

Original Research Article

Clinical profile and associated risk factors of chronic suppurative otitis media in a tertiary care centre: a cross-sectional study

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Received: 18 July 2026

Accepted: 01 August 2026

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ABSTRACT

Background: Chronic suppurative otitis media (CSOM) remains a major cause of preventable hearing loss in low- and middle-income countries and is closely associated with poverty, overcrowding, recurrent upper respiratory infection, undernutrition and delayed access to treatment. To evaluate the clinical profile and associated risk factors of CSOM in patients attending a tertiary care centre.

Methods: This hospital-based cross-sectional observational study included 384 patients with clinically diagnosed CSOM. Data were collected using a predesigned semi-structured proforma incorporating demographic characteristics, symptom profile, otoscopic findings, associated ENT conditions, hearing assessment and environmental or behavioural risk factors. Statistical analysis included descriptive statistics and multivariate analysis to identify independent predictors of severe disease.

Results: The mean age of patients was 31.32 ± 10.31 years, with the largest proportion belonging to the 31–40 years age group. Mucosal chronic otitis media was the predominant type (60.41%), while squamous disease accounted for 39.1% of cases. Cholesteatoma was present in 44.74% of patients. Ear discharge (89.1%) and hearing loss (77.6%) were the most common presenting complaints. Conductive hearing loss was the commonest audiological pattern (71.88%). Low socioeconomic status, malnutrition, bottle feeding, overcrowding, indoor cooking exposure and upper respiratory tract infection showed significant association with severe disease. On multivariate analysis, low socioeconomic status, malnutrition, bottle feeding, overcrowding and indoor cooking exposure remained independent predictors of squamous disease.

Conclusions: CSOM in this tertiary care population showed a substantial burden of hearing loss and unsafe disease. Severe disease was strongly associated with modifiable social and environmental determinants, highlighting the need for early diagnosis, hearing assessment, management of associated upper airway disease and preventive community-level interventions.

Keywords: Chronic suppurative otitis media, Cholesteatoma, Cross-sectional study, Hearing loss, Risk factors

INTRODUCTION

Chronic suppurative otitis media is a chronic inflammatory disorder of the middle ear cleft characterized by persistent or recurrent ear discharge through a perforated tympanic membrane. It remains one of the most important chronic infectious conditions encountered in otorhinolaryngology because of its prolonged course, tendency to recur, impact on hearing

and ability to produce serious extracranial and intracranial complications if left untreated. Although the disease is potentially preventable and treatable, it continues to impose a major burden in low- and middle-income countries where poverty, poor hygiene, crowding, undernutrition and delayed access to specialist care are common.^{1,2} The public-health importance of CSOM lies not merely in the persistence of otorrhoea but in the functional consequences of chronic middle ear disease.

Hearing impairment due to CSOM may interfere with speech and language acquisition, educational performance, social interaction and occupational productivity. In children, chronic hearing loss can delay auditory and linguistic development, in adults, it can impair communication and reduce quality of life. The global burden literature has consistently emphasized that the highest disease load occurs in vulnerable communities with limited access to timely diagnosis and definitive treatment.^{1,3}

The pathophysiology of CSOM is multifactorial. Recurrent upper respiratory tract infections, Eustachian tube dysfunction, allergy, adenoid disease, poor middle ear ventilation and bacterial persistence contribute to the transition from recurrent acute disease to chronic inflammation and tympanic membrane perforation. Once a chronic perforation is established, repeated contamination, biofilm formation and poor treatment adherence may sustain the disease. In some patients, especially those with attic retraction or marginal disease, keratinizing squamous epithelium may accumulate and lead to cholesteatoma, the most destructive form of chronic middle ear disease.^{3,4}

In the Indian setting, chronic ear disease remains highly relevant because of the coexistence of social and environmental risk factors. Rural residence, household crowding, indoor smoke exposure, nutritional deficiency, unsafe ear cleaning habits and repeated respiratory infections are common in many communities. Tertiary care centres therefore continue to encounter patients with long-standing symptoms, advanced perforative disease, hearing loss and complications. Region-specific data are particularly useful because the pattern of disease may vary according to local socioeconomic and healthcare realities.^{2,5}

The present study was undertaken to assess the clinical profile and associated risk factors of chronic suppurative otitis media in patients attending a tertiary care hospital in northern Chhattisgarh. The study aimed not only to document the demographic and clinical pattern of disease, but also to identify potentially modifiable determinants associated with severe pathology. Such evidence is relevant for both clinical management and preventive public-health planning.

