CoMPHI Journal: Community Medicine and Public Health of Indonesia Journal
Vol. 6, No. 1, Bulan Februari Tahun 2025, hlm. 1-6

e-ISSN 2722-8169
p-ISSN 2723-097X

Understanding the Determinants of Acute Otitis Media in Children Exposed to Tobacco Smoke: A Study from an Urban Indonesian Population

Nabilla Firya Ekananda*, Christina Rusli, Pramita Anindya

Fakultas Kedokteran, Universitas Hang Tuah

Article History:
Received: 2025-01-11
Revised: 2025-02-01
Accepted: 2025-03-20
Publish: 2025-06-30

Key words:
Children aged 0-5 years, Acute Otitis Media, Exposure to cigarette

Author correspondence:
Name: Nabilla Firya Ekananda
Institution: Faculty of Medicine, Hang Tuah University
Address: Graha Kebonsari Elveka VII/21, Kebonsari, Jambangan, Surabaya, 60233
Email: nabillafiryaekananda@gmail.com

ABSTRACT

Smoking habits have been the basis of various health issues throughout the world, including Indonesia, where smoking activities can produce products in the form of cigarette smoke, which also hurts health. Ear disorders are one of the common health issues in Indonesia. One of the common ear disorders in children is Acute Otitis Media, which is an inflammation of the middle ear, where one of the risk factors is high smoking activity or exposure to cigarette smoke. This study aims to determine the relationship between cigarette smoke exposure and the incidence of Acute Otitis Media in children aged 0-5 years at RSPAL Dr. Ramelan Surabaya. The method used is observational analytic with a cross-sectional design. The study population consisted of all patients at RSPAL. Ramelan Surabaya, who met the inclusion criteria, consisted of 74 respondents who completed a questionnaire related to cigarette smoke exposure and their diagnosis, which was then analyzed for the relationship between the two. The results of the Spearman correlation showed that there was a relationship between cigarette smoke exposure and the incidence of Acute Otitis Media in children aged 0-5 years at RSPAL. Ramelan ($p < 0.001$) with a correlation coefficient of 0.329, indicating a moderate relationship. The results of this study indicate that most patients at RSPAL Dr. Ramelan Surabaya have Acute Otitis Media, with moderate cigarette smoke exposure. This study concludes that cigarette smoke exposure has a significant relationship with the incidence of Acute Otitis Media, especially in children aged 0-5 years at RSPAL, Dr. Ramelan Surabaya.

Introduction

One of the health issues that occurs quite frequently in Indonesia, especially in children, is ear disorders. Indonesia is ranked 4th among countries with the highest prevalence of ear disorders, at 4.6%. (1) Acute Otitis Media (AOM) is a form of ear disorder that has clinical manifestations in the form of inflammation of the middle ear, accompanied by local symptoms such as fever, pain, reduced hearing function, and discharge from the ear that develops in less than 3 weeks (2). This condition can be caused by infection from harmful agents such as bacteria and viruses. The bacteria that most often cause AOM include Streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis (3).

Patients with AOM can experience a decrease in Quality of Life (QoL), particularly in school-age children, who may exhibit decreased concentration and social difficulties communicating with their surroundings, leading to a decline in the academic and social well-being of children (4). The highest incidence of AOM occurs in children aged 3 months to 3 years, during which time they will experience at least one AOM incident until they reach the age of 7 years (5). The peak incidence of AOM occurs in children aged 1–4 years, at 60.99% (1). The age distribution of AOM is influenced by anatomical

e-ISSN 2722-8169
p-ISSN 2723-097X

factors of the Eustachian tube, which is shorter, wider, and horizontally oriented in children.

Smoking can contribute to air pollution by releasing pollutants contained in cigarette smoke. Exposure to cigarette smoke is also said to be a risk factor that often underlies AOM (6). Cigarette smoke can cause inflammation of the Eustachian tube. It may reduce its effectiveness, causing damage to mucociliary clearance (MCC), thereby increasing the potential for bacterial colonization that contributes to the development of AOM. Exposure to cigarette smoke is also frequently associated with recurrent otitis media, chronic otitis media, and surgical otitis media (7).

