

Research**Pathological tissue and perforation type causing conductive hearing loss in chronic suppurative otitis media****Aditya Shantika Putra, Yohanes Sudarmanto,
Ahmad Dian Wahyudiono, Edi Handoko**Department of Otorhinolaryngology Head and Neck Surgery, Faculty of Medicine,
Universitas Brawijaya / Dr. Saiful Anwar General Hospital, Malang, Indonesia**ABSTRACT**

Background: Chronic Suppurative Otitis Media (CSOM) is an inflammatory middle ear condition that often leads to conductive hearing loss. **Purpose:** To analyse the correlation between pathological tissue and the type of perforation with conductive hearing loss, in patients with CSOM. **Method:** Cross-sectional study on medical records data of CSOM patients who visited the Ear, Nose, and Throat (ENT) outpatient clinic at Saiful Anwar General Hospital, between January 2019 and June 2022. The collected data included physical examination of the ear, audiometry results, and surgical findings during the operation. Comparative analysis was performed to compare audiometry results based on the pathological tissue diagnosis and the perforation type. **Result:** A total of 51 CSOM patients were included in the study. Moderate conductive hearing loss was the most common type (49% of cases). The comparative analysis showed no significant correlation between pathological tissue or the type of perforation with conductive hearing loss, in patients with CSOM. **Conclusion:** In this study, there were no significant correlation between pathological tissue and the type of perforation with conductive hearing loss in patients with CSOM.

Keywords: chronic suppurative otitis media, perforation, conductive hearing loss, complications

ABSTRAK

Latar belakang: Otitis Media Supurativa Kronis (OMSK) adalah kondisi inflamasi pada telinga tengah yang sering mengakibatkan gangguan pendengaran konduktif. **Tujuan:** Untuk menganalisis korelasi antara jaringan patologis dan jenis perforasi dengan gangguan pendengaran konduktif, pada pasien OMSK. **Metode:** Penelitian potong lintang pada data rekam medis pasien OMSK yang mengunjungi klinik Telinga, Hidung, dan Tenggorokan (THT) di Rumah Sakit Saiful Anwar antara Januari 2019 dan Juni 2022. Data yang dikumpulkan mencakup pemeriksaan fisik telinga, hasil audiometri, dan temuan bedah saat operasi. Analisis komparatif dilakukan untuk membandingkan hasil audiometri berdasarkan diagnosis jaringan patologis dan jenis perforasi. **Hasil:** Sebanyak 51 pasien OMSK termasuk dalam penelitian ini. Gangguan pendengaran konduktif sedang, adalah jenis yang paling umum (49% kasus). Analisis komparatif menunjukkan tidak ada hubungan signifikan antara jaringan patologis atau jenis perforasi dengan gangguan pendengaran konduktif, pada pasien OMSK. **Kesimpulan:** Dalam penelitian ini, tidak ditemukan korelasi signifikan antara jaringan patologis dan jenis perforasi dengan gangguan pendengaran konduktif, pada pasien OMSK.

Kata kunci: otitis media supurativa kronis, perforasi, gangguan pendengaran konduktif, komplikasi

Correspondence address: Aditya Shantika Putra. Department of Otorhinolaryngology-Head and Neck Surgery, Faculty of Medicine, Universitas Brawijaya / Dr. Saiful Anwar General Hospital, Malang, Indonesia. Email: adityashantikaputra@yahoo.com

INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a long-standing inflammatory condition in the middle ear fossa, and is often the main cause of hearing loss.^{1,2} CSOM is characterized by persistent or recurrent ear discharge for 6-12 weeks. This discharge is through perforation of the tympanic membrane, resulting in mucosal thickening and polyp growth. Chronic suppuration can occur with or without cholesteatoma.³ The difference between CSOM and Chronic Serous Otitis Media lies in the presence of perforation in CSOM, while in Chronic Serous Otitis Media no perforation occurs.^{4,5}