METHODS

This hospital-based cross-sectional observational study was conducted in the Department of Otorhinolaryngology at Rajmata Shrimati Devendrakumari Singhdeo Government Medical College, Ambikapur, Chhattisgarh, over a period of one year. The institution is a tertiary care teaching hospital catering to urban, rural and tribal populations from Surguja and surrounding districts.

Patients attending the ENT outpatient department with complaints suggestive of chronic ear disease were

screened. Those fulfilling the operational definition of chronic suppurative otitis media and satisfying the inclusion criteria were enrolled. For the purpose of the study, CSOM was defined as chronic inflammation of the middle ear cleft with persistent or recurrent ear discharge through a perforated tympanic membrane for at least six weeks. Patients of either sex aged three years and above were eligible for inclusion. Patients with secretory otitis media, acute suppurative otitis media, selected complicated cases excluded by protocol and immunocompromised patients were not included in the primary analytic cohort.

The sample size was calculated using the standard formula $n = Z^2pq/d^2$, taking a 95% confidence interval, an expected prevalence of 50% and an absolute precision of 5%. This yielded a required sample size of 384. Consecutive eligible patients were included until the desired sample size was achieved. A convenience consecutive sampling approach was considered appropriate for this hospital-based observational study because the main objective was to document the pattern of disease and associated factors among patients presenting for care.

Data were collected using a predesigned and pretested semi-structured proforma. The proforma included patient identification details, age, sex, residence, socioeconomic status, presenting symptoms, duration of disease, side involved, associated nose and throat complaints, relevant personal and environmental history and treatment history. Special emphasis was placed on identifying factors such as overcrowding, indoor cooking exposure, poor nutrition, bottle feeding, recurrent upper respiratory tract infection and other possible predisposing conditions.

A detailed clinical history was obtained from each patient or caregiver. Information was recorded regarding the onset and duration of ear discharge, laterality, hearing loss, associated otalgia, tinnitus, vertigo, fever and episodes of recurrent infection. History suggestive of rhinitis, sinusitis, tonsillitis, adenoid-related symptoms and recurrent URTI was elicited because of the well-known relationship between upper airway disease and Eustachian tube dysfunction. Behavioural and domestic factors such as unsafe ear cleaning practices, water entry into the ear, passive smoke exposure, indoor cooking exposure and household crowding were also noted.

All patients underwent a thorough general and ENT examination. General examination included assessment of nutritional status, build, hygiene, pallor and other relevant systemic findings. Ear examination was performed by inspection and otoscopy after aural toilet whenever needed. The site and type of perforation were recorded, along with the nature of discharge, presence of granulation tissue, retraction pocket, polyp, attic pathology, or visible cholesteatoma. Depending on the otoscopic findings, patients were clinically categorized as having mucosal or squamous chronic otitis media.

Nose and throat examination was carried out to identify associated conditions such as deviated nasal septum, rhinitis, sinusitis, adenoid hypertrophy, tonsillitis and pharyngitis. These associated pathologies were considered clinically relevant because chronic nasal and nasopharyngeal disease may perpetuate middle ear pathology through impaired Eustachian tube function.

Pure tone audiometry was used for hearing assessment wherever feasible and clinically indicated. Hearing loss was categorized as conductive, mixed, or sensorineural on audiological evaluation. Other investigations were performed as required for clinical management. The primary analytic outcome of the study was identification of factors associated with severe disease, particularly squamosal COM. Secondary observations included symptom profile, hearing loss pattern, otoscopic findings and disease distribution.

Data were entered into Microsoft Excel and analyzed using SPSS version 20.0. Descriptive statistics were presented in the form of frequency, percentage, mean and standard deviation. Inferential statistics were applied to examine association between disease type and risk factors. Multivariate analysis was performed to identify independent predictors of squamosal disease. A p value of less than 0.05 was considered statistically significant.

The study was approved by the Institutional Ethics Committee before commencement. Written informed consent was obtained from adult participants and from parents or legal guardians in the case of minors. Confidentiality of all patient data was maintained throughout the study.

RESULTS

A total of 384 patients with clinically diagnosed chronic suppurative otitis media were included in the study. The mean age of the participants was 31.32 ± 10.31 years. The largest proportion of patients belonged to the 31–40 years age group, followed by the 21–30 years age group. Males and females were almost equally represented, indicating no marked sex predominance in the study population.

