 2022).

Infectious diseases occur due to the interaction of various factors. This interaction is known as the epidemiological triad, which includes the agent, the host, and the environment. For pneumonia in infants, the disease agents are microorganisms such as Streptococcus pneumoniae, Haemophilus influenza, and Mycoplasma pneumonia. The host of the disease is a toddler, including age, sex, history of birth weight, status of exclusive breastfeeding and completeness of primary immunization. The environment of this disease is environmental conditions such as mother's education, occupation, density of house occupancy and household air pollution (Irwan, 2017; Sutriana VN et al., 2021). The realization of toddler pneumonia during the COVID-19 pandemic at the national level and in Padang tends to decrease. Even so, in the last three years, the prevalence of pneumonia in toddlers in the Working Area of the Ambacang Health Center has always been in the top ranking compared to other public health centres, with many estimated cases. Therefore, it is necessary to know the risk factors associated with the incidence of pneumonia in infants to take preventive and control measures against this infectious disease.

METHOD

This type of research is quantitative, using a case-control study design with matching age groups. The population is toddlers aged 11-59 months in the Working Area of the Ambacang Health Center, Padang City. The number of samples is 74 respondents with a comparison of the case and control groups, namely 1:1. Sampling was done using a simple random sampling technique for cases based on the pneumonia register in March 2020-March 2022 and purposive Sampling for controls. Data was collected through interviews using a questionnaire and analyzed through univariate, bivariate and multivariate analysis.

RESULT DAN DISCUSSION

This research was carried out in four sub-districts located in the working area of the Ambacang Health Center, Padang City, namely Ampang, Anduring, Lubuk Lintah and Ambacang Market in Janauri-May 2022, with the sample characteristics of toddlers in Table 1 below.

Table 1 Characteristics of Toddlers

Characteristics of Toddlers	Case		Case		Total	
	f	%	f	%	f	%
Age						
11-24 month	25	67,6	25	67,6	50	67,6
25-59 month	12	32,4	12	32,4	24	32,4
Gender						
Male	20	54,1	22	59,5	42	56,8
Female	17	45,9	15	40,5	32	43,2

Based on Table 1 on the characteristics of toddlers, it was found that the proportion of toddlers aged 11-24 months was more than the age group 25-59 months, namely 25 toddlers (67.6%) in the case and control groups. Then, based on gender, the proportion of male toddlers was higher than that of female toddlers in the case group of 20 toddlers (54.1%) and the control group of 22 toddlers (59.5%).

Table 2. Univariate Analysis of Toddler Pneumonia During the COVID-19 Pandemic

Independent Variable	Incidence of Toddler Pneumonia				Total	
	Case		Control			
	f	%	f	%	f	%
LBW history						
BBLR	1	2,7	1	2,7	2	2,7
Not BBLR	36	97,3	36	97,3	72	97,3
Breastfeeding						
Not breastfeeding	17	45,9	9	24,3	26	35,1
Breastfeeding	20	54,1	28	75,7	48	64,9
Immunization						
Uncomplete	20	54,1	11	29,7	31	41,9
Complete	17	45,9	26	70,3	43	58,1
Education						
Low	2	5,4	2	5,4	4	5,4
High	35	94,6	35	94,6	70	94,6
Work						
Working	9	24,3	7	18,9	16	21,6
Nit Working	28	75,7	30	81,1	58	78,4
Air Pollution						
Yes	30	81,1	18	48,6	48	64,9
No	7	18,9	19	51,4	26	35,1
Occupancy Density						
The given condition is not satisfied.	20	54,1	8	21,6	28	37,8
Condition complete	17	45,9	29	78,4	46	62,2

Based on the results of the univariate analysis of the independent variables in Table 2, it was found that the history of Low Birth Weight (LBW) in the case and control groups was one toddler (2.7%) each, toddlers who were not exclusively breastfed were more in the case group, 17 people (45.9%), children under five who did not get complete primary immunization were more in the case group, namely 20 people (54.1%). Then the low education level of mothers under five was the same in the case and control groups, namely two people each (5.4%), mothers who worked more in the case group, namely nine people (24.3%), the presence of air pollution in There were more households in the case group, 30 toddlers (81.1%) and the density of occupancy of houses that did not meet the requirements was more numerous in the case group, namely 20 toddlers (54.1%).

