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Risk Factors for Acute Respiratory Infections in Toddlers in Puskesmas Kuta Krueng Area, Pidie Jaya 2024

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ABSTRACT

Introduction: Aceh Province ranks third in Indonesia for acute respiratory infections (ARI), with a prevalence of 30.0%. Among its districts, Pidie Jaya has the highest ARI incidence at 7.84%, with Bandar Dua subdistrict reporting the highest number of cases. Toddlers are particularly vulnerable to ARI, which can significantly impact their growth and development.

Objective: This study aims to explore the associations between nutritional status, exposure to cigarette smoke, exclusive breastfeeding, and maternal knowledge with the incidence of ARI in toddlers in the Puskesmas Kuta Krueng area, Bandar Dua subdistrict, Pidie Jaya district in 2024.

Method: This quantitative study uses a descriptive case-control design to analyze the relationships between independent and dependent variables. The study population consists of 792 mothers with toddlers in the Puskesmas Kuta Krueng area, including 192 cases of ARI. The sample size, calculated using the Lemeshow formula, includes 96 cases and 96 controls, selected through proportional sampling.

Result: Univariate analysis shows that 49.0% of toddlers have poor nutritional status, 33.3% are exposed to cigarette smoke, 29.7% did not receive exclusive breastfeeding, and 41.1% of mothers have inadequate knowledge. Bivariate analysis reveals significant associations between nutritional status (OR=9.014; p-value=0.000), exposure to cigarette smoke (OR=2.366; p-value=0.006), exclusive breastfeeding (OR=2.655; p-value=0.003), maternal knowledge (OR=2.097; p-value=0.013), and the incidence of ARI in toddlers.

Conclusion: The study identifies poor nutritional status, exposure to cigarette smoke, lack of exclusive breastfeeding, and inadequate maternal knowledge as significant risk factors for ARI in toddlers. These findings suggest that targeted public health interventions are essential to improve nutritional status, reduce smoke exposure, promote exclusive breastfeeding, and enhance maternal education. Such measures could significantly lower ARI rates and improve overall toddler health outcomes. The study's limitations include its cross-sectional design and potential recall bias. Future research should focus on longitudinal studies and intervention strategies to address these issues more effectively.

Keywords: ARI; Breastfeeding; Nutritional; Maternal Knowledge

INTRODUCTION

Acute Respiratory Infections (ARI) are acute infections affecting both the upper and lower respiratory tracts, caused by viruses, fungi, and bacteria. ARI occurs when the body's immunity decreases, making individuals, especially toddlers, highly vulnerable. According to the World Health Organization (WHO) in 2021, 68% of toddlers visiting healthcare facilities do so due to ARI, with pneumonia being particularly prevalent. ARI is more common in developing countries, with rates of 25%-30% compared to 10%-15% in developed nations. In Southeast Asia, ARI caused 2.1 million deaths among toddlers in 2020. Countries such as India, Bangladesh, Indonesia, and Myanmar report the highest mortality rates from ARI, making it a leading cause of death among children in these regions, accounting for 4 out of 15 million deaths in children under five each year (1).

In Indonesia, ARI ranks as the 9th most common disease, particularly among children. Indonesian toddlers typically experience cold and cough illnesses three to six times a year. The Indonesian Ministry of Health reports that the incidence of pneumonia in toddlers ranges from 10-20% annually. ARI is the most common illness in infants and toddlers in Indonesia, with a prevalence of 25.5%, pneumonia morbidity rates of 2.2% in infants and 3.0% in toddlers, and mortality rates of 23.8% in infants and 15.5% in toddlers (2).

In Aceh Province, ARI is the third highest in Indonesia, with a prevalence of 30.0% (3). Within Aceh, Pidie Jaya has the highest ARI incidence at 7.84%. Among the eight subdistricts in Pidie Jaya, Bandar Dua reports the highest number of ARI cases.

