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The Relationship Between Exposure to Cigarette Smoke and the Incidence of Acute Respiratory Infections (ARI) in Children Under Five

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Abstract

Background: Acute respiratory infections (ARI) remain a major health problem in children under five. One of the risk factors associated with ARI is exposure to cigarette smoke. This study aimed to examine the relationship between exposure to cigarette smoke and the incidence of ARI among children under five at Kapasa Health Center, Makassar City, in 2024. **Methods:** This study employed a quantitative design with a cross-sectional approach. A total of 44 parents or family members of children under five were recruited using a non-probability sampling technique. Data were analyzed using the Chi-Square statistical test to determine the association between exposure to cigarette smoke and the incidence of ARI. **Results:** The Chi-Square test showed a p-value of 0.022, which was lower than the significance level of 0.05. This finding indicates a statistically significant relationship between exposure to cigarette smoke and the incidence of ARI in children under five. **Conclusion:** Exposure to cigarette smoke is significantly associated with the occurrence of ARI in children under five at Kapasa Health Center, Makassar City. Preventive measures to reduce children's exposure to cigarette smoke are urgently needed to lower the risk of ARI.

Keywords: ARI, Children under five, Cigarette Smoke Exposure

1. Introduction

Smoking remains an unresolved public health problem to this day. Smoking has spread widely among all segments of society, from children to the elderly, both men and women. According to World Health Organization (WHO) data, Indonesia ranks third in the world in terms of the number of smokers, after China with 390 million smokers and India with 144 million smokers (WHO, 2023). Based on the 2020 Basic Health Research (Riskesdas), around 34% or 80 million Indonesians are active smokers.

The Head of the Makassar City Health Office revealed that, according to research conducted by the Faculty of Public Health at Hasanuddin University, approximately 287,300 residents of Makassar consume at least one pack of cigarettes per day out of a total population of 1.5 million. The growth rate of smokers in the last five years has reached 10% annually (Riskesdas, 2020). Smoking has become normalized in society because of its prevalence and the frequent occurrence of smoking in public and household environments.

Cigarettes have spread across all age groups, including children, adolescents, and adults. The harmful substances contained in cigarettes are known to have negative health impacts, especially on bones and skin. Several toxic substances in cigarettes include cyanide, benzene, cadmium, methanol, acetylene, ammonia, formaldehyde, hydrogen cyanide, and arsenic (Kuncoro, 2020).

Acute Respiratory Infection (ARI) is one of the most common diseases in the community, especially among children under five. ARI is a leading cause of morbidity and mortality among children under five, particularly in poor and developing countries (Mokdad, 2017). The disease carries high rates of illness and death, with cases increasing by an estimated 16% annually. In 2015, deaths due to ARI totaled 920,136, with the highest numbers occurring in South Asia and Africa (WHO, 2023).

Data from the ARI Subdirectorate in 2018 showed that the incidence rate of ARI in Indonesia was 20.06 per 1,000 children under five, nearly the same as the previous year at 20.56 per 1,000. Effective detection and control of this disease requires intensive efforts targeting children under five. Nationally, the pneumonia case rate was estimated at 3.55%, with variations across provinces (Riskesdas, 2018).

Cigarette smoke inside the home is one of the most significant household environmental factors contributing to ARI in children. Therefore, analysis of ARI cases in each region is necessary to understand case distribution, pathogenic factors, and

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the strength of relationships between exposure and outcomes on a local scale. This information can serve as a strategic basis for ARI prevention efforts (Okky, 2017).

Riskesdas (2018) also reported that the prevalence of smokers in Indonesia reached 28.9%. In South Sulawesi Province, the prevalence was 25.91%, while in Gowa Regency it was 24.02%. In the work area of UPT Puskesmas Somba Opu, the figure was even higher at 42.02%. The prevalence of ARI among children under five at Kapasa Health Center in Makassar City was also high, with 313 cases recorded in 2023 (Diklat PKM Kapasa, 2023).

Based on these data, this study is expected to provide valuable information for the community in adopting healthier lifestyles. Therefore, the researcher is interested in examining the relationship between cigarette smoke exposure and the incidence of ARI in children under five

2. Materials and Methods

This study used a quantitative research design with a cross-sectional approach, conducted at Kapasa Health Center, Makassar City, in 2024. The sample consisted of 44 parents or caregivers of children under five, selected through non-probability (accidental) sampling. The independent variable was exposure to cigarette smoke, and the dependent variable was the incidence of ARI in children under five, identified based on caregiver reports and health worker diagnoses.