Table 3. Bivariate Analysis of Toddler Pneumonia during the COVID-19 Pandemic at the Ambacang Health Center

Independent Variable	Incidence of Toddler Pneumonia				Total		OR (95% CI)	*p-value*
	Case		Control					
	f	%	f	%	f	%		
LBW history								
BBLR	0	0	1	2,7	1	2,7	1,0	0,625
Not BBLR	1	2,7	35	94,6	36	97,3	(0,1-17,9)	
Breastfeeding								
Not breastfeeding	17	46	11	29,7	28	75,7	3,67	0,035
Breastfeeding	3	8,1	6	16,2	9	24,3	(1,0-20,4)	
Immunization								
Uncomplete	12	32,5	14	37,8	26	70,3	2,8	0,041
Complete	5	13,5	6	16,2	11	29,7	(1,0-9,9)	
Education								
Low	0	0	2	5,4	2	5,4	1,0	0,937
High	2	5,4	33	89,2	35	94,6	(0,1-13,7)	
Work								
Working	1	2,7	4	10,8	32	13,5	0,5	0,266
Nit Working	8	21,6	24	64,9	5	86,5	(0,5-9,0)	
Air Pollution								
Yes	4	10,8	15	40,5	19	51,4	5,0	0,004

No	3	8,1	15	40,5	18	48,6	(1,4-26,9)	
Occupancy Density								
The given condition is not satisfied.	6	16,2	2	5,4	8	21,6	3,0 (1,2-7,6)	0,014
Condition complete	11	29,8	18	48,6	29	78,4		

Based on the results of the bivariate analysis in Table 3, there is a relationship between exclusive breastfeeding status and the incidence of pneumonia in toddlers with p-value = 0.035 (p≤0.05) and OR 3.67 (95% CI: 1.0-20.4), which means meaning that toddlers with non-exclusive breastfeeding status are 3.67 times more likely to be infected with pneumonia. This aligns with research (Sutriana VN et al., 2021) and (Sari & Gustin, 2018), which state that toddlers with non-exclusive breastfeeding status are at greater risk of being infected with pneumonia. Breast milk contains nutrients, antioxidants, hormones and antibodies needed by toddlers to survive and develop, and helps the body's immune system so that it is not susceptible to infection (Sutriana VN et al., 2021). The study found many cases in the age group of 11-24 months with non-exclusive breastfeeding status. At the time of the COVID-19 pandemic, many toddlers in the Working Area of the Ambacang Health Center, Padang City, were not exclusively breastfed, so they were susceptible to pneumonia.

There is a significant relationship between the completeness of primary immunization and the incidence of pneumonia in toddlers p-value = 0.041 (p≤0.05) and OR 2.8 (95% CI: 1.0-9.9), which means that toddlers with primary immunization are at risk of 2.8 times more significant to be infected with pneumonia. This is in line with research conducted by (Susanti N & Rasyid Z, 2015) and (Budihardjo et al. IWB, 2020), which stated that toddlers with incomplete basic immunizations are at greater risk of being infected with pneumonia. Studies in many countries report that immunization has been essential in preventing pneumonia. These strategies include maximizing the number of children who receive routine basic immunizations for diphtheria, pertussis and tetanus, the measles vaccine, and a measles booster (Sutriana VN et al., 2021). The study found many cases with incomplete primary immunization at 11-24 months. During the COVID-19 pandemic, many toddlers in the Ambacang Health Center, Padang City, did not receive complete primary immunization, so they were vulnerable to pneumonia.

