Insights in Public Health Journal

x

Original Article

Risk Factors of Acute Otitis Media in Primary School Children in Purwokerto

Intan Nurmalasari[1], Siwi Pramatama MW[1], Devi Octaviana[1]

1 Public Health Department, Faculty of Health Sciences, Jenderal Soedirman University

Corresponding author : intannurmalasarii60@gmail.com

ABSTRACT

Background: Acute Otitis Media (OMA) is a condition where there is fluid in the middle ear with signs and symptoms of infection, and can be caused by various pathogens. AOM that gets the right treatment can interfere with daily activities and have an impact on permanent hearing loss. One of the efforts to prevent and overcome AOM cases is to know the risk factors. The purpose of this research is to find out what risk factors can cause AOM in elementary school children

Methods: This study uses a quantitative method with a Case-Control approach and the sampling technique in the case group using Total Sampling and in the control group using Purposive Sampling. Respondents in this study were parents of elementary school students who were sampled in this study at SDN 1 Bobosan and SDN 4 Kranji with a total of 34 respondents, while the control group in this study used a ratio of 1:2. The variables used in this study were gender, immunization status, history of allergies, history of ARI, history of exclusive breastfeeding, parental income, number of family members in the house, exposure to cigarette smoke. Data collection was done by interview. Data were analyzed using Chi-Square test and continued with logistic regression test. The risk factor for AOM is known by calculating the odds ratio (OR) value.

Results: Bivariate results showed a relationship between history of exclusive breastfeeding, parental income, and exposure to cigarette smoke with the incidence of AOM in elementary school children in Purwokerto. Multivariate results showed that there was an influence between cigarette smoke exposure (OR 7,043) and the incidence of AOM in elementary school children in Purwokerto

Conclusions: Exposure to cigarette smoke is the most influential factor in the incidence of AOM in primary school children.

Keywords: Risk Factors, Acute Otitis Media, Primary School Children

INTRODUCTION

One of the most prevalent infectious disorders in pediatric clinical institutions is acute otitis media (AOM), which has a substantial effect on healthcare. It is a polymicrobial illness that typically has a viral upper respiratory tract infection as a precursor. Treatment with antibiotics is frequently required for acute otitis media (AOM) (1) (2)

Acute Otitis Media or commonly called congek by the community is a condition when the middle ear is filled with fluid and follows the signs and symptoms of an infection. AOM is a disease caused by pathogens including Streptococcus pneumoniae, Haemophilus influenza, Streptococcus pygogenes, Moraxella catarrhalis, and viruses. AOM is a disease that's common among children. Gram-negative enteric bacterial pathogen or Staphylococcus aureus also can cause in newborns (3). AOM can cause permanent hearing infection and the ability to speak and language when it happens to children at their ages of speaking development and can affect their study if it is not properly handled (4).

The case of AOM in children in Indonesia is various, the average of the cases from research is around 14-26%. In the previous research was found that the prevalence of AOM that turns into OMSK in Bantul is around 5,28% (Padang 2013). AOM is one of ten diseases with the highest prevalence in

outpatient polyclinics jalan THT-KL RSU Prof. Dr. R. D. Kandou Manado in 2010 (5). Result from research by Anggraeni et al (2019) is 172 students have AOM (2,5% from all of the schools that had a physical exam) and 30 students have AOM (17,4%) (4). A major risk factor for rAOM in infancy is neonatal AOM. (6)

Research by Wahyono (2019) in Banyumas discovered a 3,5% prevalence of AOM in the Banyumas district. It revealed there are 125 cases of AOM in nine SD in Banyumas District. AOM can prevent by knowing the influencing factors incidence of AOM. From the previous research, influencing factors of AOM are age, gender, ras economy-social status, dysfunction of Tuba Eustachius (TU), Acute Respiratory Infection (ARI), growth in daycare, family history, near the smoking area, the quantity of family, not consuming breast milk, immune status, household firewood use, family history of ear infection, malnutrition, and allergy is also influencing factors of AOM (7,8). Recent studies have found that having siblings, postnatal household smooking, and owning birds all raise the risk of AOM. Breastfeeding reduced the likelihood of AOM, particularly in the first two months of life, nonetheless, protection is increased with exclusive and prolonged breastfeeding, while introduction of formula milk before 6 months increased the risk of AOM (2,9,10). Parent-reported prevalence of OM was linked with daycare attendance, poor mother psychological condition, and harsh parental discipline. According to these data, offering psychological supports to both parents and children may be an innovative method to prevent OM (11)