Data were collected using a structured questionnaire covering demographic information, exposure to cigarette smoke, and ARI history in the past two weeks. Data analysis was performed using SPSS with the Chi-Square test, with a significance level set at $p < 0.05$.

3. Results

3.1 Univariate Analysis

The univariate analysis aimed to provide an overview of the characteristics of each variable studied, including age, gender, education, and occupation.

Table 1. Frequency Distribution of Respondents' Demographic Characteristics

Demographic Characteristic	Category	N	%
Age	21–29 Years	18	40.9%
	30–39 Years	21	47.7%
	40–49 Years	3	6.8%
	50–60 Years	2	4.5%
	>60 Years	0	0.0%
	Total	44	100%
Gender	Male	31	70.5%
	Female	13	29.5%
	Total	44	100%
Education	No School	1	2.3%
	Primary School (SD)	6	13.6%
	Junior High School (SMP)	1	2.3%
	Senior High School (SMA)	30	68.2%
	Higher Education	6	13.6%
	Total	44	100%
Employment	Unemployed	5	11.4%
	Honorary/Temporary Job	2	4.5%
	Civil Servant (PNS)	9	20.5%
	Private Sector Employee	16	36.4%
	Entrepreneur	11	25.0%
	Farmer/Gardener	1	2.3%
	Total	44	100%

Table 1. shows the frequency distribution based on respondents' characteristics. The results indicate that most respondents were aged 30–39 years (21 respondents or 47.7%), while the fewest were aged 50–60 years (2 respondents or 4.5%). Regarding gender, 31 respondents (70.5%) were male, and 13 respondents (29.5%) were female. In terms of education, most respondents had completed high school (30 respondents or 68.2%), while only one respondent (2.3%) had completed junior high school.

Table 2. Frequency Distribution Based on the Characteristics of Children Under Five at Kapasa Health Center, Makassar

Demographic Characteristic	Category	N	%
Age	1 – 2 Years	15	34.1
	3 – 4 Years	19	43.2
	5 Years	10	22.7
	Total	44	100%
Gender	Male	24	54.5
	Female	20	45.5
	Total	44	100%

Table 2. shows the frequency distribution based on the children's characteristics. Most children were aged 3–4 years (19 respondents or 43.2%), while the fewest were aged 5 years (10 respondents or 22.7%). In terms of gender, 24 children (54.5%) were male, and 20 children (45.5%) were female.

Table 3. Frequency Distribution of Respondents Based on Exposure to Cigarette Smoke at Kapasa Health Center, Makassar

Exposure to Cigarette Smoke	N	%
No	7	15.9
Yes	37	84.1
Total	44	100%

Table 3 shows the frequency distribution of exposure to cigarette smoke. The results reveal that 37 respondents (84.1%) were exposed to cigarette smoke, while only 7 respondents (15.9%) were not. Incidence of ARI in Children Under Five

Table 4 Frequency Distribution of Respondents Based on ARI in Children Under Five at Kapasa Health Center, Makassar

Acute Respiratory Infection (ARI) in Children Under Five	N	%
No	17	38.6
Yes	27	61.4
Total	44	100%

Table 4 shows the frequency distribution of ARI in children under five. The results indicate that 27 respondents (61.4%) reported their children were affected by ARI, while 17 respondents (38.6%) reported no ARI.

3.2 Bivariate Analysis

Table 5. The Relationship Between Cigarette Smoke Exposure and the Incidence of ARI in Children Under Five at Kapasa Health Center, Makassar

Cigarette Smoke Exposure	ARI in Children Under Five				Total		p-value
	No		Yes				
	N	%	N	%	N	%	
No	0	0.0	7	15.9	7	15.9	0,022
Yes	17	38.6	20	45.5	37	84.1	
Total	17	38.6	27	61.4	44	100	

The Chi-Square test results showed a p-value of 0.022, which is lower than the significance level of 0.05. This indicates a statistically significant relationship between exposure to cigarette smoke and the incidence of ARI in children under five at Kapasa Health Center, Makassar. Based on the distribution, among 37 children exposed to cigarette smoke, 20 children (45.5%) experienced ARI and 17 children (38.6%) did not. Meanwhile, among the 7 children not exposed to cigarette smoke, all (15.9%) still experienced ARI, and none were recorded as free from ARI. These findings suggest that children exposed to cigarette smoke are more likely to develop ARI compared to those who are not exposed. Thus, cigarette smoke exposure can be considered a contributing factor to the higher prevalence of ARI in children under five.

