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Smoking Habit at Home and Upper Respiratory Infection in Infants Aged 6-12 Months

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Abstract

Upper Respiratory Tract Infection (URI) is an acute infection caused by viruses, fungi, and bacteria. Smoking habit at home is a risk factor for URI in infants. This study aimed to determine a relationship between smoking at home and the incidence of URI in infants. This study was conducted the fourth week of February 2010 until the third week of April 2010 in Kampar District, Indonesia. This analytical study used a case-control design and cluster random sampling. The samples comprised 162 cases and 162 controls, infants aged 6-12 months. The cases were 162 infants aged 6-12 months suffering from URI within the last month. The controls included mothers visiting primary health care with infants aged 6-12 months and not suffering from URI within the last month. Data analysis took a logistic regression. This study showed that smoking habit at home had an Odds Ratio of 2.68 times (95%CI: 1.51-4.81) for experiencing URI compared to infants whose families did not have such habit. Health promotion of the dangers of smoking at home through a family approach and anti-smoking campaigns must be more intensively carried out among all Indonesian families to control URI.

Keywords: habit, smoking, home, upper respiratory infection

Introduction

Upper respiratory infection (URI) is an acute disease attacking one or more parts of the respiratory tract from the nose to alveoli, including adnexal tissue such as the sinuses, middle ear cavity, and pleura.[1] URI is the main cause of morbidity and mortality for infants aged under one year in developing countries where the 2016 URI incidence in the age group under one year was 169,163 cases,[2] while the number of URI incidence in infants is around 6-10 times each year.[3,4] Currently, URI still remains a major public health problem in Indonesia. According to the 2013 Indonesian Basic Health Research, the prevalence of URI based on diagnosis in Riau Province was 10.9%, while the prevalence of URI based on diagnosis and symptoms reached 17.1%. However, the prevalence of URI in this province is still lower than the national prevalence at 13.8% based on diagnosis and 25% based on diagnosis and symptoms.[5-7] The 2023 Indonesian Health Survey results found that Indonesia's prevalence of URI in infants aged less than one year with a diagnosis was 4.4%. Moreover, the prevalence of ARI in babies less than one-year-old with diagnosis and symptoms was 26.6%.[8]

The high rates of morbidity and mortality due to URI in developing countries relate to a risk factor of smoking at home.[7,9-13] A report estimates smoking prevalence at 9% in 2020–2025, contributing to deaths worldwide, and half of smokers die from smoking-related illnesses and diseases.[14] Cigarette smoke at home can cause health problems for the family compared to a healthy home without cigarette smoke around.[1] Several studies have found many risk factors for the incidence of URI in infants and toddlers, including smoking habit at home, poor nutrition in infants, low birth weight, insufficient breastfeeding, homes with high population density, incomplete immunization, sex, lack of vitamin A, iron deficiency, vitamin D or calcium deficiency, age of the baby, health services, low socioeconomic status, and cigarette smoke.[1,15,16]

The high incidence of URI and the high smoking behavior of the population aged 15 years and older have shown an increase to 36.3% in 2013 from 34.2% in 2007.[7] Other studies found a relationship between people closest to the family

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smoking at home and the URI incidence in toddlers.[17,18] Therefore, this study aimed to determine a relationship between smoking habits at home and URI in infants aged 6-12 months. This study is pivotal in strengthening policies against smoking at home in Indonesia.

Method

This quantitative study used a case-control design to determine the relationship between smoking habits at home and the incidence of URI in infants aged 6-12 months. Data collection was carried out through structured interviews with respondents using questionnaires, including an initial survey. This study started by collecting initial data, writing a proposal, collecting primary data, and writing the results. The sampling method was cluster sampling, in which the sampling unit was the primary health care (PHC), which would take samples of 162 cases and 162 controls. Of the 27 PHCs in the Kampar District of Riau Province, Indonesia, 15 PHCs with the highest incidence of URI were selected.

This study was carried out in the fourth week of February 2010 until the third week of April 2010 using primary data, including data on the characteristics of mothers and their infants aged 6-12 months comprising (1) infant characteristic factors (records of infants exposed to immunization for measles and diphtheria, pertussis, and tetanus (DPT)); (2) maternal sociodemographic factors (education, knowledge, and maternal occupation); (3) those visiting the selected PHCs for treatment and were diagnosed with URI; (4) having controlled for non-URI by a doctor at the PHC and recorded in the URI register book who met the sample criteria and then followed up for interviews using a questionnaire. The data used in this study was taken in 2010 and had no data updates.

Measurements and observations were taken to obtain data on infants' body weight, records of measles and DPT immunizations, and the presence of burning smoke at home. Besides, this study validated whether any subject information was true, such as the infant's birth date in the Road-to-Health Card/Kartu Menuju Sehat they had. Stata 11 software with Serial Number 3101506243955 was then employed for the data analysis, including a univariate analysis to determine the distribution of each variable, bivariate analysis to determine the relationship of the independent variable (smoking habit at home) with the dependent variable (URI), and multivariate analysis with multiple logistic regression.