Based on the explanation above, it can be seen that AOM is one of the health issues that occurs quite frequently in Indonesia. AOM also has a close relationship with exposure to cigarette smoke as a risk factor, where high smoking behavior influences exposure to cigarette smoke in Indonesia. Hence, the incidence of AOM and its prevention are significant to pay attention to. However, several previous studies have not been able to show consistent results regarding the relationship between exposure to cigarette smoke and the incidence of AOM in Indonesia. In contrast, research conducted by (8) concluded that there is a relationship between exposure to cigarette smoke and the incidence of AOM. Therefore, in this study, further observations will be made regarding the relationship between exposure to cigarette smoke and the incidence of AOM, especially in children aged 0-5 years.

Methodology

This type of research is observational analytic using a cross-sectional research design. The population in this study consisted of every child aged 0-5 years who were registered as patients with family members who smoke or do not smoke at Dr. Ramelan Hospital Surabaya, with a sample size of 35 individuals. The research subjects used were medical record data from patients diagnosed with AOM, which will then be further analyzed regarding exposure to cigarette smoke using a questionnaire instrument. The sampling technique employed was purposive sampling, and the study was conducted from July 2024 to December 2024. Data analysis used univariate and bivariate analysis.

Results and Discussion

The results of this study explain whether there is a relationship between cigarette smoke exposure and the incidence of Acute Otitis Media in children aged 0-5 years at RSPAL Dr. Ramelan Surabaya. The number of respondents was 74 people who met the inclusion criteria and did not meet the exclusion criteria. The cigarette smoke exposure variable was obtained from primary data collected using a questionnaire. In contrast, the OMA variable was obtained from secondary data, specifically the medical records of patients and children at the ENT Polyclinic in RSPAL, Dr. Ramelan Surabaya.

Table 1. Characteristics Based on Age

Age	Frequency	Percentage (%)
<1 year	9	12%
1 year	6	8%
2 years	6	8%
3 years	9	12%
4 years	17	23%
5 years	27	37%
Total	74	100%

Table 1 shows that the majority of respondents were children aged 5 years with a total of 27 people (37%), while children aged >1 year were nine people (12%), children aged 1 year were six people (8%), children aged 2 years were six people (8%), children aged 3 years were 9 years (12%), and children aged 4 years were 17 people (17%).

e-ISSN 2722-8169
p-ISSN 2723-097X

Table 2. Characteristics Based on Gender

Gender	Frequency	Percentage (%)
Man	53	53%
Woman	21	21%
Total	74	100%

Table 2 shows that there were 53 male children (53%) and 21 female children (21%).

Table 3. Exposure to Cigarette Smoke

Exposure to Cigarette Smoke	Frequency	Percentage (%)
Low View	38	51%
Medium View	28	38%
High View	8	11%
Total	74	100%

Table 3 shows that there were 38 children (51%) with low exposure to cigarette smoke, 28 children (38%) with moderate exposure to cigarette smoke, and 8 children (11%) with high exposure to cigarette smoke.

There are two measuring instruments in this study, namely data from the ENT and pediatric polyclinics of Dr. Ramelan Surabaya Hospital to determine the incidence of AOM in children aged 0-5 years at Dr. Ramelan Surabaya Hospital and a cigarette smoke exposure questionnaire which is divided into two subscales consisting of exposure to cigarette smoke in the family environment and exposure to cigarette smoke in the outside environment. After that, a correlation test will be carried out between the total score of the questionnaire and the incidence of AOM in patients.

Researchers used the Spearman correlation test as a statistical test to determine the relationship between the independent variable, namely exposure to cigarette smoke, and the dependent variable, namely the incidence of AOM.

Table 4. Spearman Correlation Test of Cigarette Smoke Exposure with the Incidence of Acute Otitis Media

	Correlation Value	Sig. (2-tailed) (p)	Total (N)
Duration	1.000	<0,001	74
Secondhand Smoke Exposure Questionnaire	.329**		

Table 4 shows that the p value < 0.001 (p < 0.005). Therefore, in this study, H1 is accepted and H0 is rejected, where H1 means there is a significant relationship with a correlation coefficient of 0.329, which means a unidirectional relationship and is at a moderate level between cigarette smoke exposure and the incidence of AOM in children aged 0-5 years at RSPAL Dr. Ramelan Surabaya.

Of the 74 respondents in this study, the majority were 5 years old. However, among the 37 respondents diagnosed with AOM, the majority were aged 0-3 years, specifically 20 individuals. This is based on research (9) that states most cases of AOM occur in children aged 3 months to 3 years. In addition, research by (10) also supports this statement, indicating that at least 60% of children aged 2 years have experienced at least one AOM incident.

