



# Chronic Suppurative Otitis Media Characteristic in Secondary Hospital in Yogyakarta

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## Abstract

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**BACKGROUND:** Chronic suppurative otitis media (CSOM) is the most common ear infection that causes hearing loss and affects the quality of life worldwide.

**AIM:** The study aimed to describe the risk factor of CSOM patients at a private hospital in Yogyakarta, Indonesia, from March to June 2021.

**METHODS:** This study was an observational analytical study with a case-control design. The respondents were 55 patients with CSOM who met inclusion criteria and 56 respondents as controls. A checklist interview was conducted to determine the present and past history of diseases, and the relationship among potential risk factors was analyzed using bivariate analysis. A bivariate analysis was used to specify the odds ratios, 95% confidence intervals, and the relationship between risk factors and the incidence of CSOM.

**RESULTS:** The characteristic cases were as follows: Majority age over 20 years, 56% male, 47% university degree, 29% history of allergy, 25% history of acute respiratory infection, 56% complain of discharge from the ear, 31% snoring, 67% cigarette consumption, 42% earn 2–5 million rupiahs per month, and 73% of their homes are closed to health-care facilities. Four risk factors for CSOM omit this included: Education, medical history from the ear, snoring, and income per month ( $p < 0.05$ ).

**CONCLUSION:** According to the results, the majority of CSOM patients to be treated at a private clinic in Yogyakarta were male at productive age, had university education, had no history of allergies and acute respiratory infections, and had a history of secrete from the ear, exposure to cigarettes, and median income per month.

## Introduction

Chronic suppurative otitis media (CSOM) is inflammation of the middle ear and mastoid process that lasts for more than 2 months. CSOM is characterized by perforation of the eardrum and exits from the ear canal. The prevalence of CSOM in the world reaches 60% when those affected experience significant hearing loss [1]. The number of CSOMs reaches 65–330 million people with otorrhea and 60% of them have hearing loss. In the UK, the prevalence of CSOM affects 0.5% of adults in the United Kingdom, 34.8% of Nepalese children, and 5.4% of Indonesian children. In Asia, the prevalence of hearing loss from CSOM is higher in men than in women [2]. The prevalence of CSOM is more common in rural areas [3].

The causes of suppurative otitis media depend on the anatomical structure, the pathophysiology of the interaction between microbial pathogens and the host's immune response, and the biological anatomy of the middle ear (mastoid, middle ear cavity, and Eustachian tube) and the nasopharynx [4]. In developing countries,

the incidence is higher, especially in areas with poor sanitation and socioeconomic conditions, poor nutrition, and higher nutrition, and there is still a popular misunderstanding about this disease so that it is not fully treated [5], [6].

CSOM is caused by both aerobic and anaerobic bacteria. Several bacteria that cause chronic aerobic suppurative otitis media include *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Proteus mirabilis*, and *Klebsiella* sp. *Bacteroides* sp., *Peptostreptococcus*, and *Propionibacterium* are among the anaerobic bacteria groups [7], [8]. *P. aeruginosa* bacteria mostly cause CSOM in adults [9].

So far, the incidence of CSOM is still quite high in various regions of Indonesia. If not treated seriously, it can lead to a decreased quality of life and even death. Research into demographic and behavioral risk factors associated with CSOM has been widely conducted in several countries. However, to date, the evidence on the risk factors of CSOM in Indonesia is still limited. The researchers aimed to identify the risk factors affecting CSOM in Yogyakarta.

## Methods

The study design was an observational analytical study with a case–control design. The study was carried out from March to June 2021. The case population of the study included all patients diagnosed with CSOM who were treated in the ear, nose, and throat (ENT) specialist clinic of a private hospital in Yogyakarta based on a diagnosis by an ENT specialist. Negative controls were subjects with no reported clinical CSOM who lived in Yogyakarta during the study. This study involved a sample of 55 case respondents and 56 respondents as controls. The sampling was carried out by a total sample, namely, all patients who were treated in the ENT clinic of a private hospital in Yogyakarta from March until June 2021. The patients who became respondents were asked for their consent by signing the informed consent form. The research obtained approval from the Ethics Committee of Medical Science and Health Faculty, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia, number: 049/EC-KEPK FKIK UMY/VI/2021.

