

RESEARCH ARTICLE

RELATIONSHIP OF AGE, GENDER, AND RECURRENT
ACUTE OTITIS MEDIA WITH CHRONIC SUPPURATIVE OTITIS MEDIA
(HUBUNGAN USIA, JENIS KELAMIN, DAN OTITIS MEDIA AKUT BERULANG
DENGAN OTITIS MEDIA SUPURATIF KRONIK)

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ABSTRACT

Chronic suppurative otitis media (CSOM) can cause hearing loss and negatively affect children's growth and development. Many predisposing factors may influence the development of chronic suppurative otitis media. This condition can be prevented through appropriate preventive measures. This study aimed to determine the relationship between age, gender, and a history of recurrent acute otitis media (AOM) and the incidence of CSOM in children. This observational study used a case-control design. The study sample consisted of children aged 6 months to 18 years, selected through consecutive sampling, comprising 51 children with CSOM and 51 children without CSOM. Data were analyzed using the chi-square and Fisher's exact test. The most common age group was 1-5 years, and the most common gender was female. Age and gender were not significantly associated with OMS (p = 0.227; OR = 1.630 and p = 0.843, OR = 1.082, respectively). In contrast, recurrent AOM was significantly associated with CSOM (p-value = 0.000 (<0.05); OR = 13.143). Thus, a history of recurrent AOM was identified as the most important factor associated with CSOM in this study, conferring a 13-fold higher risk.

Keywords: acute otitis media, age, chronic suppurative otitis media, gender

ABSTRAK

Otitis Media Supuratif Kronik (OMSK) dapat menimbulkan gangguan pendengaran dan berdampak negatif pada tumbuh kembang anak. Banyak faktor predisposisi yang dapat mempengaruhi berkembangnya OMSK. Kondisi ini dapat dihindari melalui tindakan preventif. Penelitian ini bertujuan untuk mengetahui hubungan faktor usia, jenis kelamin, dan riwayat Otitis Media Akut (OMA) berulang dengan kejadian OMSK pada anak. Penelitian ini menggunakan metode analitik observasional dengan pendekatan case-control, sampel penelitian adalah anak usia 6 bulan-18 tahun yang dipilih secara consecutive sampling berjumlah 51 subjek pasien OMSK dan 51 subjek non OMSK. Analisa data dilakukan dengan

uji chi-square dan fisher exact test. Hasil penelitian ini menunjukkan usia terbanyak pada adalah usia 1-5 tahun, dan jenis kelamin terbanyak pada perempuan. Faktor usia dan jenis kelamin tidak memiliki hubungan yang signifikan terhadap OMSK (p-value 0,227; OR=1,630 dan 0,843; OR=1,082). Sedangkan faktor OMA berulang mendapatkan hubungan yang signifikan terhadap OMSK (p-value 0,000 (<0,05); OR=13,143). Dengan demikian dapat disimpulkan riwayat OMA berulang menjadi faktor yang paling berperan terhadap kejadian OMSK pada penelitian ini dengan peningkatan risiko 13 kali lebih besar.

Kata kunci: jenis kelamin, otitis media akut, otitis media supuratif kronik, usia

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a chronic inflammation affecting part or all of the middle ear that persists continuously or recurs for more than two months. It is characterized by tympanic membrane perforation and the discharge of mucopurulent or purulent secretions.¹ This disease is classified into two forms: benign and malignant.² According to data from the World Health Organization (WHO), CSOM affects an estimated 65-330 million people worldwide, with approximately 60% experiencing significant hearing loss. Most cases occur in developing countries, including Indonesia.³ According to the Indonesian Ministry of Health, Indonesia contributes substantially to the global burden, with a prevalence of approximately 2-4%. Among these cases, 22% occur in children under five years of age.⁴

Many predisposing factors increase the risk of CSOM, including age, gender, poor nutritional status, exposure to cigarette smoke, and a history of recurrent illnesses

such as acute respiratory tract infection (ARTIs), acute otitis media (AOM), and allergies.⁵ In children, CSOM is more common because of their immature immune system, which increases susceptibility to infection. The risk is further exacerbated by untreated or inadequately managed recurrent AOM and poor hygiene practices.⁶ If left untreated, CSOM can negatively affect a child's growth and development, as the infection may damage the auditory system and lead to hearing loss.⁴

According to the WHO, 60% of hearing loss cases can be prevented through measures such as immunization against rubella and meningitis, improved maternal and neonatal care, and early screening and treatment of otitis media.⁷ Therefore, prevention efforts should focus on identifying predisposing factors and ensuring appropriate management of CSOM. Previous studies have examined the risk factors associated with CSOM. Several studies have reported a significant

relationship between recurrent AOM and the incidence of CSOM, as well as the potential influence of age, gender, and other risk factors. However, previous studies have involved variations in population and have been conducted predominantly in hospitals. This study aimed to address this gap by examining the relationship between age, gender, and history of recurrent acute otitis media (AOM) and the incidence of CSOM among children attending primary healthcare centers, with the goal of supporting early detection and preventing further complications.