The results of the bivariate analysis showed that there was a significant relationship between the presence of household air pollution and the incidence of pneumonia in toddlers with p-value = 0.004 (p≤0.05) and OR 5.0 (95% CI: 1.4-26.9), which means that toddlers who have household air pollution are at risk of 5.0 times greater risk of being infected with pneumonia. This is in line with research conducted by (Sutriana VN et al., 2021) and (Budihardjo et al. IWB, 2020), which stated that toddlers with the presence of air pollution in the household are at greater risk of being infected with pneumonia. During the COVID-19 pandemic, toddlers tended to spend much time at home and with other family members, so they were exposed to more smoke originating from inside the house, such as smoking family members and using mosquito repellents and firewood for cooking. House occupancy density is also associated with the incidence of pneumonia in toddlers p-value = 0.014 (p≤0.05) and OR 3.0 (95% CI: 1.2-7.6), which means that toddlers with a house occupancy density that does not meet conditions 3.0 times greater risk of being infected with pneumonia. This is in line with research (Dewiningsih U, 2018) and (Hasanah U & Santik YDP, 2021), which states that toddlers who live in a residential density that does not meet the requirements are at greater risk of being infected with pneumonia. Density is a prerequisite for disease transmission; the more dense it is, the easier and faster the transfer of disease, especially disease, through the air. Therefore, the density of occupancy in the residence is a variable that plays a role in the incidence of pneumonia in toddlers.

Based on the results of bivariate analysis, it was found that a history of low birth weight (LBW) was not associated with the incidence of pneumonia under five. This is in line with research (Efni Y et al., 2016) and (Armina et al., 2020), which found that a history of LBW was not associated with the incidence of pneumonia in toddlers. However, these results contradict research conducted by (Sutriana VN et al., 2021), which states that toddlers with a history of LBW are 3.27 times more at risk of being infected with pneumonia. The difference in the results in this study could be that during the COVID-19 pandemic, the number

of LBW cases was tiny compared to the total toddler population in the Working Area of the Ambacang Health Center, Padang City.

A mother's education level is not associated with the incidence of pneumonia in infants. This is in line with research (Sutriana VN et al., 2021) and (Rigustia R et al., 2019), which state that there is no relationship between the level of maternal education and the incidence of pneumonia in toddlers. The results of this study are contrary to research conducted (Susanti N & Rasyid Z, 2015), which found toddlers with a low level of maternal education were 4.27 times more at risk of being infected with pneumonia. The difference in the results in this study could be because, in general, the mothers had taken the higher education level group, namely high school and university. Based on the bivariate analysis results, employment status is unrelated to the incidence of pneumonia in under five. The results of this study contradict research conducted by (Rigustia R et al., 2019), which states that toddlers with working mother status have a greater risk of being infected with pneumonia. The difference in the results in this study was that since most mothers of toddlers did not work during the COVID-19 pandemic, they had more time to care for and pay attention to the health and growth of their children.

Table 4 Final Model of Multivariate Analysis of Toddler Pneumonia Occurrences during the COVID-19 Pandemic at the Ambacang Health Center

Variable	*p-value*	OR	95% CI	
			Low	Upper
Breastfeeding *	0,072	2,86	0,91	9,0
Immunization	0,033	3,36	1,10	10,2
Air Pollution	0,013	4,50	1,37	14,7
Occupancy Density	0,023	3,65	1,20	11,1

The results of the multivariate analysis in Table 4 show that household air pollution is the most dominant factor associated with the incidence of pneumonia in under-fives. Household air pollution has an OR value of 4.5 with a p-value of 0.013 ($p \leq 0.05$). From this analysis, it can be concluded that toddlers with air pollution in the household are at risk of 4.5 times being infected with pneumonia compared to toddlers without air pollution. Household air pollution is the most dominant factor related to the incidence of pneumonia in toddlers. Most of the air pollution in households is directly related to smoking inside the house and the use of mosquito coils and wood-burning stoves, which directly impact the quality of the air we breathe (Sutriana VN et al., 2021). Cigarette smoke contains approximately 4,000 elements, and at least 200 are said to be harmful to health (Hasanah U & Santik YDP, 2021). Exposure to smoke and by-products from burning mosquitoes can cause acute and chronic health risks, especially pneumonia (Dewiningsih U, 2018). Using stoves or firewood for cooking is significantly associated with pneumonia and provides clear evidence for an increased risk of more severe pneumonia due to impaired respiratory defence mechanisms. (Sutriana VN et al., 2021)