This age distribution is based on the statement that exposure to cigarette smoke by parents has a negative impact, especially on toddlers (11). Still, this distribution can also be

e-ISSN 2722-8169
p-ISSN 2723-097X

influenced by other risk factors, one of which is the anatomy of the Eustachian tube in children which has a shorter size, horizontal projection, and more flexible walls so that it can facilitate the reflux of pathogens from the nasopharynx to the middle ear which can increase the risk of AOM (10). Breastfeeding in the supine position is also thought to have a significant Influence on AOM (5).

Of the 74 respondents in this study, the majority were boys, comprising 53 individuals (71%), compared to 21 girls (28%). Similarly, of the 37 respondents diagnosed with AOM, the majority consisted of boys, namely 25 people (68%), compared to girls, namely 12 people (32%). This is based on research (1), which states that men are more susceptible to AOM than women. Men are said to be more susceptible to AOM because of the immunological response and hormonal factors that are different from women, which make men more susceptible to ARI, which can disrupt the function of the Eustachian tube, causing AOM (12).

In adults, AOM also attacks men more often than women, presumably because in Indonesia the percentage of male smokers reaches 66% and women only 6.7% (13). Research by (3) also shows that smoking behavior in Indonesia is higher in men than women, so this has an impact on the higher incidence of AOM in men.

Of the 74 respondents in this study, the most children were found to have moderate exposure to cigarette smoke, namely 38 people (51%). Similarly, of the 37 respondents who had children diagnosed with AOM, it was found that the majority of children had moderate exposure to cigarette smoke, namely 18 children (49%), followed by children with low exposure to cigarette smoke as many as 13 people (35%) and children with high exposure to cigarette smoke as many as six people (16%). This is based on research (5) which states that smoking habits in parents have a significant Influence on the occurrence of AOM in children.

Most children who live with smoking family members with prolonged exposure to cigarette smoke for more than three hours are at increased health risks (14). As stated in research by (7), cigarette smoke can cause inflammation of the Eustachian tube. It may reduce its effectiveness to cause damage to mucociliary clearance (MCC), thereby increasing the potential for bacterial colonization that contributes to the development of AOM.

Based on the research that has been done, data analysis and statistical tests in the form of Spearman correlation tests were carried out to see the relationship between the independent variable, namely exposure to cigarette smoke on an ordinal scale, with the dependent variable, namely the incidence of AOM in children aged 0-5 years on a nominal scale. The study's results were significant. There was a relationship between exposure to cigarette smoke and the incidence of AOM in children aged 0-5 years at RSPAL Dr. Ramelan Surabaya, which was proven by the p-value ($p < 0.005$), which means that H1 was accepted. At the same time, H0 was rejected, and the correlation coefficient was 0.329, indicating a unidirectional correlation of moderate strength.

In this study, the results obtained are in the same direction as the study by (8) which concluded that there is a relationship between exposure to cigarette smoke and the incidence of AOM where the correlation test by (15) found significant results with a correlation coefficient of 0.517 which means there is a relationship in the same direction with a strong level between exposure to cigarette smoke and the incidence of AOM. This phenomenon is associated with smoking habits, which are thought to have underpinned various health issues throughout the world, where it is known that the number of smokers globally has reached 1.3 billion people (13). However, the direct relationship between environmental factors and AOM has not yet been proven; however, exposure to cigarette smoke is thought to have a significant Influence on AOM (5).

e-ISSN 2722-8169
p-ISSN 2723-097X

The relationship between cigarette smoke exposure and the incidence of AOM in children is supported by research (5), which states that the nicotine activity contained in cigarette smoke increases bacterial adhesion to the surface of epithelial cells, thereby mediating the occurrence of infection and invasion of microorganisms in the nasopharynx. This infection can then spread to the middle ear and disrupt mucociliary function, which has the potential to increase the risk of developing AOM in children.

Research by (7) also states that cigarette smoke can cause inflammation of the Eustachian tube and may reduce its effectiveness, causing damage to mucociliary clearance (MCC), thereby increasing the potential for bacterial colonization that contributes to the development of AOM. Exposure to cigarette smoke is also often associated with the occurrence of recurrent otitis media, chronic otitis media, and otitis media with surgery.