MATERIAL AND METHODS

This study used an observational analytical method with a case-control design. The study was conducted from March to May 2025 at primary healthcare centers in Pondok Aren District. The study sample consisted of children aged 6 months to 18 years who were selected through consecutive sampling. The minimum sample size was calculated using the Lemeshow formula, resulting in 51 subjects with CSOM and 51 subjects without CSOM.

The inclusion criteria were: (1) children diagnosed with CSOM for the case group and children without current or prior CSOM for the control group, and (2) children whose parents agreed to participate as respondents and complete the

questionnaire. The exclusion criteria included children with congenital abnormalities of the ear, nose, and throat and parents who declined to participate.

This study used both primary and secondary data obtained from patient medical records. Data were analyzed using univariate analysis and bivariate analyses. Bivariate analysis was performed using SPSS version 27, with the chi-square test and Fisher's exact test. This study was approved by the Medical and Health Research Ethics Committee of the University of Muhammadiyah Prof. DR. HAMKA (Approval No. KEPKK/FK/025/03/025).

RESULT AND DISCUSSION

The frequency distribution of chronic suppurative otitis media characteristics is presented in Table 1. Chronic suppurative otitis media (CSOM) was most commonly found in the 1-5-year age group (45.1%). Similar findings were reported by Nurafni et al. (2024), who found that the highest proportion of children with CSOM was in the 2-10-year-old age group (59%).⁸ However, several other studies reported different findings. Studies conducted by Alwy et al. (2023) and Novian et al. (2018) at an ENT-KL clinic found the highest prevalence of CSOM among individuals aged 26-45 years.^{1,9}

In this study, CSOM was more common among females, accounting for 27 children (52.9%). This finding is consistent with the study by Alwy et al. (2023), which reported 117 female patients (57.4%) compared with 42.6% male patients.¹ Similar findings were reported by Adellia et al. (2024). Who found that CSOM cases were more common among females (52.9%). A study conducted at Sayang Rakyat General Hospital during January–December 2021 also reported a similar pattern, with 55% of CSOM patients being female.^{8,10}

However, some studies have reported different results. Asroel et al. (2013) found a higher proportion of males

(64; 53.78%) than females (55; 46.22%).¹¹ Similarly, Arifin, et al. (2025) reported a higher proportion of males (50; 62.50%) compared with females (30; 37.50%).¹²

Based on the history of recurrent AOM among children with CSOM, 30 children (58.8%) had a history of recurrent AOM. These findings are consistent with those reported by Boediarsih et al., who found that recurrent AOM was more common among patients with CSOM (68.4%).⁴ A study conducted at H. Adam Malik General Hospital also found that 68.91% of patients with CSOM had a history of recurrent otitis media.¹¹ The detailed distribution is presented in Table 1.

Table 1 Frequency distribution of CSOM characteristics

Characteristics		Frequency	%
Age	6-11 months	1	2,0
	1-5 years	23	45,1
	6-7 years	11	21,6
	8-18 years	16	31,4
Gender	Male	24	47,1
	Female	27	52,9
History of recurrent AOM	Recurrent	30	58,8
	Non-recurrent	21	41,2

This study also presents the frequency distribution of CSOM according to other risk factors associated with recurrent acute otitis media. Based on Table

2, among children with CSOM, 30 (58%) had a history of acute respiratory infection, and 31 (60.8%) were exposed to cigarette smoke.

Table 2 Frequency distribution of CSOM characteristics according to other risk factors

Characteristics	Frequency (%)	
	Yes	No
History of acute respiratory infection	30 (58,8)	21 (41,2)
Exposure to cigarette smoke	31 (60,8)	20 (39,2)

The Relationship Between Age and CSOM

The results of the statistical analysis examining the relationship between age and CSOM are presented in Tables 3 and 4.

Based on Table 3, several cells contained frequencies of less than 5. Therefore, Fisher’s exact test was performed as an alternative using a 2x2 contingency table. Age was subsequently categorized into two groups.