4. Discussion

The results showed that the HR aspect had a very significant influence on the success of EMR implementation at Ahmad Dahlan Kediri Hospital, with a p = 0.000 and r = 0.468 value, which showed a moderate but significant relationship between the quality of human resources and the application of EMR technology.

This study involving 44 respondents at Kapasa Health Center, Makassar City, revealed that 37 children under five (84.1%) were exposed to cigarette smoke, while only 7 children (15.9%) were not exposed. The primary source of exposure came from

parents or family members who smoked near the children. This indicates that smoking behavior within households remains prevalent, and children are often passive smokers in their own homes. Indoor smoking in particular results in prolonged and continuous exposure, which substantially increases health risks (Victor et al., 2022). The Chi-Square test further confirmed a statistically significant relationship between cigarette smoke exposure and the incidence of ARI in children under five.

The results of this study align with a body of research showing the harmful effects of passive smoking on child health. Sofiah (2017) found a similar significant relationship between smoking habits and ARI incidence among children under five in Aceh Besar. Lestari (2022) also reported that children regularly exposed to household cigarette smoke had higher rates of ARI. These findings are consistent with international evidence that cigarette smoke affects not only active smokers but also passive smokers, especially children, whose immune systems are not fully developed. This vulnerability makes them more susceptible to respiratory tract infections compared to adults.

The high rate of exposure in this study can be linked to several contributing factors. First, the demographic characteristics of respondents show that most were adults, where smoking is often regarded as a common social activity. In many communities, smoking is normalized, particularly among men, and is even considered a part of daily interaction within families (Gemini & Trisna, 2020). Second, the educational background of respondents also played a role. Most respondents had completed only high school (68.2%). According to Asmidar (2018), lower levels of education are often associated with limited knowledge about the dangers of smoking and its impact on child health. Individuals with higher education levels are generally more exposed to health information and therefore possess greater awareness of smoking-related risks.

Cigarette smoke contains harmful substances such as nicotine, carbon monoxide, and tar that can impair respiratory health. In children, prolonged exposure increases the risk of acute respiratory problems, including bronchitis, pneumonia, and inflammation of both the upper and lower respiratory tracts (Indarti & Istikomah, 2019). At critical stages of growth and development, this exposure can also interfere with lung maturation and weaken the immune system, making children more prone to recurrent infections. Moreover, studies have shown that even when adults do not smoke directly near children, cigarette smoke residues (third-hand smoke) can remain in the environment, reducing indoor air quality and continuing to affect children's health (Amaliyah & Faidah, 2023).

Beyond direct smoking exposure, ARI is influenced by broader environmental conditions. Bambang (2024) identified several environmental risk factors for ARI, including housing conditions, population density, air pollution from household burning, vehicle emissions, industrial waste, and forest fires. Among these, household cigarette smoke pollution is one of the most significant contributors because of its constant presence in indoor environments. Children typically spend most of their time indoors, which increases their risk of continuous inhalation of toxic substances. Therefore, the household environment plays a central role in determining child health outcomes.

Given the strong association between cigarette smoke exposure and ARI, preventive measures must be prioritized. Families should adopt smoke-free household policies to eliminate exposure. Parental education programs are critical to improving awareness of the dangers of smoking for children (Alamsyah, 2020). Public health campaigns should also emphasize that smoking indoors—even with ventilation—still poses serious health risks to children. Preventive strategies include keeping homes and vehicles smoke-free, designating no-smoking zones around children, and encouraging parents or caregivers to quit smoking entirely.

Furthermore, environmental modifications can help reduce risk. Well-ventilated living spaces, such as by opening windows or installing air purifiers, may decrease the concentration of harmful substances, although they cannot fully eliminate the dangers of second-hand and third-hand smoke (Yusuf et al., 2023). Strengthening community-based interventions, such as health promotion at local health centers, is also essential to foster behavior change and promote smoke-free environments. Greater knowledge among parents and caregivers has the potential to drive long-term changes in household smoking practices (Jain et al., 2023).

5. Conclusions

In conclusion, this study confirms that cigarette smoke exposure is significantly associated with ARI incidence among children under five at Kapasa Health Center, Makassar City. The findings are consistent with national and international studies, reinforcing the evidence that passive smoking is a major risk factor for respiratory illness in children. Children's vulnerability is amplified by their immature immune systems and prolonged exposure in household environments where smoking is common. To reduce ARI incidence, interventions must focus on family awareness, strict implementation of smoke-free home policies, and comprehensive public health campaigns. Creating healthy, smoke-free environments is crucial to protecting children's respiratory health and ensuring their optimal growth and development.

Conflict of Interest

There is no conflict of interest

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