CONCLUSION

The study's findings indicate a higher prevalence of pneumonia in toddlers aged 11-24 months in comparison to the age range of 25-59 months. There was a higher incidence of pneumonia seen among male toddlers compared to female toddlers, with respect to gender. The incidence of child pneumonia during the COVID-19 pandemic in the Ambacang Health Center, Padang City, is found to be associated with air pollution, occupancy density, exclusive nursing, and primary immunization. The occurrence of pneumonia is primarily attributed to household air pollution.

ACKNOWLEDGMENTS

REFERENCE

[1]   Armina A, & Wulansari A. (2020). Korelasi Faktor yang Berhubungan dengan Kejadian Pneumonia Balita di Dua Puskesmas Kota Jambi. *Jurnal Ilmiah Universitas Batanghari Jambi*, *20*(1), 6–272.

[2]   Aulia I, Chamid MS, & Andari S. (2017). Pemodelan Pneumonia pada Balita di Surabaya Menggunakan Spatial Autoregressive Models. *Jurnal Sains Dan Seni ITS*, *6*(1), 82–88.

[3]   Budihardjo SN, & Suryawan IWB. (2020). Faktor-Faktor Resiko Kejadian Pneumonia pada Pasien Pneumonia Usia 12-59 Bulan di RSUD Wangaya. *Intisari Sains Medis*, *11*(1), 398–404.

[4]   Dewiningsih U. (2018). Faktor Lingkungan dan Perilaku Kejadian Pneumonia Balita Usia 12-59 Bulan. *Journal of Public Health Research and Development*, *2*(3), 64–453.

[5]   Dinas Kesehatan Kota Padang. (2022). *Profil Kesehatan Tahun 2021*.

[6]   Dinas Kesehatan Provinsi Sumatera Barat. (2022). *Laporan ISPA Tahun 2020 dan 2021*.

[7]   Efni Y, Machmud R, & Pertiwi D. (2016). Faktor Risiko yang Berhubungan dengan Kejadian Pneumonia pada Balita di Kelurahan Air Tawar Barat Padang. *Jurnal Kesehatan Andalas*, *5*(2).

[8]   Hasanah U, & Santik YDP. (2021). Faktor Intrinsik dan Ekstrinsik yang Berhubungan dengan Kejadian Pneumonia di Wilayah Puskesmas Rembang. *Jurnal Kesehatan Masyarakat Indonesia*, *16*(2), 84–90.

[9]   Hidayani WR. (2020). *Pneumonia: Epidemiologi, Faktor Risiko pada Balita*. CV. Pena Persada.

[10] Irwan. (2017). *Buku Epidemiologi Penyakit Menular*. CV. Absolute Media.

[11] Kementerian Kesehatan RI. (2021). *Profil Kesehatan Indonesia Tahun 2020*.

[12] Rigustia R, Zeffira L, & Vani AT. (2019). Faktor Risiko yang Berhubungan dengan Kejadian Pneumonia pada Balita di Puskesmas Ikur Koto Kota Padang. *Health and Medical Journal*, *1*(1), 9–22.

[13] Sari, Y. P., & Gustin, R. K. (2018). Risk Factors Pneumonia Occurence in The Work Are of Puskesmas Rao Pasaman Regency Year 2017. *Jurnal Kesehatan*, *9*(2), 149–161.

[14] Susanti N, & Rasyid Z. (2015). Kejadian Pneumonia pada Balita di Wilayah Kerja Puskesmas Rumbai Kota Pekanbaru dan Faktor yang Berhubungan. *Jurnal Proteksi Kesehatan*, *4*(1).

[15] Sutriana VN, Sitaresmi MN, & Wahab A. (2021). Risk Factors for Childhood Pneumonia: a Case Control Study in a High Prevalence Area in Indonesia. *Clinical and Experimental Pediatrics*, *64*(11), 588