Information about risk factors that affect incidents of AOM can increase knowledge and planning preventive action. This research is proposed to find which risk factor can be the cause of AOM. Variables of this research are gender, immune status, allergy history, history of *Acute Respiratory Infection*, history of breastfeeding, history of exclusive breastfeeding, parent's income, number of family members, and cigarette smoke exposure. This research is expected to be a source of information to prevent AOM in elementary school children. Based on the data obtained in the field, there were 34 cases of AOM from several elementary schools in Purwokerto which were examined. So researchers are interested in researching the risk factors for AOM in students of an elementary school in Purwokerto

METHODS

This study uses a quantitative research methodology with a case-control study design. The research locations were in 2 elementary schools in the administrative city of Purwokerto, the Schools are SDN 4 Kranji and SDN 1 Bobosan. The case population and control population in this study were all elementary school students who had positive (case) and negative (control) AOM after being screened with symptoms of cough and runny nose, as well as being examined by an ENT (Ear, Nose, and Throat) specialist. The sampling of cases used in this study was Total Sampling with a sample of 34 cases. The control sample in this study used a purposive sampling technique with a case: control ratio of 1: 2, so a total of 68 samples were obtained as a control sample. The respondents used in this study were parents of elementary school students who were sampled in this study with specified criteria.

The instrument used in this research is a questionnaire. The dependent variable in this study was the incidence of Acute Otitis Media (AOM) in elementary school children in Purwokerto and the independent variable was the host (including gender, immunization status, history of allergies, history of ARI, history of exclusive breastfeeding, and parental income), and environmental conditions (includes number of family members in the house, and exposure to cigarette smoke). Data collection was carried out by visiting the respondent's house and conducting direct interviews. Data analysis was assisted by using SPSS tools using statistical tests using univariate analysis, bivariate analysis with Chi-square test, and multivariate analysis with logistic regression tests.

RESULTS

Univariate Analysis

The following is the frequency distribution of the variables in this study:

Table 1. Frequency Distribution of Variables

No	Variable	Case		Control	
		n	%	n	%
1	**Gender**				
	Man	15	44,1	30	44,1
	Woman	19	55,9	38	55,9
2	**Immunization Status**				
	Complete	34	17,6	5	7,4
	Incomplete	6	82,4	63	92,6
3	**Allergy History**				
	Yes	8	23,5	7	10,3
	No	26	76,5	61	89,7
4	**ARI History**				
	Yes	22	64,7	32	47,1
	No	12	35,3	36	52,9
5	**History of Exclusive Breastfeeding**				
	Not Exclusive Breastfeeding	12	35,3	9	13,2
	Exclusive Breastfeeding	22	64,7	59	86,8
6	**Parents income**				
	< district minimum wage	14	41,2	13	19,1
	>= district minimum wage	20	58,8	55	80,9
7	**Number of family members**				
	>5 people	4	11,8	7	10,3
	1-5 people	30	88,2	61	89,7
8	**Cigarette smoke exposure**				
	Exposed	23	67,7	7	25,0
	Not exposed	11	32,4	51	75,0