Epidemiologically, the incidence of CSOM is highest in tropical and subtropical countries. About 90% of patients with CSOM live in poor and developing countries such as Southeast Asia, the Western Pacific, and Africa. The global prevalence of CSOM is estimated to be between 65-330 million people, with 60% of the population experiencing hearing loss. In Indonesia, according to the Sight and Hearing Health Survey conducted by the Ministry of Health, the incidence of CSOM between 2006-2009 reached 3.1% of the total population. It was estimated that around 6.6 million people out of a total Indonesian population of 220 million have hearing loss due to CSOM.^{6,7}

According to the World Health Organization (WHO), hearing loss is defined as the inability to hear clearly, with a hearing threshold of 20 dB or less in both ears. Hearing loss can have different levels of severity, namely mild, moderate, moderate severe, or severe. It can occur in one ear or both ears, and causes difficulty in hearing conversations.⁸

In cases of CSOM, hearing loss occurs due to infection of the middle ear. This infection results in increased production of mucosal fluid which over time accumulates and causes disturbances in the transmission

of sound and air received. In addition, there is perforation of the tympanic membrane and erosion of the ossicle chain, which impairs hearing function and may result in deafness. Generally, the hearing loss caused by CSOM is conductive, although some patients may also develop sensorineural deafness. Conductive deafness in CSOM has been found to be associated with pathological tissue in the form of granulation tissue or cholesteatoma, polyps, et cetera. Granulation tissue can fill the middle ear space, occupy perforations, and extend into the mastoid cavity. On the other hand, cholesteatoma can gradually expand and erode surrounding structures, such as the ossicles (small bones of the middle ear) and the mastoid bone. The presence of pathological tissue, either granulation tissue or cholesteatoma, can contribute to conductive hearing loss in CSOM.⁹ If left untreated, damage from CSOM can lead to complications such as intracranial infection, mastoiditis, meningitis, and subdural abscess.^{10,11}

This study aimed to analyze the relationship between pathological tissue and perforation type with conduction deafness, in patients with CSOM. This information will provide better insight into the factors contributing to conduction deafness in CSOM, and may help in more effective management of CSOM patients with hearing loss.

METHOD

This was a cross-sectional study conducted by collecting medical record data of CSOM patients who came to the Ear Nose Throat (ENT) Polyclinic of Saiful Anwar General Hospital, Malang, in the period January 2019 to June 2022. The inclusion criteria for participants were CSOM patients who had been diagnosed through physical examination, and confirmed by audiometry results to assess the hearing loss suffered.

Data collected included physical examination of the ear, audiometry results, and surgical findings during surgery. The physical examination of the ear included assessment of the condition of the tympanic membrane, the presence of pathological tissues such as granulations, polyps, or adhesions, and the type of perforation in the tympanic membrane. Audiometry was used to measure the degree of conduction deafness in the patient.

Univariate analysis of numerical variables was performed by displaying mean and standard deviation, while categorical variables were displayed with relative frequency and proportion. Furthermore, a comparative analysis was performed to compare audiometry results based on pathological tissue diagnosis and perforation type. Appropriate statistical analysis was used to determine the relationship between pathological tissue and perforation type with conduction deafness in CSOM patients. This study used a significance level of $\alpha=0.05$.

RESULT

There were 51 patients with CSOM included in this study. Patients were dominated by the age group of 21-30 years (29.41%), female patients (72.55%), where most of them had disorders in the left ear 50.98%, and on the right ear was 49.02%. As much as 49.02% of patients had moderate deafness, 29.41% had moderate-severe deafness, and 21.57% had mild deafness. Meanwhile, none of the patients had very severe deafness or normal hearing.

The results of the analysis using the one-way Anova test in Table 2. showed that there was no significant difference in audiometric values based on pathological tissue ($p>0.05$), while the independent t test showed that there was no significant difference in audiometric values based on the type of perforation ($p>0.05$) (Table 2).