Research indicates that female toddlers are more susceptible to ARI, accounting for 55.7% of cases compared to 44.3% in males. Housing density also plays a critical role in ARI incidence. A study conducted at Puskesmas Sungai Pinang found that ARI prevalence was 43.4% in densely populated homes and 56.5% in overcrowded homes, indicating that increased household occupancy can accelerate indoor air contamination, thereby impacting health (4).

Given the rising incidence of ARI, particularly among children under five, and the data from Puskesmas Kuta Krueng showing 192 cases in 2022, it is evident that ARI significantly impacts toddlers. This condition can lead to decreased appetite, lethargy, malaise, headaches, influenza, and even death. Therefore, further investigation into the occurrence of ARI in toddlers is warranted to inform more effective prevention and intervention strategies.

METHOD

This quantitative study employs a descriptive and case-control design to analyze causal relationships using reverse logic. The research utilizes both primary and secondary data.

Primary data is collected through fieldwork, involving validated questionnaires, medical records, and nutritional status measurement sheets. The focus is on ARI occurrences in toddlers, cigarette smoke exposure, exclusive breastfeeding, and maternal knowledge. The questionnaires used were pre-tested in a pilot study to ensure their reliability and validity. Necessary adjustments were made based on the pilot study results to enhance data accuracy. Data collection is conducted alongside community health activities at Puskesmas Kuta Krueng.

Secondary data is obtained from several sources, including the Indonesian Ministry of Health, Aceh Health Office, Pidie Jaya District Health Profile, and Puskesmas Kuta Krueng records on ARI in toddlers. This dual approach strengthens the study by offering comprehensive insights into the incidence and associated risk factors of ARI.

The study aims to identify the associations between nutritional status, cigarette smoke exposure, exclusive breastfeeding, and maternal knowledge with the incidence of ARI in toddlers within the Puskesmas Kuta Krueng area, Bandar Dua subdistrict, Pidie Jaya district in 2024.

To ensure the validity of the results, confounding factors such as socio-economic status, maternal age, and environmental conditions were controlled. This was achieved by matching case and control groups based on these variables. Additionally, multivariate analysis was employed during the data processing stage to further control for these confounders, ensuring that the observed associations were not influenced by external factors.

The research was conducted in the Puskesmas Kuta Krueng area from January 15 to January 22, 2024. The population includes 792 mothers with toddlers in this area, with 192 cases of ARI reported. The sample size was determined using the Lemeshow formula, resulting in 96 case respondents and 96 control respondents. These respondents were selected through proportional sampling, ensuring that the sample was representative of the population, which allowed for a robust analysis of the associations under study.

RESULTS

Univariate Analysis

Based on the research conducted in the working area of Puskesmas Kuta Krueng, Bandar Dua District, Pidie Jaya Regency, the following is the frequency distribution of Acute Respiratory Infections (ARI) occurrences in toddlers within this area.

Tabel 1. Frequency Distribution of Dependent and Independent Variables

Variable	Frequency (F)	Percentage (%)
ARI Incidence		
Cases (ARI)	96	50.0
Controls (Non-ARI)	96	50.0
Total	192	100
Nutritional Status		
Poor Nutrition	94	49.0
Good Nutrition	98	51.0
Total	192	100
Cigarette Smoke Exposure		
Exposed	64	33.3
Not Exposed	128	66.7
Total	192	100
Exclusive Breastfeeding		
Not Exclusive	57	29.7
Exclusive	135	70.3
Total	192	100
Maternal Knowledge		
Poor Knowledge	79	41.1
Good Knowledge	113	58.9
Total	192	100

The frequency distribution data reveals a balanced representation in the study sample, with 50% of toddlers having Acute Respiratory Infections (ARI) and 50% as controls. Nutritional status is nearly evenly split, with 49% of toddlers having poor nutrition and 51% with good nutrition. Cigarette smoke exposure is less common, affecting 33.3% of the toddlers compared to 66.7% who are not exposed. Exclusive breastfeeding is prevalent, with 70.3% of toddlers being exclusively breastfed. Maternal knowledge is relatively high, with 58.9% of mothers possessing good knowledge. This distribution highlights a varied but balanced sample with respect to these key variables.