Based on Table 1 it can be seen that most of the respondents in the case group and the control group were female, there were 19 respondents (70.4%) in the case group and 38 respondents (55.9%) in the control group. From the immunization complete variable were 28 respondents (82.4%) in the case group, and 63 respondents (92.6%) in the control group. No history of allergies, as many as 26 respondents (76.5%) in the case group, and 61 respondents (89.7%) in the control group. Most of the respondents in the case group had a history of ARI, 22 respondents (64.7%), while in the control group, most did not have a history of ARI, 36 respondents (52.9%). The majority of respondents in the case and control groups received exclusive breastfeeding, namely 22 respondents (64.7%) in the case group, and 59 respondents (86.8%) in the control group. Having parents' income is more than the same as the UMK of Banyumas Regency, namely 20 respondents (58.8%) in the case group, and 55 respondents (80.9%) in the control group. Respondents lived with 1 to 5 people in one house, namely 30 respondents (88.2%) in the case group, and 61 respondents (89.7%) in the control group. Most of the respondents in the case group had exposure to cigarette smoke as many as 23 respondents (67.6%), while in the control group, most of them had no exposure to cigarette smoke as many as 51 respondents (75.0%).

Bivariate Analysis

These are the results of bivariate analysis to determine the relationship between the research variables and the incidence of AOM in children in Purwokerto:

Table 2 Results of Bivariate Analysis

No	Variable	P value	OR (95% CI)	Relationship
1	Gender	1,000		Not related
2	Immunization Status	0,173		Not related
3	Allergy History	0,138		Not related
4	ARI History	0,141		Not related
5	History of Exclusive Breastfeeding	0,019	3,576 (1,324 – 9,655)	Related
6	Parents Income	0,032	2,962 (1,190 – 7,372)	Related
7	Number of Family Member	1,000		Not related
8	Cigarette smoke exposure	0,000	6,273 (2,540 – 15,493)	Related

Based on Table 2, it can be seen that the variables associated with the incidence of AOM in elementary school children in Purwokerto were a history of exclusive breastfeeding (p=0.019), parental income (p=0.032), and exposure to cigarette smoke (p=0.000), while the variable which was not related to the incidence of AOM in elementary school children in Purwokerto were gender (p=1.000), immunization status (p=0.173), history of allergies (p=0.138), history of ARI (p=0.141), and number of family members in the house (p=1,000).

Multivariate Analysis

The following is the final modeling of the results of multivariate analysis to determine the variables that influence the incidence of AOM in elementary school children in Purwokerto:

Table 3: Final Model of Multivariate Analysis

Variable	B	Wald	P	OR	95% CI
Cigarette smoke exposure	1,952	13,814	0,000	7,043	2,516 – 19,714

Based on Table 3, it define that the variable that influences the incidence of AOM in elementary school children in Purwokerto is exposure to cigarette smoke (p=0.000).

DISCUSSION

Based on the results of bivariate analysis, exposure to cigarette smoke has a relationship between exposure to cigarette smoke and the incidence of AOM in students of an elementary school in Purwokerto. Based on the results of a multivariate analysis of cigarette smoke exposure affecting the incidence of AOM in students of an elementary school in Purwokerto, it can be concluded that students of elementary school exposed to cigarette smoke have a high risk of 7.043 times greater risk of developing AOM than elementary school children who are not exposed to cigarette smoke. This is in line with research conducted by Rovers MM, de Kok IM, and Schilder AG (2006) which found that in countries with high exposure to cigarette smoke, there will be a higher incidence of AOM (5).

Based on a meta-analytic study conducted by Kong and Coates (2009) defined that the risk of acute otitis media increased by 66% due to exposure to cigarette smoke (6). This is in line with Riskesdas (2012) which states that exposure to cigarette smoke is the risk of developing a disease in individuals due to inhaling cigarette smoke that comes from the individual's tobacco cigarette smoke environment, which can cause by an active smoker or a passive smoker. Based on a meta-analytic study conducted

by Kong & Coates (2009) it shows that exposure to cigarette smoke contributes to increasing the risk of AOM, because cigarette smoke will disrupt the Eustachian Tube Mucociliary Function. This is due to a disturbance in the function of the cilia in the respiratory epithelium resulting in the formation of excessive mucus which causes blockage of the Eustachian tube. If there is a blockage, the function of the Eustachian tube is disrupted and causes germs to enter the middle ear. This can lead to inflammation of the middle ear (6).