Table 3 Chi-square test results for the relationship between age and CSOM

Age	CSOM		Total	P-value
	Yes	No		
6-11 months	1 (2,0%)	1 (2,0%)	2	0,341
1-5 years	23 (45,1%)	17 (33,3%)	40	
6-7 years	11 (21,6%)	8 (15,7%)	19	
8-18 years	16 (31,4%)	25 (49,0%)	41	

Based on table 4, there was no significant relationship between age and the incidence of CSOM (p-value = 0.007). The odds ratio indicated that children aged ≥ 6 years had a 1.630-fold higher risk of

developing CSOM than children aged < 6 years. However, this association was not statistically significant as the confidence interval included 1.

Table 4 Fisher’s exact test results for the relationship between age and CSOM

Age	CSOM		Total	P-value	OR	95%CI
	Yes	No				
≥ 6 years	27 (45,0%)	33 (55,0%)	60	0,227	1,630	0,736 – 3,609
< 6 years	24 (57,1%)	18 (42,9%)	42			

These results are in line with a study conducted between 2019 and 2020 at the ENT-KL Clinic, Cut Meutia Regional Hospital, North Aceh, which also found no significant relationship between age and CSOM (p-value = 0.319).¹ In contrast, a

study by Novian et al. reported a statistically significant association (p-value = 0.000).⁹

Children and adults have a similar likelihood of developing CSOM; however, the risk factors may differ between age groups. In children, CSOM may be

associated with an immature immune system, anatomical factors, such as shorter and flatter Eustachian tubes that increase susceptibility to pathogen reflux from the upper respiratory tract, and external risk factors including exposure to cigarette smoke, poor parental hygiene practices, and untreated ear infections resulting from inadequate treatment. In adults, the high prevalence of CSOM may be related to poor personal hygiene, vulnerable immunity due to external factors such as stress associated with lifestyle changes and life demands, active or passive exposure to cigarette smoke, and a history of recurrent ear infections.⁹

In addition, parental knowledge and education also play an important role. Studies by Adellia et al. and Boesoirie et al. showed that parents with higher levels of education are generally better to understand health information, recognize early

symptoms, and implement healthy lifestyle practices. Conversely, lower education attainment may limit parents' understanding of the importance of nutrition, ear hygiene, and the management of conditions such as respiratory infections and allergies, which may contribute to the risk of otitis media.^{10,13}

The Relationship Between Gender and CSOM

The results of the statistical analysis examining the relationship between gender and CSOM are presented in Table 5. As shown in the table, there was no significant relationship between gender and the incidence of CSOM (p-value = 0.843). The odds ratio indicated that females had a 1.082-fold higher likelihood of developing CSOM than males. However, this finding was not statistically significant because the confidence interval included 1.

Table 5 Chi-square test results for the relationship between gender and CSOM

Gender	CSOM		Total	P-value	OR	95%CI
	Yes	No				
Female	27 (49,1%)	28 (50,9%)	55	0,843	1,082	0,497 – 2,358
Male	24 (51,1%)	23 (48,9%)	47			

Research by Monganisa et al. reported similar findings, showing no significant relationship between gender and CSOM (p-value = 0.442).¹ However, another study reported contrasting results, finding a

significant association between gender and the incidence of CSOM (p value = 0.000).⁹

According to studies by Kishore and Mahayana et al., hormonal factors, immune responses, treatment-seeking behavior, and socioeconomic factors may contribute to the

higher occurrence of CSOM among females. Higher estrogen levels in females may influence immune and inflammatory responses, thereby increasing susceptibility to ear infections.^{14,15} Although there is no definitive theory that directly links hormones to CSOM, some studies suggest that estrogen may contribute to Eustachian tube dysfunction (ETD) through mechanisms such as fluid retention and mucosal edema, which can lead to tube obstruction and subsequently trigger otitis media. In addition, women tend to seek for medical treatment more proactively than men, which may result in a higher number of diagnosed cases among females.¹⁶

Conversely, other studies have associated the higher prevalence of CSOM among males with environmental factors, activity-related factors, and smoking. Males are often more exposed to outdoor pollutants and communicable diseases such as acute respiratory infections (ARI), increasing their risk of developing CSOM.⁹ Smoking is also a contributing factor, as pathogens from the respiratory tract can migrate through the Eustachian tube into the middle ear, leading to tube dysfunction and

impaired mucociliary clearance, ultimately resulting in CSOM over time.¹¹

In pediatric CSOM, no studies in Indonesia have specifically examined differences in parental behavior towards boys and girls regarding treatment-seeking or disease management. However, studies conducted in Lucknow, India, and Nepal found that boys were more likely to receive medical treatment sooner than girls. Parents also tended to seek higher-quality healthcare for male children than for female children.¹⁷

The Relationship Between a History of Recurrent AOM and CSOM

The results of the statistical analysis examining the relationship between a history of recurrent AOM and chronic suppurative otitis media (CSOM) are presented in table 6. As shown in the table, there was a significant relationship between a history of recurrent AOM and the occurrence of CSOM (p-value = 0.000). The odds ratio indicated that children with a history of recurrent AOM had a 13.143-fold higher risk of developing CSOM than those without a history of recurrent AOM.