With regard to disease type, mucosal chronic otitis media was the commonest form and accounted for 60.41% of cases. Squamosal disease constituted 39.1% of cases, while a very small residual group showed mixed features. Cholesteatoma was identified in 44.74% of patients, indicating a substantial burden of potentially destructive disease within the referral population.

Ear discharge was the most frequent presenting complaint and was reported by 89.1% of patients. Hearing loss was the second most common symptom and was present in 77.6% of cases. Other symptoms such as otalgia, tinnitus, vertigo and fever were noted in smaller proportions. A considerable number of patients reported long duration of symptoms, including disease persisting for more than two

years, which suggested delayed presentation and prolonged morbidity.

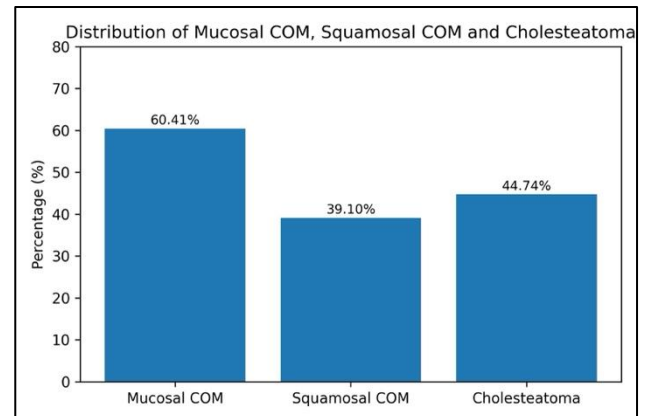


Figure 1: Bar chart showing the distribution of mucosal COM, squamosal COM among study participants and cholesteatoma among squamosal COM study participant.

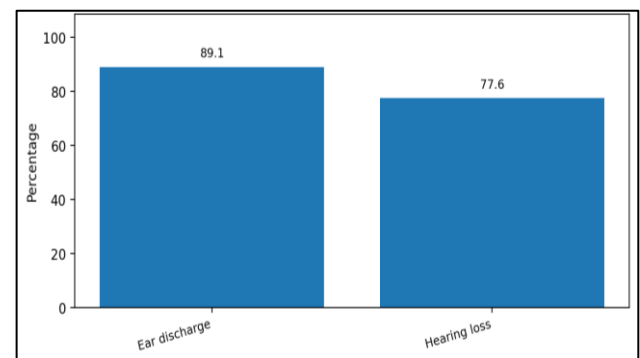


Figure 2: The two most common presenting complaints: ear discharge and hearing loss.

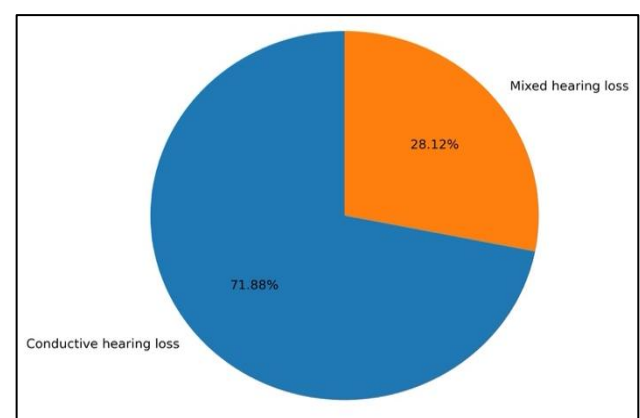


Figure 3: The pattern of hearing loss, with conductive hearing loss as the predominant type.

Otoscopic examination revealed central perforation as the commonest finding, consistent with the predominance of mucosal disease. Attic perforation, marginal perforation and retraction pockets were observed in smaller but

clinically important proportions, supporting the burden of squamous pathology and cholesteatoma. Most cases were unilateral, although bilateral disease was present in approximately one-fifth of patients. Audiological assessment showed conductive hearing loss to be the most common pattern, present in 71.88% of patients. Mixed hearing loss was seen in 28.0%. These findings suggest that while the middle ear remained the principal site of pathology, a subset of long-standing cases had associated cochlear involvement. On risk factor analysis, low socioeconomic status, malnutrition, bottle feeding,

overcrowding, indoor cooking exposure and upper respiratory tract infection showed statistically significant association with severe disease. Multivariate analysis demonstrated that low socioeconomic status, malnutrition, bottle feeding, indoor cooking exposure and overcrowding remained independent predictors of squamosal disease. Although most patients did not have documented complications at the time of evaluation, mastoiditis, facial nerve palsy and intracranial complications were observed in a minority, underlining the continuing seriousness of neglected disease.

