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THE RISK FACTOR ANALYSIS OF UPPER ACUTE RESPIRATORY INFECTION IN TODDLERS

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Abstract

According to 2016 data from the World Health Organization (WHO), 5.6 million children perished, with acute respiratory infections (ARI) accounting for 16% of these fatalities. As of now, the incidence of Acute Respiratory Infections (ARI) in Indonesia is at 93,260 cases, whereas the global mortality rate attributable to ARI in 2018 was 896,000 children under five years old. The study aimed to identify the risk factors for upper acute respiratory infections in toddlers at Ananda Makassar Hospital and to ascertain the most predominant risk variables for such infections. This research employs an observational analytic methodology utilizing a case-control approach. The purposive sampling technique involved 292 samples, comprising 146 case samples and 146 control samples, derived from medical record data. The results indicated that the Chi-Square derived p-value for age was 0.034 ($p<0.05$), for gender was 0.16 ($p>0.05$), for nutritional status was 0.01 ($p<0.05$), for exclusive breastfeeding history was 0.000 ($p<0.05$), and for birth weight was 0.094 ($p>0.05$). Additionally, the multiple regression analysis yielded an odds ratio of 0.641 for the nutritional status variable. This study concludes that a strong link exists between age, nutritional status, and exclusive breastfeeding history with the prevalence of ARI at Ananda Hospital Makassar, where the predominant risk factor for ARI is the nutritional state of toddlers.

Keywords: Age, Gender, Nutritional Status, History of Exclusive Breastfeeding, Birth Weight, ARI

Introduction

Acute respiratory infections (ARIs) are acute infections that affect the upper and lower respiratory tract. These infections are the result of the transmission of a variety of microorganisms, including viruses, fungi, and bacteria, from one individual to another. Fever, congestion, runny nose, shortness of breath, and sore throat are among the symptoms. Acute respiratory infections are classified into two categories based on the site of infection: upper ARI and lower ARI. The upper ARI extends from the nostrils to the larynx and can reach the paranasal sinuses and middle ear, whereas the lower ARI begins at the trachea and descends to the alveolus. (Prasekti, 2017).

Upper respiratory tract infection (ARI) is a prevalent health issue that affects individuals worldwide. The majority of cases are caused by viruses, which enable the disease to self-heal. Parents believe that patients with moderate symptoms of upper ARI do not require special medical care, which allows the child to continue with their activities. This, in turn, facilitates the transmission of the illness. Upper ARI is experienced by children on average six to eight times per year.(Prasekti, Anam and Arkhaesi, 2018).

In 2016, the World Health Organization (WHO) reported that there were 5.6 million deaths among children under five years of age, with acute respiratory infections (ARI) accounting for 16% of

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these fatalities. In 2018, 93,620 toddlers in Indonesia were diagnosed with Acute Respiratory Infections (ARI), reflecting an incidence of 12.8%. The predominant age group of toddlers diagnosed with ARI was 12-23 months, exhibiting a prevalence of 14.4%, with a higher incidence rate in boys at 13.2% compared to females at 12.4%. South Sulawesi ranks in the top 20 provinces in Indonesia for the prevalence of Acute Respiratory Infections (ARI), with 3,269 children under five diagnosed and an incidence rate of 8.7%.(Kemenkes RI, 2018).

Based on data surveys conducted in three hospitals, namely RSIA Ananda, RSIA Khadijah, and RSUD Haji, it was found that data from the medical records of RSIA Ananda, throughout 2021 there were 236 toddlers diagnosed with upper ARI, this data is more than the data in the other two hospitals, namely at RSIA Khadijah, in 2021 there were 22 cases of ARI and at RSUD Haji in 2021 there were 32 cases of ARI. The large population of upper URI cases at RSIA Ananda compared to other hospitals is one of the considerations for researchers to make RSIA Ananda a research location. (RSIA Ananda, 2022; RSIA Khadijah, 2022; RSUD Haji, 2022)

There are three primary risk factors linked to the occurrence of ARI in children under five: environmental factors, individual child characteristics, and behavioral factors. Environmental considerations encompass indoor air pollution, home ventilation, and occupancy density. Child-specific characteristics encompass gender, age, birth weight, nutritional status, vitamin A levels, and immunization status. Behavioral variables encompass the actions taken to prevent and address ARI in newborns, as well as the proactive involvement of the family and community in managing ARI diseases.(Howay, Mamoribo and Violita, 2021)