The researchers collected data on risk factor data, which included the characteristics, behavior, and risk factor of the respondents' social environment, both in cases and in controls using checklists. Many checklists were created to record the respondents' condition. They included demographics, history of allergies, acute respiratory infections, past cigarettes consumption, the distance between home and health-care facilities, and monthly income. In this study, the reliability and validity of the checklists were not tested because the contents of the checklist had been used by the previous researchers. Chi-square test was performed with Statistical Package for the Social Sciences version 21.0 to calculate the odds ratio (OR) with a 95% confidence interval (CI) value ( $\alpha = 0.05$ ).

## Results

Table 1 shows the demographic characteristics of the respondents. The majority of the respondents diagnosed with CSOM cases were over 20 years

**Table 1: Frequency of distribution of case and control respondents based on age, education, and gender**

Demography	Cases (n = 55) (%)	Control (n = 56) (%)	p	95%CI
Age (year)				
<20	5 (9)	4 (7)	0.72	
>20	50 (91)	52 (93)		
Education				
Some primary	5 (9)	0 (0)	0.000*	1.733–2.3
Primary	4 (7)	0 (0)		
Some secondary	20 (36)	50 (91)		
University	26 (47)	6 (9)		
Gender				
Male	31 (56)	27 (48)	0.39	
Women	24 (44)	29 (52)		

\*Significant P < 5%, CI: Confidence interval.

old and they were balanced in the case group (91%) and the control group (93%). The frequency of distribution based on the educational background of the respondents in the case group was dominated by university degree (47%), while the control group consisted mainly of some secondary school (91%). The gender-specific cases were predominantly male (56%) and the controls were female (52%). Among the three characteristics of the respondents, education was a risk factor for the incidence of CSOM in Yogyakarta with an OR of 2.12 ( $p = 0.000$ , CI 95% = 1.733–2.593).

Seven behavioral and socioenvironmental risk factors were examined, which are presented in Table 2. The frequency of distribution based on the history of allergies of the respondents in the case group was 29% and the control group was 21%. About 25% of the case respondents had a history of acute respiratory infection and 56% had a history of discharge from the ears. The percentage of case respondents who snored was more than the control ones by 31% and 7%, respectively. Likewise, more case respondents were exposed to cigarettes than the controls and it was about 67% (case) and 7% (control). About 42% of case respondents had income between 2 and 5 million rupiahs per month, but 62% of control respondents had more than 5 million rupiahs per month. Both case and control respondents had the distance between home and health-care facilities more than 3 km with the frequencies of distribution which were 73% and 70%, respectively. Behavioral and social-environment risk factors that influenced the incidence of CSOM in Yogyakarta included the history of discharge from the ear with an OR 34.875 ( $p = 0.000$ , 95% CI 7.715–157.647); snoring with an OR 5.816 ( $p = 0.001$ , 95% CI 1.811–18.678); and income per month (million rupiah): An OR 1.887 ( $p = 0.002$ , 95% CI 0.769–4.632).

**Table 2: The comparison of behavioral and social-environment risk factors between case and control groups in the incidence of CSOM**

Behavioral and social- environment variable	Cases (n = 55) (%)	Control (n = 56) (%)	p	CI 95%
The history of allergies				
Yes	16 (29)	12 (21)	0.35	
No	39 (71)	44 (79)		
The history of acute respiratory infection				
Yes	14 (25)	10 (18)	0.33	
No	41 (75)	46 (82)		
The history of discharge from the ear				
Yes	31 (56)	2 (4)	0.000*	7.715–157.65
No	24 (44)	54 (96)		
Snoring				
Yes	17 (31)	4 (7)	0.001*	1.811–18.68
No	38 (69)	52 (93)		
Exposure cigarettes				
Yes	37 (67)	4 (7)	0.14	
No	18 (33)	52 (93)		
The income per month (million rupiahs)				
<2	16 (29)	10 (18)	0.02*	0.769–4.63
2–5	23 (42)	11 (20)		
>5	16 (29)	35 (62)		
Distance from home to health facilities (kilometers)				
<3	40 (73)	39 (70)	0.72	
>3	15 (27)	17 (30)		

\*Significant P < 5%. CSOM: Chronic suppurative otitis media.