Table 1: Demographic and disease characteristics of study participants (n=384).

Variables	Result
Mean age	31.32±10.31 years
Commonest age group	31–40 years
Sex distribution	Near-equal male and female representation
Mucosal COM	60.41%
Squamosal COM	39.1%
Cholesteatoma	44.74%

Table 2: Symptom and hearing profile.

Variables	Result (%)
Ear discharge	89.1
Hearing loss	77.6
Conductive hearing loss	71.88
Mixed hearing loss	28.12

Table 3: Significant risk factors associated with severe disease.

Risk factors	Association
Low socioeconomic status	Significant
Malnutrition	Significant
Bottle feeding	Significant
Overcrowding	Significant
Indoor cooking exposure	Significant
Upper respiratory tract infection	Significant

DISCUSSION

The present study demonstrates that chronic suppurative otitis media remains a significant cause of chronic otologic morbidity in patients attending a tertiary care ENT service. The disease burden observed in this study extends beyond persistent otorrhoea to include hearing impairment, unsafe disease, cholesteatoma and a pattern of clear association with social and environmental disadvantage. This broad picture is consistent with WHO documentation and contemporary reviews, which identify CSOM as a preventable cause of hearing disability concentrated predominantly in low- and middle-income countries.^{1,2} The age pattern observed in the present study, with predominance of patients in the third and fourth decades of life, likely reflects chronic neglected disease rather than disease beginning only in adulthood. Chronic otitis media often starts in childhood because of

immature Eustachian tube function, recurrent URTI, adenoidal disease and poor middle ear ventilation. However, where access to effective treatment is limited, the disease may persist into adulthood and present later with hearing loss or complications. This interpretation is supported by the long duration of symptoms recorded in many patients in the present study.^{3,4} The sex distribution in the study was nearly equal and showed no significant association with disease type. This observation agrees with much of the available literature, which generally does not demonstrate a strong biologic sex predilection in chronic suppurative otitis media. Differences reported in individual clinical series may be influenced more by local health-seeking behaviour, social priorities and referral pattern than by true underlying susceptibility.³ Mucosal chronic otitis media was the dominant disease type in the present study, which is in accordance with standard ENT teaching and most hospital-based series. Mucosal disease

generally represents the commoner and relatively safer end of chronic perforative middle ear disease. Nevertheless, the finding that nearly two-fifths of patients had squamosal disease is clinically important. It indicates that a substantial proportion of patients reached the tertiary care centre only after the disease had progressed to a potentially unsafe stage. The presence of cholesteatoma in more than one-quarter of cases strengthens this concern.^{2,3}

Cholesteatoma occupies a central place in the clinical seriousness of chronic otitis media. It is not merely a variant of middle ear inflammation but a destructive lesion characterized by accumulation of keratinizing squamous epithelium, local inflammation, osteolysis and potential extension into adjacent structures. Current literature continues to emphasize that the major morbidity of unsafe chronic ear disease arises from cholesteatoma, which is capable of causing ossicular erosion, mastoid destruction, labyrinthine fistula, facial nerve palsy, meningitis and intracranial abscess.^{3,9,15} The substantial cholesteatoma burden in the present series therefore suggests delayed diagnosis and advanced pathology in a significant subgroup of patients.

One of the most important results of the present study is the dominant role of low socioeconomic status, which emerged as the strongest independent predictor of squamosal disease. This finding aligns closely with the historical and current understanding of CSOM as a disease of deprivation. Poverty influences disease severity through multiple interconnected mechanisms: overcrowded housing, poor sanitation, delayed treatment, recurrent untreated infection, inadequate follow-up, nutritional deficiency, smoke exposure and limited access to surgery. WHO's monograph on CSOM and subsequent studies from South Asia have repeatedly underscored this relationship.^{1,2,6}

The association between malnutrition and severe disease in the present study is also biologically plausible and clinically meaningful. Malnutrition impairs host defense, diminishes mucosal immunity, reduces tissue repair and increases the risk that recurrent ear and respiratory infections will become chronic. In vulnerable communities, malnutrition also clusters with poverty and recurrent URTI, producing a cumulative effect on disease persistence. The fact that malnutrition remained independently associated with squamosal disease suggests that nutritional vulnerability may influence not only disease occurrence, but progression toward more destructive pathology.^{1,2}