A significant risk factor for childhood otitis media is passive smoking, which also increases the likelihood that the condition would become chronic (21). Other studies reported that one of the parents' smoking relatives contributed to the development of recurrent acute otitis media (RAOM) (12). The reduction in 1,25-dihydroxyvitamin D synthesis caused by cigarette smoke in lung epithelial cells can be reversed by increasing serum levels of the substrate 25-hydroxyvitamin D. Additionally, cigarette smoke may impact the vitamin D receptor's expression levels (13,14). It was determined that a lowered level of 25(OH) vitamin D in the blood serum, which might raise the risk of episodes of acute otitis media in children and necessitate therapeutic correction, characterizes an absolute number of children (96%) with RAOM. (12)

Previous studies have revealed a relationship between socioeconomic status and the incidence of acute otitis media in both children and adults (19). 4.5% of people had OME. 46 instances were examined, and 4% were from the upper class, 26% from the upper middle class, 26% from the lower middle class, and 43% from the upper lower class (16). Further reported that Patients with a medium-high socioeconomic status had a lower incidence of COM, whereas those who reported higher ear discharge as a result of upper respiratory tract infections had a higher incidence. Patients used 12.07 percent to 60.37 percent of their household income to pay for COM-related expenses. (18) (20)

By identifying these risk factors, suitable action can be taken to lower the prevalence of AOM in Indonesia. PRECEDE-based education with regulating, monitoring, and follow-up was successful in encouraging preventive practices for otitis media. Therefore, it is advised that trainings based on this model be conducted in other health care centers and clinics in order to maintain children's health owing to the side effects of otitis media, especially in vulnerable periods such as childhood. (15)

CONCLUSIONS

Most of the case and control groups were female, received complete immunization, had no history of allergies, received exclusive breastfeeding, parents' income was above the UMK of Banyumas Regency, and lived with 1-5 people in 1 house. Most of the case groups had a history of ARI and exposure to cigarette smoke. Meanwhile, the control group had no history of ARI and no exposure to cigarette smoke. Based on the results of bivariate analysis, it defines that the variables that have a relationship with the incidence of AOM in students of elementary school in Purwokerto are a history of exclusive breastfeeding, parental income, and exposure to cigarette smoke. Based on the results of the multivariate test, the variable that is proven to influence the incidence of AOM is exposure to cigarette smoke where children who are exposed to cigarette smoke have a 7.043 times greater risk of developing AOM compared to children who do not get exposure to cigarette smoke (OR=7.043).

RECOMMENDATION

Parents who have children of primary school age should keep their children from being exposed to cigarette smoke. This can be done by not smoking around children or outside the home, and giving an appeal to families not to smoke inside the house and not to be around children.

ACKNOWLEDGMENTS

--

REFERENCES

1. Darmawan AB, Dewantari AK, Putri HFM, Wiyatno A, Wahyono DJ, Safari D. Identification of the Viral Pathogens in School Children With Acute Otitis Media in Central Java, Indonesia. Glob Pediatr Heal. 2023;10:2333794X221149899.
2. van Ingen G, le Clercq CMP, Touw CE, Duijts L, Moll HA, Jaddoe VW V, et al. Environmental determinants associated with acute otitis media in children: a longitudinal study. Pediatr Res. 2020 Jan;87(1):163–8.
3. Betz CL. Buku Saku Keperawatan Pediatri. Jakarta: EGC; 2009.
4. Soepardi EA, Iskandar N, Bashiruddin J, Restuti RD. Kelainan telinga tengah. In: Buku Ajar Ilmu Kesehatan Telinga Hidung Tenggorok. 6th ed. Jakarta: Balai Penerbit FKUI; 2012.
5. Sedjati M, Palandeng O, Pelealu O. POLA KUMAN PENYEBAB OTITIS EKSTERNA DAN UJI KEPEKAAN ANTIBIOTIK DI POLIKLINIK THT-KL BLU RSUP PROF. Dr. R. D. KANDOU MANADO

PERIODE NOVEMBER – DESEMBER 2013. e-CliniC. 2014 Feb 14;2.

6. Megged O, Abdulgany S, Bar-Meir M. Does Acute Otitis Media in the First Month of Life Increase the Risk for Recurrent Otitis? Clin Pediatr (Phila). 2018 Jan;57(1):89–92.