## Discussion

This study shows that education, the history of ear discharge, snoring, and monthly income were the risk factors for CSOM in Yogyakarta. On the other hand, the variables of age, gender, history of allergies, acute respiratory infections, the distance between homes and health-care facilities, and history of cigarettes have no association with the frequency of CSOM. Age is a risk factor for acute otitis media in children and adolescents in Taiwan [10], as well as children under 4 years of age in Saudi Arabia [11]. Incidence of otitis media is lower in adults compared to childhood [12], for example is the percentage shown for children under the age of 6 in Nigeria which is 9.2% [13]. Similar to CSOM in Colombia [14] and China [15], the majority of CSOM cases are on people over 20 years old. This result can occur if the patient had a discharge from the ear (otorrhea) since childhood and the symptoms persist into adulthood.

In this study, the ratio between male and female respondents with CSOM is almost equal, with a greater percentage in males than females (56%:44%). The result is similar to Mahdiani *et al.*, one of the reasons was men were more likely to suffer from CSOM due to their tendency to suffer upper respiratory infection from the working environment [16]. Therefore, they are easily exposed to risk factors [17]. Men are more likely to suffer from CSOM. However, no research has shown the relationship between CSOM and gender [18]. The educational level of CSOM sufferers varies. In this study, most of the CSOM cases were university students. Thus, 29.3% of CSOM have primary education in Medan. In Bandung, the majority of CSOM have the primary education. About 37.0% of CSOM do not study in Ambon. The people/patients with lower level of education are synonymous with a lack of knowledge about nutrition and a healthy lifestyle [19]. Frequent and loud snoring is the most common clinical manifestation of sleep disorder breathing in adults and children. That condition is associated with chronic nasal obstruction, atopic disease, asthma, adenotonsillar hypertrophy, craniofacial, and neuromuscular factors. Among all conditions, the increased proliferation of lymph adenoid tissues in the upper airway increases resistance and leads Eustachian tube dysfunction as a risk factor to CSOM [20].

The history of allergy was not a risk factor for CSOM in this study. It differs from the research by Diana and Haryuna which found that there was a significant association between allergic rhinitis and the incidence of CSOM [21]. It may be caused the history of allergies in this study which was general and not specific to allergic rhinitis. Allergic reactions that occur in the nasal mucosa can affect the Eustachian tube and eardrum in several ways, namely: (1) The release of various mediators and cytokines from nasal secretions that migrate into the mouth of the Eustachian tube

and (2) nasal reaction in the form of mucosal edema and nasal hypersecretion. This edema of the mucous membrane continues to the mouth of the Eustachian tube in the nasopharynx and obstructs the nasal cavity. The obstruction of the nasal cavity can also lead to epithelial changes and secretions from the epithelial lining of the middle ear. This situation causes negative pressure in the nasopharynx and middle ear [22], [23]. This negative pressure in the middle ear cavity leads to a retraction of the eardrum [24]. People with allergic or atopic diseases are at higher risk of developing CSOM. The presence of sinonasal abnormalities and allergic rhinitis supports the pathogenesis of CSOM. Sinonasal abnormalities lead to Eustachian tube dysfunction that progresses to CSOM [25].