Acute respiratory infections (ARI) in toddlers are frequently regarded as minor infectious diseases and do not garner significant public attention; however, the current situation demonstrates that complications arising from ARI can render it the primary cause of mortality among toddlers globally, with approximately 808,920 deaths attributed to respiratory infections. Additional causes of mortality in children under five include complications in preterm infants, diarrhea, hypoxia, neonatal trauma, congenital anomalies, malaria, various neonatal illnesses, sepsis, neonatal infections, meningitis, and starvation. (Institute for Health Metrics and Evaluation, 2018)

Based on research conducted by Howay (2021) on 90 respondents with interviews using a questionnaire and with a cross-sectional research method, 24 toddlers suffered from ARI (26.7%), with factors that have a significant relationship with the incidence of ARI in toddlers are the nutritional status of toddlers, immunization status, and family smoking habits. Meanwhile, the exclusive breastfeeding factor was found to be unrelated to the incidence of ARI in toddlers. (Howay, Mamoribo and Violita, 2021).

Another study related to ARI risk factors in toddlers conducted by Prasekti (2017) on 50 toddlers at the Ngesrep Semarang Health Center using the prospective cohort method using a questionnaire found a significant relationship between exclusive breastfeeding with the duration of upper ARI healing with a value of $p = 0.02$ and did not find a significant relationship between nutritional status, immunization status, vitamin A supplementation, type of drug obtained, air pollution in the house, house conditions, and socioeconomic status to the duration of upper ARI healing ($p>0.05$). (Prasekti, Anam and Arkhaesi, 2018)

Fitriyani (2022) conducted a study on risk factors for acute respiratory infections (ARI) in 154 children at Pasar Rebo Health Center during the initial six months of the COVID-19 pandemic, utilizing secondary data from patient medical records and employing a cross-sectional research methodology. The findings indicated that age correlates with the prevalence of ARI, with an elevated risk observed in toddlers. Toddlers are susceptible to acute respiratory infections (ARI) likely due to their imperfect immune systems and the narrower configuration of their airways compared to older children. Additionally, adverse environmental variables may contribute to the incidence of ARI. (Fitriyani, 2021)

Based on the above background, researchers are very interested in conducting research with the title "Analysis of Risk Factors for Acute Upper Respiratory Tract Infection in Toddlers at Ananda Hospital Makassar".

Method

This research employs a quantitative approach, utilizing an observational analytic design in a case-control framework to examine the risk factors associated with the occurrence of upper respiratory tract infections (ARI) in toddlers. The research will take place from October to November 2022 at RSIA Ananda Makassar. This study's case population consisted of toddlers aged 12-59 months diagnosed with upper respiratory tract infection (URTI), as documented in the medical records of RSIA Ananda Makassar in 2021. The control population in this study consisted of toddlers aged 12-59 months who were not diagnosed with upper respiratory tract infections, as recorded in the medical records of RSIA Ananda Makassar in 2021. The sampling technique employed was purposive sampling, utilizing the Isaac and Michael formula. Out of a total population of 236 cases, a sample of 146 cases will be utilized. In case-control research, a 1:1 ratio is employed for cases and controls, resulting in a total sample size of 292, comprising 146 cases and 146 controls.

This research will gather secondary data from the medical records of toddlers diagnosed with upper acute respiratory infections (ARI) at RSIA Ananda Makassar from January 2021 to December 2021. The acquired data is then inputted into the distribution table and analyzed methodically. The analysis utilized the Statistical Package for the Social Sciences (SPSS). Initially, univariate analysis was conducted to delineate the sample characteristics. Bivariate analysis was subsequently performed using the Odds Ratio (OR) test to evaluate the association between risk factor factors and the occurrence of Acute Respiratory Infections (ARI) in toddlers. Ultimately, multivariate analysis was conducted employing multiple logistic regression to ascertain the characteristics most strongly correlated with ARI in this sample.

The Health Research Ethics Committee of the Faculty of Medicine and Health Sciences of UIN Alauddin Makassar has authorized this study, reference No. B.329/KEPK/FKIK/X/2022. The ethical viability was determined based on seven WHO Standards from 2011: 1) Social Value, 2) Scientific Value, 3) Equitable Distribution of Burdens and Benefits, 4) Risk, 5) Inducement/Exploitation, 6) Confidentiality and Privacy, and 7) Informed Consent, as specified in the 2016 CIOMS Guidelines. This is evidenced by the attainment of the indicators for each standard.