Conclusion

Based on the results of the research, data analysis, and discussion on "The Relationship between Cigarette Smoke Exposure and the Incidence of Acute Otitis Media in Children Aged 0-5 Years at RSPAL dr. Ramelan Surabaya", it can be concluded that there is a significant and unidirectional relationship with a moderate level, with a correlation coefficient of 0.329 between cigarette smoke exposure and the incidence of AOM in children aged 0-5 years at RSPAL Dr. Ramelan Surabaya ($p < 0.001$).

References

1. Dandung, M.I. et al. (2024) Prevalensi Otitis Media Akut di RSUD Haji Makassar Provinsi Sulawesi Selatan Tahun 2020-2021.

2. Arief, T. *et al.* (2021) 'Karakteristik Pasien Otitis Media Akut', *Jurnal Ilmiah Kesehatan Sandi Husada*, 10(1), pp. 7–11. Available at: https://doi.org/10.35816/jiskh.v10i1.492

3. Dewi Ratnasari, N. (2023) 'Diagnosis Dan Tatalaksana Terkini Otitis Media Akut : Tinjauan Pustaka', *Journal of Comprehensive Science (JCS)*, 2(11). Available at: https://doi.org/10.59188/jcs.v2i11.540

4. Fairza, R.I. (2021) 'Hubungan Paparan Asap Rokok dengan Kejadian Otitis Media Akut Pada Anak', *Journal of Medicine*, 14(1).

5. Ahmed, I. *et al.* (2022) 'Risk Factors of Acute Otitis Media in Early Age (A Meta-Analysis)', *Pakistan Journal of Medical and Health Sciences*, 16(3). Available at: https://doi.org/10.53350/pjmhs221631212.

6. Safitri, A. and Laksmiasanti, A. (2021) 'Hubungan antara Frekuensi Merokok dengan Gangguan Pendengaran', *Proceeding Book National Symposium and Workshop Continuing Medical Education XIV*, pp. 1547–1555

7. Lam, T.K. *et al.* (2023) 'Association of e-Cigarette Exposure with Pediatric Otitis Media Recurrence', *Annals of Otology, Rhinology and Laryngology*, 132(9). Available at: https://doi.org/10.1177/00034894221129013.

8. Amelia, R., Nasrul, E. and Basyar, M. (2016) 'Hubungan Derajat Merokok Berdasarkan Indeks Brinkman dengan Kadar Hemoglobin', *Jurnal Kesehatan Andalas*, 5(3), pp. 619–624. Available at: https://doi.org/10.25077/jka.v5i3.587

9. Purba, L.A., Imanto, M. and Angraini, D.I. (2021) 'Hubungan Otitis Media Akut dengan Riwayat Infeksi Saluran Pernapasan Atas pada Anak', *Medula*, 10, pp. 670–676.

10. Zega, C.B. (2020) 'Otitis media akut', *Kesehatan*, p. 1437

11. Riyanto, R. and Kusumawati, A. (2016) 'Pengaruh Asap Rokok Terhadap Frekuensi Terjadinya Penyakit ISPA pada Balita di Puskesmas Kedung Banteng Banyumas', *MEDISAINS: Jurnal Ilmiah Ilmu-ilmu Kesehatan*, 14(3), pp. 15–23. Available at: http://jurnalnasional.ump.ac.id/index.php/medisains/article/download/1614/2120

12. Hastuti, W. (2024) 'Analisis Hubungan Usia dan Jenis Kelamin dengan Kejadian Otitis Media Akut', 2(4).

e-ISSN 2722-8169
p-ISSN 2723-097X

13. Salsabila, N.N., Indraswari, N. and Sujatmiko, B. (2022) 'Gambaran Kebiasaan Merokok Di Indonesia Berdasarkan Indonesia Family Life Survey 5 (Ifls 5)', *Jurnal Ekonomi Kesehatan Indonesia*, 7(1), p. 13. Available at: https://doi.org/10.7454/eki.v7i1.5394

14. Muchlis, N. *et al.* (2023) 'Cigarette Smoke Exposure and Stunting Among Under-five Children in Rural and Poor Families in Indonesia', *Environmental Health Insights*, 17(December 2022). Available at: https://doi.org/10.1177/11786302231185210

15. Fairza, R.I. (2021) 'Hubungan Paparan Asap Rokok dengan Kejadian Otitis Media Akut Pada Anak', *Journal of Medicine*, 14(1)