Table 1. Characteristic of the respondents

Variable	n	%
Age		
<21 years old	5	9.80
21-30 years old	15	29.41
31-40 years old	5	9.80
41-50 years old	12	23.53
51-60 years old	8	15.69
61-70 years old	5	9.80
>70 years old	1	1.96
Gender		
Male	14	27.45
Female	37	72.55
Cholesteatoma		
Positive	34	66.67
Negative	17	33.33
Granulation		
Positive	36	70.59
Negative	15	29.41
Deafness		
Mild Conductive	11	21.57
Moderate Conductive	25	49.02

Moderate-Severe Conductive	15	29.41
Ear		
Right	26	50.98
Left	25	49.02
Perforation Type		
Tubotympanic	35	68.63
Attic	16	31.37

Table 2. Statistical analysis of pathological tissue and perforation type with conductive hearing loss

Variable	N	Mean±SD %	p%	Results
Pathological tissue				
Cholesteatoma	11	51.29±10.29	0.475	Not significant
Granulation	8	46.41±7.72		
No pathological	22	47.07±7.56		
Cholesteatoma + granulation	10	49.50±7.88		
Perforation type				
Tubotympanic	35	47.64±7.28	0.427	Not significant
Attic	16	49.92±10.17		

*SD=Standard Deviation; p=Significance

DISCUSSION

Based on the general description of CSOM patients who seek treatment at the ENT clinic, it was found that patients were dominated by 21-30 years old and 41-50 years old. Mostly patients were female, out of 67.14% of the total respondents. The findings showed that the left ear was more often impaired than the right ear, although the difference was not very significant, which amounted to 52.86% for the left ear and 47.14% for the right ear. Based on the severity of hearing loss, CSOM patients mostly experienced moderate conduction deafness, with a percentage of 35.71%. Moderate-severe conduction deafness ranked second with a percentage of 21.43%, followed by mild conduction deafness (15.71%), severe mixed deafness (12.86%), severe conduction deafness and moderate-severe mixed deafness (both had the same percentage of 5.71%), and the last was moderate mixed deafness (2.86%).

Research conducted in several regions in Indonesia provided varying results. In Bandung in 2019, the incidence of CSOM tended to occur in the age group of 7-18 years. Meanwhile, in Makassar in 2017, out of 107 CSOM patients, 40 patients (37.4%) were in the age group of 25-44 years. Research in Malang in 2016 showed that the age group with the highest incidence of CSOM was 21-30 years old, with a percentage of 24.73%.¹² The varying results could be caused by various factors including causative and environmental factors, availability and ease of access to treatment, and variations in different genetic susceptibilities.⁷ In addition, socio-economic status also played a role in differences of incidence rates, where communities with lower socio-economic status tended to have a higher incidence of CSOM in children and young adults, compared to those with better socio-economic status.⁶

Based on gender, the results also showed variations. In Bandung, out of 94 CSOM patients, 53% were male and 47% were female. In Makassar, from 107 CSOM patients, 72 were male and 35 were female. Research at Dr. Saiful Anwar General Hospital in Malang in 2016 showed that out of 186 patients, 54.84% were female and 45.16% were male.¹³ Studies had shown that CSOM tended to occur more in males than females. The reasons for this difference were not entirely clear, but might be influenced by factors such as anatomical differences, hormonal factors, or variations in health care seeking behavior between the sexes. In terms of variation in gender trends, regarding to age-dominant incidence, CSOM also had tendency to vary in age of onset between males and females. In some populations, CSOM had been found to have an earlier age of onset in males than females. This had been attributed to factors such as differences in exposure to risk factors, or anatomical variations. In addition, in some cases, men might be more susceptible to developing CSOM due to factors such as occupational exposures, such as exposure to dust, pollutants, or water-related activities.¹⁴

In a study that reviewed the correlation between pathological tissue and the type of conduction deafness, results were obtained with a value of 0.475, which showed a non-significant difference. Another study showed that 72% of CSOM patients with otorrhea and central perforation without pathological tissue had conduction deafness, while 64% of CSOM patients with otorrhea, attic perforation, and granulation tissue or cholesteatoma had conduction deafness. The correlation between perforation and conduction deafness also showed a non-significant difference. The study was in accordance with the findings that sound transmission in the perforated tympanic membrane did not depend on its location.^{7,15,16} The results of a study conducted by Adawiyah et al.¹⁷ also showed that the results of the Chi-Square test in the study showed a value of $p=0.326$ ($p>0.05$), so

that there was no correlation between the type of tympanic membrane perforation and the degree of ear disorders. The absence of significant differences in several studies might be influenced by the location and size of pathological tissue. If the tissue blocked sound transmission from the outer ear to the middle ear, or if it affected the movement of the ossicles (small bones in the middle ear), it might result in more significant conductive hearing loss. However, if the tissue was smaller or located in a less critical area, the impact on hearing might be less pronounced.^{3,11} In future studies, the size of the pathological tissue and the extent of the perforation should be considered in the analysis.