Results

Based on the research that has been done, the following data is obtained:

Table 1 Distribution of Risk Factors for Acute Upper Respiratory Tract Infection (ARI) at RSIA Ananda Makassar in 2021

Variable	Case		Control		Total	
	n	%	n	%	n	%
Age						
12-35 months	90	55,9	71	44,1	161	57,1
36-59 months	56	42,7	75	57,3	131	44,9
Gender						
Female	64	45,4	77	54,6	141	48,3
Male	82	54,3	69	45,7	151	51,8
Nutritional Status						
BMI <18.5 kg/m^2 and >25 kg/m^2	89	57,4	66	42,6	155	53,1
BMI 18.5 kg/m^2 -24.9 kg/m^2	57	41,6	80	58,4	137	46,9
Exclusive Breast Milk history						
Non-exclusive Breast Milk	107	63,3	62	36,7	169	57,9
Exclusive Breast Milk	39	31,7	84	68,3	123	42,1
Birth Weight						
Weight <2,500 gr and >4,000 gr	96	54,2	81	45,8	177	60,6
Weight ≥ 2,500 gr - 4,000 gr	50	43,5	65	56,5	115	39,4
Total	146	100	146	100	292	100

Table 1 explains that the number of respondents was 292 consisting of 146 respondents in the case group and 146 respondents in the control group. There are five variables in this study, namely age, gender, nutritional status, exclusive breastfeeding history, and birth weight. Toddlers in this study were more dominant with age 12-35 months totaling 161 people (57.1%), gender was more dominant male totaling 151 people (51.7%), nutritional status of toddlers was more dominant BMI <18.5 kg/m^2 and >25 kg/m^2 totaling 155 people (53%), toddlers with a history of exclusive breastfeeding were more dominant not exclusively breastfed totaling 169 people (57.9%), birth weight was more dominant with BW <2,500 gr and >4,000 gr totaling 177 people (60.6%).

Table 2 Analysis of Risk Factors for Acute Upper Respiratory Tract Infection (ARI) in Toddlers at RSIA Ananda Makassar in 2021

Variable	Case		Control				95% CI	
	n	%	n	%	*p-value*	*OR*	LL	UL
Age								
12-35 months	90	55,9	71	44,1	0,034	1,698	1,066	2,704
36-59 months	56	42,7	75	57,3				
Gender								
Female	64	45,4	77	54,6	0,16	0,699	0,441	1,109
Male	82	54,3	69	45,7				
Nutritional Status								
BMI <18.5 kg/m^2 and >25 kg/m^2	89	57,4	66	42,6	0,01	1,893	1,188	3,015
BMI 18.5 kg/m^2 -24.9 kg/m^2	57	41,6	80	58,4				
Exclusive Breast Milk history								
Non-exclusive Breast Milk	107	63,3	62	36,7	0,000	3,717	2,273	6,080
Exclusive Breast Milk	39	31,7	84	68,3				

Birth Weight								
Weight <2,500 gr and >4,000 gr	96	54,2	81	45,8	0,094	1,541	0,96	2,472
Weight ≥ 2,500 gr - 4,000 gr	50	43,5	65	56,5				
TOTAL	146	100	146	100				

Table 2 reveals that the case group consisted of a greater number of toddlers aged 12-35 months, totaling 90 persons (55.9%), compared to the control group, which contained 71 individuals (44.1%). The bivariate analysis produced an odds ratio of 1.698, signifying that toddlers in the high-risk age category are 1.698 times more likely to develop upper acute respiratory infections. The odds ratio (OR) is 1.698, with a 95% confidence interval (CI) ranging from 1.066 to 2.704, which excludes the value of one, signifying statistical significance. A p-value of 0.034, which is below 0.05, indicates a statistically significant difference. Consequently, it may be inferred that age is a risk factor for the occurrence of upper respiratory infections among toddlers.

Table 2 reveals that the case group comprises fewer female toddlers, totaling 64 individuals (45.4%), in contrast to 77 individuals (54.6%) in the control group. The bivariate analysis produced an odds ratio of 0.699 with a 95% confidence interval of (0.441-1.109), encompassing one, signifying a lack of significance. The p-value of 0.699, beyond 0.05, indicates that the result lacks statistical significance. This indicates that gender does not operate as a risk factor for the incidence of upper respiratory tract infections.