A history of respiratory infection did not affect the incidence of CSOM at a private hospital in Yogyakarta. It differs from research by Zhang *et al.* (2014), revealing that tract infections cause inflammation and can affect the function of the Eustachian tube, reducing pressure in the middle ear, followed by the entry of bacteria and viruses into the middle ear through the Eustachian tube. It results in inflammation and effusion in the middle ear [24]. A history of upper respiratory infection significantly increases the risk of developing chronic otitis media. Daycare centers can increase the risk of exposure of children to respiratory pathogens. This can be a risk factor for the history of history of acute respiratory infection in children. Acute respiratory infections are caused by viruses or bacteria. This illness begins with a fever accompanied by one or more by one or more symptoms such as sore throat or difficulty in swallowing, runny nose, dry cough, or mucus. The bacteria that cause CSOM are *P. aeruginosa*, *E. coli*, *S. aureus*, *S. pyogenes*, *P. mirabilis*, *Klebsiella* sp., or anaerobic bacteria (*Bacteroides*, *Peptostreptococcus*, and *Propionibacterium*) [26]. This bacterium is rarely found on the skin of the external ear canal but is able to multiply in multiply in the event of trauma, inflammation, cracks, or high humidity. These bacteria can enter the middle ear through a chronic perforation. Among these bacteria, *P. aeruginosa* is often cited as the cause of the progressive destruction of the middle ear and mastoid structures by toxins and enzymes [9].

The presence of discharge in the ear is a risk factor for the occurrence of CSOM. CSOM is a chronic infection in the middle ear with perforation of the eardrum and discharge from the middle ear continuously or intermittently. Otorrhea or watery ears are early symptoms that are common and very annoying to a person's appearance, especially in patients who constantly suffer from otorrhea. Therefore, this condition may encourage them to see a doctor immediately [19]. The first symptom of CSOM is chronic otorrhea with mucosuppurative secretion through a perforated eardrum. The secretions produced by *Pseudomonas* and other anaerobic bacteria. Tympanic membrane



perforations can be dry for years or, in other cases, be accompanied by persistent or recurrent otorrhea. It depends on the patient's persistence in protecting the ear and practicing ear hygiene.

Risk factors for CSOM from the environment are the density of housing, pollution from household fuels, and cigarette smoke [13], [26]. In this study, exposures to passive and active cigarettes did not affect the incidence of CSOM. It corresponds to the research by Zhang *et al.* [25] but it differs from Amusa *et al.* [13] who found or finding that an association between the number of occupants of a house and exposure to firewood smoke from household fuels was associated with the incidence of CSOM. Ilechukwu *et al.* also found that there was a significant association between exposure to cigarette smoke and the incidence of otitis media in children whose mothers smoked [26]. As an addition, cigarette smoke disrupts the function of the mucous membrane of the Eustachian tube.

This study shows that monthly income is a risk factor for CSMO. Low-income professions make it difficult to provide good housing, adequate health care, good education, and the main problem which do not meet the need for healthy diet affecting poor nutritional quality. It can weaken the body's immune system, which can affect the susceptible to disease, particularly CSOM [19]. Low socioeconomic life, a slum environment, and poor health and nutritional status are the factors underlying the increasing prevalence of CSOM in developing countries [27], [28]. Chronic otitis media is chronic otitis media followed by the formation of continuous or intermittent discharge, the perforated eardrum, and usually with hearing impairment [29]. It leads to communication problems that can hinder social interaction and daily life, both at work and during activities. It is often found that hearing-impaired patients withdraw themselves from social activities [30]. The unavailability of adequate health facilities will result in improper management of various diseases that occur in the community. In this study, however, there was no association between home distance to health-care facilities and the incidence of CSOM. The limitations of this study include the study which did not examine the microbes causing CSOM. Besides, the number of respondents and the risk factor variable is too slight.

## Conclusion

It was observed that education, the history of ear discharge, snoring, and medium monthly income were risk factors for CSMO in Yogyakarta. On the other hand, the variables of age, gender, history of allergies, acute respiratory infections, the distance between homes and health-care facilities, and history of cigarettes have no association with the frequency

of CSMO. The promotive and preventive policy related to CSMO disease needs to consider the risk factors, especially from the aspect of personal hygiene and immunity.

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