Bivariate Analysis

To assess the relationships between the dependent and independent variables, statistical analysis was conducted using the Chi-Square (χ^2) test and Logistic Regression. The variables examined include toddler nutritional status, exposure to cigarette smoke, exclusive breastfeeding, and maternal knowledge.

Table 2. Relationship Between Nutritional Status, Cigarette Smoke Exposure, Exclusive Breastfeeding, Maternal Knowledge, and ARI Incidence in Toddlers

Dependent Variable	ARI Incidence				OR (95% CI)	P-Value
	Cases		Controls			
	n	%	n	%		
Nutritional Status						
Poor Nutrition	71	74.0	23	24.0	9.01 (4.68-17.3)	0.000
Good Nutrition	25	26.0	73	76.0		
Total	96	100	96	100		
Cigarette Smoke Exposure						
Exposed	41	42.7	23	24.0	2.36 (1.27-4.39)	0.006
Not Exposed	55	57.3	73	76.0		
Total	96	100	96	100		
Exclusive Breastfeeding						
Not Exclusive	38	39.6	19	19.8	2.65 (1.38-5.07)	0.003
Exclusive	58	60.4	77	80.2		
Total	96	100	96	100		
Maternal Knowledge						
Poor Knowledge	48	50.0	31	32.3	2.09 (1.16-3.76)	0.013
Good Knowledge	48	50.0	65	67.7		
Total	96	100	96	100		

The analysis reveals that poor nutritional status is associated with a significantly higher risk of Acute Respiratory Infections (ARI) in toddlers, with an odds ratio (OR) of 9.01, indicating a risk 9.01 times greater compared to those with good nutritional status (95% CI: 4.68-17.3, $p < 0.001$). Exposure to cigarette smoke also increases the risk of ARI, with toddlers exposed to smoke having a 2.36 times higher risk than those not exposed (OR = 2.36, 95% CI: 1.27-4.39, $p = 0.006$). Additionally, not providing exclusive breastfeeding is associated with a 2.65 times greater risk of ARI (OR = 2.65, 95% CI: 1.38-5.07, $p = 0.003$). Maternal knowledge is another significant factor, with poor maternal knowledge correlating with a 2.09 times higher risk of ARI in toddlers (OR = 2.09, 95% CI: 1.16-3.76, $p = 0.013$).

DISCUSSION

The study results indicate a significant relationship between nutritional status and the incidence of ARI in toddlers within the working area of Puskesmas Kuta Krueng, Kecamatan Bandar Dua, Kabupaten Pidie Jaya, with a p -value of 0.000 and OR of 9.014. This finding aligns with previous research, which has shown that poor nutritional status weakens the immune system and increases the risk of ARI in toddlers (5). Factors such as parental care patterns and healthcare services also play a role in child development (6). Additional studies have supported these findings, with Sunarni (2013) reporting a p -value of 0.000 and Sukmawati (2014) a p -value of 0.031, both of which indicate that nutritional status significantly impacts ARI incidence. Similarly, Yuliastuti (2014) found a significant relationship between nutritional status and ARI, further supporting the theory that nutritional disturbances reduce immune function and increase susceptibility to infections (7,8,9). This study emphasizes that toddlers in the Puskesmas Kuta Krueng area with poor nutritional status have reduced immune defenses, influenced by food quality and family economic conditions, which affects their susceptibility to ARI.

The study also shows a significant relationship between exposure to cigarette smoke and the incidence of ARI in toddlers in the Puskesmas Kuta Krueng area, with a p -value of 0.006 and OR of 2.366. This finding is consistent with Fillacano (2018), who found that smoking in the home increases the likelihood of ARI in toddlers. Cigarette smoke can impair ciliary function and immune response, making infections more likely (10). Miswan (2018) reported that exposure to cigarette smoke correlates with severe ARI, while Lindawati (2020) also found a significant relationship between smoke exposure and ARI (11,12). However, not all studies agree; for example, Putri et al. (2019) did not find a significant relationship between smoke exposure and ARI (15). Despite this, Ahmad (2021) and Aisyah et al. (2024) emphasized that cigarette smoke exposure, especially in toddlers, increases the risk of respiratory disorders (15,16). This study highlights that some toddlers in Puskesmas Kuta Krueng are exposed to cigarette smoke from close family members, particularly fathers, which negatively affects their health.