Table 2 demonstrates that toddlers exhibiting a nutritional status defined by a BMI of less than 18.5 kg/m2 and greater than 25 kg/m2 were more frequently observed in the case group, totaling 89 individuals (57.4%), in contrast to the control group, which comprised 66 individuals (42.6%). The bivariate analysis produced an odds ratio of 1.893, suggesting that toddlers with high-risk nutritional status are 1.893 times more likely to develop upper acute respiratory infections. The odds ratio (OR) is 1.893, accompanied by a 95% confidence interval (CI) ranging from 1.188 to 3.015. This interval does not include the value of one, suggesting statistical significance, as evidenced by a p-value of 0.01, which is below the conventional threshold of 0.05. This indicates a notable disparity, resulting in the conclusion that nutritional status serves as a risk factor for the occurrence of upper respiratory infections in toddlers.

Table 2 shows that among toddlers with a history of exclusive breastfeeding, a higher prevalence was observed in the case group, with 107 individuals (63.3%) not receiving exclusive breastfeeding, compared to 62 individuals (36.7%) in the control group. The bivariate analysis produced an odds ratio of 3.717, suggesting that toddlers with a history of exclusive breastfeeding at high risk are 3.717 times more likely to develop upper acute respiratory infections. The odds ratio (OR) is 3.717, with a 95% confidence interval (CI) ranging from 2.273 to 6.080, which excludes one, thereby indicating statistical significance. The p-value is 0.00, which is below the threshold of 0.05, indicating a statistically significant difference. In conclusion, a history of exclusive breastfeeding is identified as a risk factor for the occurrence of upper respiratory infections in toddlers.

Table 2 shows that toddlers with a birth weight below 2,500 grams and above 4,000 grams are more common in the case group, comprising 96 individuals (54.2%), compared to 81 individuals (45.8%) in the control group. The bivariate analysis produced an odds ratio (OR) of 1.541, indicating that toddlers with high-risk birth weights are 1.541 times more likely to develop upper acute respiratory infections (ARI). The 95% confidence interval (CI) is (0.96-2.472), which includes one, suggesting a lack of statistical significance. The p-value of 0.094 exceeds the 0.05 threshold, confirming the lack of statistical significance. This indicates that birth weight is not a risk factor for upper respiratory tract infections.

Table 3 Bivariate Test Results Independent Variables Included in Multivariate Analysis

Variable	*OR*	95% CI		*P-Value*	Description
		LL	UL		
Age	1,698	1,066	2,704	0,034	Included
Gender	0,699	0,441	1,109	0,16	Excluded
Nutritional Status	1,893	1,188	3,015	0,01	Included
Exclusive Breast Milk history	3,717	2,273	6,080	0,000	Included
Birth Weight	1,541	0,96	2,472	0,094	Excluded

Table 3 shows that of the 5 independent variables studied, there are 3 variables that have a p-value <0.25, namely age, nutritional status, and exclusive breastfeeding history. These three variables will be included in the multiple logistic regression test.

Table 4 Results of Multiple Logistic Regression Test for the Most Dominant Risk Factor for the Incidence of Upper Acute Respiratory Tract Infection (ARI) in Toddlers at RSIA Ananda Makassar in 2021

Variable	*P-Value*	*OR*	95% CI	
			LL	UL
Age	0,049	0,605	0,367	0,997
Nutritional Status	0,084	0,641	0,387	1,061
Exclusive Breast Milk history	0,000	0,317	0,19	0,53

Table 4.4 shows the results of the multiple logistic regression test performed on 3 dependent variables that met the p-value <0.25, namely age, nutritional status, and exclusive breastfeeding history. The risk factor with the largest OR value was nutritional status (p-value = 0.084; OR=0.641; 95% CI=0.387-1.061).

Discussion

The analysis yielded an Odds Ratio of 1.698, accompanied by a 95% confidence interval with a lower limit of 1.066 and an upper limit of 2.704. The findings indicate that toddlers in the high-risk age group are 1.698 times more likely to experience upper acute respiratory infections compared to those in the low-risk age group, with a 95% confidence interval of 1.066 to 2.704. The findings indicate that the number one is not included, leading to a statistically significant result with a p-value of 0.034, which is below the threshold of 0.05. This suggests a notable difference, allowing us to conclude that age is a risk factor for the incidence of upper acute respiratory infections in toddlers.