In conclusion, pathological tissue, and type of perforation in patients with CSOM were not significantly associated with conduction deafness. Future study needs to illustrate the type of pathological tissue, the location of the pathological tissue, and the damage caused by the pathological tissue to conduction deafness. For the type of perforation, it needs to be explored further by focusing at the association of the size of the tympanic membrane perforation on conduction deafness.

REFERENCE

1. Acuin J. Chronic suppurative otitis media. *BMJ Clin Evid.* 2007;2007:0507. Published 2007 Feb 1.
2. Morris P. Chronic suppurative otitis media. *BMJ Clin Evid.* 2012;2012:0507. Published 2012 Aug 6.
3. Smith JA, Danner CJ. Complications of chronic otitis media and cholesteatoma. *Otolaryngolog Clin NAm.* 2006;39(6):1237–55.
4. Emmett SD, Kokesh J, Kaylie D. Chronic ear disease. *Medical Clinics.* 2018;102(6):1063–79.
5. Mactaggart D. Assessment and management of chronic ear disease. In *Practice.* 2008;30(8):450–8.

6. Ruffin WC, Crouch JB, Burruss CP, Bush ML. Sociodemographic factors and health care utilization in pediatric chronic suppurative otitis media. *Laryngoscope*. 2023;133(3):700–5.
7. Gupta P, Varshney S, Kumar SK, Mohanty A, Jha MK. Chronic suppurative otitis media: A microbiological review of 20 years. *Indian J Otol*. 2020;26(2):59–67.
8. World Health Organization. Deafness and hearing loss [Internet]. Geneva: WHO; 2025 [cited 2025 Mar 20]. Available from: <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>
9. Subramaniam V, Ashkar A, Rai S. Cochlear dysfunction in chronic otitis media and its determinants. *Iran J Otorhinolaryngol*. 2020;32(109):79–84.
10. Ahadiah TH, Rahmawati R, Purnami N, Edi H. Profile of chronic suppurative otitis media complication in Indonesian Patients: Review of 25 cases. *Sys Rev Pharm*. 2020;11(11):1477–81.
11. Hidayat R. Pathophysiological to clinical aspects of chronic suppurative otitis media (CSOM): narrative literature review. *ACMCR (Archives of The Medicine and Case Reports*. 2022;3(2):246–55.
12. Islam MS, Islam MR, Bhuiyan MAR, Rashid MS, Datta PG. Pattern and degree of hearing loss in chronic suppurative otitis media. *Bangladesh Otorhinolaryngol*. 2010; 16(2):96–105.
13. Moruskar A, Karodpati N, Ingale M, Shah S. Study of pattern of hearing loss in CSOM (chronic suppurative OTITIS media). *Trop J Ophtho Otolaryngol*. 2019; 4:131–6.
14. Abraham ZS, Ntunaguzi D, Kahinga AA, Mpondella KB, Massawe ER, Nkuwi EJ, et al. Prevalence and etiological agents for chronic suppurative otitis media in a tertiary hospital in Tanzania. *BMC Res Notes*. 2019 Jul 17;12:429.
15. Meera PC. Correlating the severity of conductive hearing loss with the size and site of pars tensa tympanic membrane perforation using video-otoscopy [PhD Thesis]. University of Nairobi, Kenya; 2012.
16. Prasad SC, Shin SH, Russo A, Di Trapani G, Sanna M. Current trends in the management of the complications of chronic otitis media with cholesteatoma. *Curr Opin Otolaryngol Head Neck Surg*. 2013;21(5):446–54.
17. Adawiyah AA, Adelién A, Septadina IS. Hubungan antara tipe perforasi membran timpani dan derajat gangguan pendengaran pada pasien otitis media kronik. *BJI (The Biomedical Journal of Indonesia)*. 2017;3(3):120–7.