7. Wijayanti SPM, Wahyono DJ, Rejeki DSS, Octaviana D, Mumpuni A, Darmawan AB, et al. Risk factors for acute otitis media in primary school children: a case-control study in Central Java, Indonesia. J Public health Res. 2021 Jan;10(1):1909.

8. Carlson L. Inside and out. A review of otitis in children. Adv Nurse Pract. 2007 May;15(5):51-52,54,56-58.

9. Kørvel-Hanquist A, Djurhuus BD, Homøe P. The Effect of Breastfeeding on Childhood Otitis Media. Curr Allergy Asthma Rep. 2017 Jul;17(7):45.

10. Bowatte G, Tham R, Allen KJ, Tan DJ, Lau M, Dai X, et al. Breastfeeding and childhood acute otitis media: a systematic review and meta-analysis. Acta Paediatr. 2015 Dec;104(467):85–95.

11. Chen K-WK, Huang DT-N, Chou L-T, Nieh H-P, Fu R-H, Chang C-J. Childhood otitis media: Relationship with daycare attendance, harsh parenting, and maternal mental health. PLoS One. 2019;14(7):e0219684.

12. Vorobyeva MP, Karpova EP, Tulupov DA, Naumov OG, Zakharova IN. [Risk factors and clinical features of the course of recurrent acute otitis media in children]. Vestn Otorinolaringol. 2022;87(1):9–13.

13. Haley KJ, Manoli SE, Tantisira KG, Litonjua AA, Nguyen P, Kobzik L, et al. Maternal Smoking Causes Abnormal Expression of the Vitamin D Receptor. In: D41 SMOKING HEALTH EFFECTS. American Thoracic Society; 2009. p. A5874.

14. Hansdottir S, Monick M, Lovan N, Powers L, Hunninghake G. Smoking Disrupts Vitamin D Metabolism In The Lungs. Vol. 181, Am J Respir Crit Care Med. 2010. 1425–1425 p.

15. Moradi A, Soltani R, Shamsi M, Moradzadeh R. Effects of online social media on improving mothers' behaviors towards preventing their children's otitis media based on the PRECED model: a randomized educational intervention trial. BMC Pediatr. 2023 May;23(1):216.

16. Siddartha, Bhat V, Bhandary SK, Shenoy V, Rashmi. Otitis media with effusion in relation to socio economic status: a community based study. Indian J Otolaryngol head neck Surg Off Publ Assoc Otolaryngol India. 2012 Mar;64(1):56–8.

17. Norhayati MN, Ho JJ, Azman MY. Influenza vaccines for preventing acute otitis media in infants and children. Cochrane database Syst Rev. 2017 Oct;10(10):CD010089.

18. Pérez-Herrera LC, Peñaranda D, Moreno-López S, Otoya-Tono AM, Gutiérrez-Velasco L, García JM, et al. Associated factors, health-related quality of life, and reported costs of chronic otitis media in adults at two otologic referral centers in a middle-income country. PLoS One. 2020;15(12):e0244797.

19. Castagno LA, Lavinsky L. Otitis media in children: seasonal changes and socioeconomic level. Int J Pediatr Otorhinolaryngol [Internet]. 2002;62(2):129–34. Available from: https://www.sciencedirect.com/science/article/pii/S0165587601006073

20. Hounkpatin SHR, Adedemy JD, Flatin MC, E. Awassi SF, Afouda SL, Avakoudjo F, et al. Risk Factors for Acute Otitis Media in Children Aged 0 to 5 Years in Parakou. Int J Otolaryngol Head & Neck Surg. 2016;05(02):73–8.

21. Samson D, Rupa V, Veeraraghavan B, Varghese R, Isaac R, L J. Follow up of a birth cohort to identify prevalence and risk factors for otitis media among Indian children in the eighth year of life. Int J Pediatr Otorhinolaryngol [Internet]. 2020;137:110201. Available from: https://www.sciencedirect.com/science/article/pii/S016558762030344X