The findings of this study align with the research conducted by Ardianti (2017) at the Tembilahan Hulu Health Center in Riau Province, which involved a sample of 636 individuals divided into two groups: 318 in the case group and 318 in the control group. The research yielded a p-value of 0.047, indicating a significant correlation between age and the incidence of Upper Acute Respiratory Infections (ARI) in toddlers, with an Odds Ratio (OR) of 1.389. This suggests that toddlers aged 1-3 years (high-risk age) are 1.389 times more likely to experience upper ARI compared to those aged 4-5 years (low-risk age). (Sari and Ardianti, 2017) The findings of this study align with the research conducted by Putri in 2017 in Tumapel Village, Mojokerto Regency, which involved a sample of 50 toddlers. The study yielded a p-value of 0.013, indicating a significant correlation between the age of toddlers and upper respiratory infection cases in Tumapel Village, Mojokerto Regency. (Putri and Adriyani, 2018)

This study's results support the theory that toddler age significantly affects the incidence of upper respiratory infections (URI). The clinical presentation of upper URI in toddlers is typically more severe than in adults, as these infections often represent the first infectious event for this age group. The natural immune response in toddlers is not fully developed, and their immune systems are still maturing. Additionally, the narrowness of their airway lumens contributes to a higher incidence of upper URI compared to adults. (Sari and Ardianti, 2017)

The research findings indicate an Odds Ratio of 0.699, with a p-value of 0.16, which exceeds the 0.05 threshold. The 95% confidence interval ranges from a lower limit of 0.441 to an upper limit of 1.109, encompassing the value of one. Consequently, gender does not demonstrate a significant statistical relationship with the incidence of upper ARI in toddlers. This suggests that gender does not serve as a risk factor for the occurrence of upper respiratory infections in children under five years of age.

The findings of this study align with the research conducted by Fibrila (2018) in Lampung Province, which involved a sample of 48 toddlers divided into two groups: 24 in the case group and 24 in the control group. The p-value of 0.097, being greater than 0.05, indicates no significant relationship between toddler gender as a risk factor and the incidence of upper ARI in this population. Putri (2017) conducted a study in Tumapel Village, Mojokerto Regency, involving a sample of 50 toddlers. The results indicated a p-value of 0.764, which exceeds the threshold of 0.05, suggesting no significant relationship between the age of toddlers and upper respiratory infection cases in this population. This study's findings align with Ariani's 2021 research at the UPTD Puskesmas Tanjung Baru, East Baturaja District, Ogan Komering Ulu Regency, which involved a sample of 120 individuals. The research yielded a p-value of 0.442, indicating no significant relationship between gender and the incidence of upper respiratory infections in toddlers at the Tanjung Baru Health Center.(Ariani and Ekawati, 2021)

Based on one theory, male toddlers have a higher risk than female toddlers to experience upper ARI events because boys play outside more often so that the risk of exposure to air is greater when compared to female toddlers whose games are predominantly carried out inside the house. (Sari and Ardianti, 2017) This theory is in line with the theory in a study conducted by Ariani in 2021 which states that the incidence of upper ARI in toddlers is caused by many factors, with the main factor being the mechanism of entry of agents into the body so that an inflammatory process occurs, so that gender is a supporting factor but not a risk factor that affects the incidence of upper ARI in toddlers. (Ariani and Ekawati, 2021)

The results of this study indicate that the gender of toddlers does not significantly affect the incidence of upper URI so that gender is not a risk factor for the incidence of upper URI in toddlers. According to the researcher, this could happen and is not in line with the theory considering that in today's modern era, there is no significant difference between the location of playing female and male toddlers, currently male toddlers and female toddlers have the same frequency of playing outdoors because the variety of outdoor games is currently increasingly diverse and interesting, so the theory that upper ARI is more common in male toddlers because male toddlers play outside more often is considered not in line with the results of this study, besides that this can be influenced by the sampling process using purposive sampling technique so that if there are toddlers with high risk age but do not meet the inclusion and exclusion criteria then the data cannot be included in this study.

The research findings indicate an Odds Ratio of 1.893, with a 95% confidence interval ranging from a lower limit of 1.188 to an upper limit of 3.015. The analysis concludes that toddlers with high-risk nutritional status have a 1.893 times increased risk of experiencing upper acute respiratory infections compared to those with low-risk nutritional status, with a 95% confidence interval of 1.188 to 3.015. The p-value of 0.01, which is less than 0.05, indicates statistical significance, suggesting a significant difference. Therefore, it can be concluded that nutritional status is a risk factor for upper ARI events in toddlers.