Table 6 Chi-square test results for the relationship between recurrent AOM And CSOM

History of recurrent AOM	CSOM		Total	P-value	OR	95%CI
	Yes	No				
Recurring	30 (85,7%)	5 (14,3%)	35	0,000	13,143	4,471 – 38,637
Non-recurring	21 (31,3%)	46 (68,7%)	67			

This finding is consistent with the study by Boediarsih et al. (2024), which also reported a significant relationship between these variables (p-value 0.023).⁴ Similar results were reported in a study conducted in Surakarta, which found a significant association between recurrent AOM and CSOM (p-value = 0.001).¹⁸ These findings are further supported by a meta-analysis that reported a significance association (p-value = 0.04), with patients with a history of recurrent AOM showing an increased risk of CSOM (OR = 11.13).¹⁹

Recurrent AOM may result from impaired immune function, inadequate treatment, and high bacterial virulence, all of which increase susceptibility to repeated infections.⁴ A tympanic membrane perforation that fails to close remains exposed to infectious agents. Pathogens originating from the nasopharynx may migrate to the middle ear through the Eustachian tube, causing tube dysfunction and impaired mucociliary clearance. This process promotes persistent middle ear infection and inflammation. Impaired drainage can lead to fluid accumulation, fever, and increased production of pro-inflammatory mediators, which elevate middle ear pressure and contribute to membrane perforation. A persistent tympanic membrane perforation allows the tympanic cavity to remain continuously exposed to the external environment,

enabling pathogens from the external auditory canal to enter freely and cause recurrent or persistent infection.²⁰

In children, this process is further exacerbated by anatomical characteristics such as shorter, wider and more horizontally oriented Eustachian tubes. An immature immune system also plays a role in recurrent otitis media.²¹ In addition, highly virulent pathogens and biofilm formation can increase resistance to antibiotics and other antimicrobial agents, making infections more difficult to eradicate. These pathogens may also promote more severe conditions by activating keratinocyte cells within cholesteatoma matrices. The resulting cholesteatoma can invade surrounding tissues and lead to ossicular destruction. However, the molecular mechanisms underlying biofilm formation in CSOM remain poorly understood.²²

In this study, 21 children developed CSOM despite having no history of recurrent AOM. Previous studies have suggested that this finding may be related to a lack of parental awareness or inadequate response to early ear-related symptoms, allowing the infection to persist and become chronic.¹³ In addition to recurrent AOM, a history of acute respiratory infection and exposure to cigarette smoke were identified as potential contributing factors that may promote the occurrence of AOM and subsequently, recurrent AOM. Among the

51 children with CSOM, 30 had a history of ARI and 31 had been exposed to cigarette smoke.

Pathogens from the respiratory tract can invade the Eustachian tube and damage the ciliated epithelium. This process triggers inflammation, impairs Eustachian tube function, and disrupts mucociliary flow, thereby increasing the risk of acute middle ear infection.²³ Cigarette smoke may contribute directly to AOM by irritating the ear mucosa or indirectly by increasing the risk of ARI, which can subsequently lead to AOM. Harmful substances in cigarette smoke can damage the Eustachian tube mucosa, impair ciliary and goblet cell function, prolong mucociliary clearance time, and hinder the tube's ability to balance middle ear pressure. Repeated exposure to these processes may eventually result in chronic otitis media.²⁴ All of the pathophysiological mechanisms described above may be prevented through early detection and appropriate treatment. A thorough and focused history-taking process is essential for identifying risk factors that can support accurate diagnosis and appropriate management of CSOM.²⁵

CONCLUSION

Based on the results of this study, it can be concluded that a history of recurrent acute otitis media (AOM) is significantly associated with the incidence of chronic

suppurative otitis media (CSOM) in children with a 13-fold increased risk among those with a history of recurrent AOM. This finding reinforces the understanding that recurrent AOM is a major contributing factor in the progression of acute to chronic middle ear infection.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest related to this study.

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