Results

The final parsimonious model described the association between smoking at home and the incidence of URI. Therefore, the final multivariate analysis model obtained is shown in Table 1. Based on the results, the habit of smoking at home has an OR of 2.68 times (95% CI: 1.51-4.81) for experiencing URI compared to not smoking after being controlled for the variable of not being exclusively breastfed. The results of this study proved the hypothesis that the habit of smoking at home increases the incidence of URI in infants aged 6-12 months compared to not having such a habit. The final model equation obtained from this study is as follows:

$$\text{Logit P (URI in infants)} = \beta o + \beta \text{ (presence of smoking habit at home)} + \beta \text{ (exclusively breastfed).}$$

$$\text{Logit P (URI in infants)} = -3.96 + 3.36 \text{ (any smoking habit at home)} + 2.19 \text{ (not being exclusively breastfed)}$$

Table 1. Final Model of Multivariate Analysis of the Relationship between Smoking Habit at Home and Upper Respiratory Infections

Variable	B	S.E	p-value	OR	95% CI
Smoking habit at home	3.36	0.79	0.001	2.68	1.51-4.81
Not being exclusively breastfed	2.19	1.23	0.025	3.68	1.91-7.09
Constant	-3.96	0.09	0.00	-	-

Notes: S.E = Standard Error, OR = odds ratio; CI = confidence interval.

The presence of a smoking habit at home is an indicator affecting health, especially in infants under one year of age. From the results of the final model of multivariate analysis, the presence of the habit had an OR of 2.68 times (95%CI: 1.51-4.81) for experiencing URI compared to infants who did not have a smoking family at home. This is statistically significant with p-value = 0.001 after controlling for the variable of not being exclusively breastfed. Those infants whose families were known to have smoking habits at home were more likely to be found in the case group (URI) than in the control group (non-URI). The results showed that smoking habit at home was a variable influencing the URI incidence.

Discussion

Increasing interventions implemented to strengthen healthy families without anyone smoking in the house can be done through a family approach program.[2] A family approach is crucial for all family members to always maintain the health of their infant in the first year of life. The results are fundamentally confirmed by a study by Nuriman stating that the presence of smoker family members is a risk factor for URI in infants.[19] The consistency of this study can also be seen in previous studies, which found that the habit increases the likelihood of URI by 2.05 times compared to not having the habit in the family.[12,17-19] Zulaikhah *et al.* found that family members who smoke at home increase the risk of respiratory tract infections by 1.35 times greater than family members who do not.[10]

Smoking is a public health problem and has economic and environmental impacts.[20] Smoking can reduce levels of antibacterial molecules.[14] Smoking habits can cause air pollution in the house and disrupt the defense mechanism of the respiratory tract, resulting in acute respiratory tract infections in toddlers.[9,12,16,21] In a study by Purba *et al.* in 2023, 34 parents (44.2%) have a smoking intensity of 11-20 cigarettes per day.[13] This is also in line with other studies' findings that a smoker at home has a higher risk of developing the common cold compared to the non-smoker in their family.[3,12]

The URI control program is immediately accelerated through advocacy and community outreach regarding the no-smoking movement and overcoming smoking risk factors.[3] This advocacy and outreach is a pivotal activity to obtain political commitment from regional and central governments and raise public awareness. All smokers are prohibited from smoking indoors, especially those infants aged less than one year.[9,10,19,22] Cross-sector collaboration should be made involving the police, religious leaders, social services, education services, subdistricts, and community leaders to reduce the prevalence of smoking in society.[10,23]

This study showed that the smoking habit at home increased the incidence of URI in infants aged 6-12 months. Handling the URI is not only done through a treatment (curative) but also by increasing promotive and preventive efforts. A "Health Family"-based health promotion in the form of counseling inside and outside the building is suggested to enforce smoking cessation at the PHCs, integrated health care, and other health facilities.[5,10,22]

Modifying risk factors in a stop-smoking at home needs to be implemented in a family approach through a healthy lifestyle.[9,11,24,25] A healthy lifestyle through anti-smoking campaigns and a family approach through health promotion to family members not to smoke inside and outside the home must be encouraged through communication, information, and education at home or in the infant's room. Community outreach activities encouraging clean and healthy behavior through smoking prohibitions can create a healthy environment.[5,10]

URI control can be carried out by increasing human resource capabilities through short training, medicine supplies, facilities and infrastructure, required health equipment, and validation of routine recording and reporting. Regular supervision by the personnel in charge of the program should be implemented by carrying out active supervision and monitoring program evaluation. Inhalation of cigarette smoke by infants impairs local lung resistance as well as mucociliary clearance ability.[11,18]

Cigarette consumption by fathers has been proven to increase the likelihood that children under five will experience respiratory problems.[9,11,12,18,19] A longitudinal study by Qamarya *et al.* presented that smoker mothers impacted their infants in which the cotinine entered into the breast milk and could be detected in the infant's urine.[23] Infants breastfed using a bottle by smoker mothers at home were found ten times more likely to have a higher level of urinary cotinine.[23] Cotinine is a chemical produced when the body breaks down nicotine from inhaled smoke.[23] This study, however, has a limitation. The limitation is that the data obtained was more than ten years ago. However, it is still considered very effective in creating a sustainable "healthy home without cigarette smoke"-based health promotions.

Conclusion

This study highlights that smoking habit has a significant relationship with URI in infants. For this study's finding, health promotion of the dangers of smoking at home through a family approach, as well as anti-smoking campaigns, must be carried out more intensively in all Indonesian families to control URI.

Abbreviations

URI: upper respiratory infection; PHC: primary health care; DPT: diphtheria, pertussis, and tetanus.

Ethics Approval and Consent to Participate

This study was granted permission from the Dean of the Faculty of Public Health Universitas Indonesia No. 889/PT.02.H5.FKMUI/I/2010 dated on February 22, 2010.

Competing Interest
The authors declare no competing interest in this study.

Availability of Data and Materials
The data is available upon request.

Authors' Contribution
MR, NPS, and TE conceived and designed the study, proofread Indonesian and English languages, led the data collection and statistical analysis, and revised the manuscript. All authors have read and approved the manuscript.

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