The findings of this study align with the research by Arimbawa et al. (2018) conducted at the Banjarangkan II Klungkung Health Center, which involved a sample of 250 individuals. The study reported a p-value of less than 0.05, indicating a significant relationship between the nutritional status of toddlers and the incidence of upper acute respiratory infections at the Banjarangkan II Klungkung Health Center. (Nirmala Utami, Purniti and Arimbawa, 2018) A study by Bidjuni et al. (2022) at the Tompaso Health Center in Minahasa Regency revealed comparable findings, with a sample size of 62 and a p-value of 0.003, indicating a significant relationship between toddlers' nutritional status and the incidence of upper acute respiratory infections at the Tompaso Health Center.(Giroth, Manoppo and Bidjuni, 2022) Furthermore, a study by Edlinovputri in 2021 at the Seilekop Health Center in Batam City corroborated these findings. With a sample size of 120, the results indicated a p-value of 0.031, which is less than 0.05, signifying a significant relationship between the nutritional status of toddlers and the incidence of upper acute respiratory infections at the Seilekop Health Center in Batam City. (Edlinovputri, 2021)

Nutritional status is characterized by the equilibrium between nutrient requirements and intake, influencing the body's resistance and immune response to disease. Conversely, poor nutritional status arises when there is insufficient nutrient intake relative to needs. The findings of this study align with the theory that a toddler's optimal nutritional status enhances immune response compared to poor nutrition. Consequently, nutritional deficiencies in toddlers can compromise immunity against acute infectious diseases, such as upper respiratory infections.(Nirmala Utami, Purniti and Arimbawa, 2018) This study's results align with the theory that nutrition influences the quality of human resources. Nutritional disorders diminish cellular immunity, leading to atrophy of the thymus glands and tonsils, as well as a reduction in T lymphocyte count, thereby increasing susceptibility to infections. (Giroth, Manoppo and Bidjuni, 2022)

The research findings indicate an Odds Ratio of 3.717, with a 95% confidence interval lower limit of 2.273 and an upper limit of 6.080. The findings indicate that toddlers with a high-risk history of exclusive breastfeeding are 3.717 times more likely to experience upper respiratory infections compared to those with a low-risk history, with a 95% confidence interval of 2.273 to 6.080. The absence of overlap with the null value indicates statistical significance, as evidenced by a p-value of 0.000, which is less than 0.05. This suggests a significant difference, leading to the conclusion that a history of exclusive breastfeeding is a risk factor for the incidence of upper respiratory infections in toddlers.

The results of this study are in line with research conducted by Prasekti (2018) at the Ngesrep Health Center with a total sample of 50 people with the results of the study p-value <0.05 indicating that there is a significant relationship between exclusive breastfeeding history and the incidence of upper ARI in toddlers at the Ngesrep Health Center. (Prasekti, Anam and Arkhaesi, 2018) Another study conducted by Wafi (2020) at Puskesmas Junrejo Batu City also showed similar results with a total sample of 70 people with a p-value of 0.01 <0.05 indicating that there is a significant relationship between exclusive breastfeeding history and the incidence of upper URI in toddlers at Puskesmas Junrejo Batu City.(WAFI, 2020) In addition, another study conducted by Fauziah in 2018 stated that exclusive breastfeeding has a relationship with the incidence of upper URI in toddlers, with 0R 7.38 indicating that toddlers who do not have a history of exclusive breastfeeding are at risk of 7.38 times experiencing URI compared to toddlers with a history of exclusive breastfeeding. (ASYARI, no date)

This study's results support the theory that breast milk provides essential nutrients adequate for children's needs and can combat infections affecting the body. The presence of macrophage cells and antibodies in breast milk and colostrum offers protection to infants against specific infections. Consequently, infants who are exclusively breastfed exhibit a reduced risk of respiratory infections and infections in other areas. (WAFI, 2020)

The immune system is categorized into two components: innate and adaptive (specific). The components of breast milk serve dual functions. The leukocyte concentration in colostrum and early breast milk during the initial weeks of breastfeeding ranges from 1,000,000 to 3,000,000 leukocytes per milliliter. After 2-3 months of breastfeeding, leukocyte counts decrease to 1,000/ml, comprising 59-63% macrophages, 18-23% neutrophils, and 7-13% lymphocytes. (Zakiudin and Nia, 2018) Breast milk contains protective factors, including lysozyme enzymes that disrupt bacterial cell walls, lactoferrin that inhibits bacterial growth, and cytokines that enhance the production of IgA antibodies. (Baratawidjaja, 2018)