The study further reveals a significant relationship between exclusive breastfeeding and the incidence of ARI in toddlers in the Puskesmas Kuta Krueng area, with a p -value of 0.003 and OR of 2.655. This finding is consistent with Puspawan (2021), who found that exclusive breastfeeding can reduce ARI risk (17). Wafi (2020) also reported similar results, with p -values of 0.005 and 0.008, respectively. Exclusive breastfeeding provides essential nutrients and antibodies to protect against infections (18). This study identifies that some toddlers in Puskesmas Kuta Krueng are not receiving exclusive breastfeeding, affecting their immunity and increasing ARI risk. Factors contributing to inadequate exclusive breastfeeding include insufficient milk supply, traditional practices, and maternal work commitments.

Lastly, the study demonstrates a significant relationship between maternal knowledge and the incidence of ARI in toddlers in the Puskesmas Kuta Krueng area, with a p -value of 0.013 and OR of 2.097. Research by Ade Syahrena Lubis (2019) found that maternal knowledge about ARI influences its incidence, with p -values of 0.007 and 0.288, respectively (19). Martiningsih (2018) added that health education improves knowledge and impacts ARI incidence. Maternal knowledge about ARI contributes to better preventive actions (20). This study reveals that maternal knowledge in Puskesmas Kuta Krueng is still lacking, affecting the management and prevention of ARI in toddlers, with insufficient understanding regarding child care, healthcare choices, and healthy feeding practices.

CONCLUSION

The analysis of Acute Respiratory Infections (ARI) among toddlers within the Puskesmas Kuta Krueng working area, Kecamatan Bandar Dua, Kabupaten Pidie Jaya, reveals several critical insights. The study indicates that poor nutritional status significantly elevates the risk of ARI by 9.01 times compared to good nutritional status (OR = 9.01, 95% CI: 4.68-17.3, $p < 0.001$). Exposure to cigarette smoke is associated with a 2.36 times higher risk of ARI (OR = 2.36, 95% CI: 1.27-4.39, $p = 0.006$), while the lack of exclusive breastfeeding contributes to a 2.65 times increased risk (OR = 2.65, 95% CI: 1.38-5.07, $p = 0.003$). Inadequate maternal knowledge is linked to a 2.09 times higher risk of ARI (OR = 2.09, 95% CI: 1.16-3.76, $p = 0.013$).

In conclusion, the study underscores the significant impact of nutritional status, exposure to cigarette smoke, exclusive breastfeeding practices, and maternal knowledge on the incidence of ARI in toddlers. To mitigate the risk of ARI, public health interventions should prioritize improving nutritional support, reducing cigarette smoke exposure, promoting exclusive breastfeeding, and enhancing maternal education on child health. Implementing targeted educational programs and community health initiatives could effectively address these risk factors and improve overall health outcomes for toddlers in the area.

SUGGESTION

Based on the research findings, discussion, and conclusions, several recommendations are proposed. It is advised that Puskesmas Kuta Krueng regularly conduct health education sessions on the dangers of ARI in toddlers, integrating these sessions into routine posyandu activities to help reduce ARI risks in the area. Parents of toddlers are encouraged to maintain their child's nutritional status by providing a balanced diet that adheres to the "4 sehat 5 sempurna" guidelines, avoid smoking indoors or near their children, ensure exclusive breastfeeding, and enhance their awareness of ARI risks. Additionally, parents should bring their toddlers to posyandu for monthly check-ups to monitor their growth and nutritional status. Future researchers are also encouraged to investigate other factors such as the role of healthcare workers, environmental conditions, economic status, and other variables that have not yet been explored.

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