The research findings indicate an Odds Ratio of 1.541, accompanied by a p-value of 0.094, which exceeds the 0.05 threshold, with a confidence interval of 95%. Continuous Integration The lower limit value (LL) of 0.96 and upper limit value (UL) of 2.472 encompass the value of one, indicating that birth weight does not exhibit a meaningful or statistically significant relationship with the incidence of upper acute respiratory infections (ARI) in toddlers. This suggests that birth weight does not serve as a risk factor for the occurrence of upper respiratory infections in toddlers.

The findings of this study align with the research by Magdaleni (2020) at the Karang Asam Community Health Center in Samarinda City, which involved a sample of 90 toddlers. The study reported a p-value of 0.078, indicating no significant relationship between birth weight as a risk factor and the occurrence of upper ARI in toddlers. A study by Sukmawati and Ayu in 2018, conducted in Tunikamaseang Village, Maros Regency, involved a sample of 48 toddlers. The results indicated a p-value of 0.636, which exceeds 0.05, suggesting no significant relationship between the age of toddlers and upper respiratory infection cases in this population. (Magdaleni, Irawan and Sukemi, 2020)

According to a specific theory, infants with low birth weight, defined as a weight below 2500 grams, exhibit a heightened risk of infection compared to those with normal birth weight. This vulnerability is particularly pronounced during the initial months post-birth, attributed to the inadequate development of immune substances, rendering them more susceptible to infectious and respiratory diseases. (Direktur Jenderal Kesehatan Masyarakat and Direktur Gizi Masyarakat, 2020) Additionally, low birth weight infants frequently encounter respiratory system disorders resulting from inadequate lung growth and development, as well as compromised respiratory muscle strength. Infants with low birth weight exhibit a compromised immune system, rendering them vulnerable to infectious diseases, particularly upper respiratory tract infections. (Magdaleni, Irawan and Sukemi, 2020)

The findings of this study demonstrate that birth weight does not significantly correlate with the incidence of upper respiratory infections in toddlers, indicating that it is not a risk factor for such infections in this population. This suggests that the occurrence of upper respiratory infections in toddlers at Ananda Makassar Hospital is influenced not only by birth weight but also by various other risk factors beyond the examined variables. Researchers indicate that this scenario contradicts existing theory, as toddlers with a history of low birth weight often experience nutritional deficiencies during pregnancy. However, if these children receive adequate nutritional support in the future, including exclusive breastfeeding and sufficient complementary feeding, their immune systems may strengthen as a result of these interventions. The theory suggesting that upper acute respiratory infections (ARI) in toddlers are linked to a history of low birth weight (LBW) due to inadequate prenatal nutrition is not supported by the findings of this study. Additionally, the sampling process, which employed a purposive sampling technique, may have influenced the results. Consequently, toddlers with LBW who did not meet the inclusion and exclusion criteria were excluded from the study, potentially affecting the overall data.

The results of the multivariate analysis, utilizing multiple logistic regression tests, were based on three dependent variables that achieved a p-value of less than 0.25: age, nutritional status, and exclusive breastfeeding history. The risk factor exhibiting the highest odds ratio was nutritional status (p-value = 0.084; OR = 0.641; 95% CI = 0.387-1.061).

Nutritional status refers to the condition of an individual's body as influenced by their daily dietary intake. The assessment of nutritional status is based on body weight (BW) in relation to body length (PB) or height (TB), expressed as BW/PB or BW/TB. The nutritional status of toddlers correlates directly with their immune capacity to combat pathogens. This study indicates that nutritional status is the primary risk factor influencing the incidence of upper acute respiratory infections in toddlers at Ananda Hospital Makassar in 2021.

Conclusion

The study's findings indicate that age, nutritional status, history of exclusive breastfeeding, and birth weight are risk factors for the occurrence of upper respiratory infections in toddlers at Ananda Hospital Makassar in 2021. The nutritional status is the most significant risk factor affecting the incidence of upper respiratory infections in toddlers. Understanding the risk factors for the occurrence of upper respiratory infections in toddlers aims to enable the community, particularly parents, to prevent these infections at the earliest opportunity.

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