Bottle feeding also showed a significant association with severe disease. This finding points toward the importance of early-life determinants in chronic ear pathology. Breastfeeding is known to confer passive immune protection and reduce the frequency of respiratory and middle ear infections during infancy. Bottle feeding, on the other hand, may reflect reduced immune protection,

poor feeding posture, or broader early-life social vulnerability. Its association with squamosal disease in the present study suggests that the roots of severe chronic ear disease may extend back to infancy and early childhood.^{2,6}

Household overcrowding emerged as another important factor associated with severe disease. This is in keeping with the established epidemiology of chronic otitis media. Crowded living conditions facilitate person-to-person spread of respiratory infection, persistent nasopharyngeal colonization, poor ventilation and reduced hygiene. Because recurrent URTI and Eustachian tube dysfunction are central to the pathogenesis of CSOM, overcrowding provides an ideal setting for persistence and recurrence of middle ear infection.^{1,2}

Indoor cooking exposure was independently associated with squamosal disease in the present study. This is a particularly relevant observation in the Indian and rural context. Household smoke exposure contributes to chronic upper airway irritation, impaired mucociliary clearance, recurrent respiratory symptoms and persistent Eustachian tube dysfunction. Although older otologic literature did not always isolate indoor cooking smoke as a separate variable, its clinical importance has become increasingly clear in settings where biomass fuel use and poor kitchen ventilation are common. The present study therefore adds practical local relevance to the literature by identifying a modifiable domestic exposure associated with severe disease.³

A strong association was also observed between upper respiratory tract infection and disease type. This is entirely consistent with the accepted pathophysiology of chronic otitis media. The middle ear is functionally linked to the nasopharynx through the Eustachian tube and repeated upper respiratory infection can result in tube edema, impaired aeration, negative middle ear pressure and persistence of infection. The present finding therefore validates the inclusion of nose and throat examination in all CSOM patients and reinforces the need to manage associated rhinitis, sinusitis, tonsillitis, or adenoidal disease when present.^{3,4}

The symptom profile observed in the present study closely mirrors the classic presentation of CSOM. Ear discharge and hearing loss were the dominant complaints. Persistent otorrhoea through a perforated tympanic membrane remains the defining clinical feature of chronic middle ear suppuration, while hearing loss is the principal functional consequence that drives disability. The large number of patients with prolonged symptom duration indicates that chronic ear discharge is often tolerated for long periods before specialist care is sought. Such delay is likely to contribute directly to the burden of cholesteatoma, hearing impairment and complications documented in tertiary-care populations.^{1,3} The hearing profile of the study deserves special attention. Conductive

hearing loss was the commonest audiological pattern, which is expected because the primary pathology lies in the tympanic membrane and middle ear. However, the presence of mixed hearing loss in a meaningful proportion of patients is important. Previous studies have shown that chronic inflammatory middle ear disease may affect the cochlea, possibly through diffusion of bacterial toxins and inflammatory mediators across the round window membrane.^{7,8} This implies that longstanding CSOM is not always a purely conductive disorder and that part of the hearing loss may become irreversible if treatment is delayed.

The otoscopic findings in the present study were internally coherent. Central perforation was the commonest finding, matching the predominance of mucosal disease. Attic and marginal perforations and retraction pockets, though less common, were clinically important because of their known association with cholesteatoma and unsafe disease. This underscores the continued importance of meticulous otoscopic examination in all patients with chronic ear discharge, especially at the peripheral-care level where early referral decisions are made.^{3,4}

The presence of complications such as mastoiditis, facial nerve palsy and intracranial involvement in a minority of patients further highlights the seriousness of delayed and unsafe disease. While complication rates were not numerically high, their clinical significance remains substantial because of the risk of permanent disability and mortality. Published series from developing-country settings continue to show that neglected CSOM can still progress to serious complications despite the availability of antibiotics, especially when cholesteatoma is present.¹²⁻¹⁴

One of the principal strengths of this study is the use of multivariate analysis, which makes it possible to distinguish crude associations from independent predictors. The finding that low socioeconomic status, malnutrition, bottle feeding, overcrowding and indoor cooking exposure remained independently associated with squamous disease is highly informative. It indicates that severe chronic ear disease is socially patterned and shaped more by living conditions than by demographic characteristics such as age or sex alone. In practical terms, the study suggests that risk assessment in CSOM should extend beyond ear findings to the wider family and domestic environment.

The study also has public-health implications. Control of CSOM cannot rely solely on outpatient prescriptions or otologic surgery. Preventive efforts should include breastfeeding promotion, nutritional support, early treatment of URTI, reduction of indoor smoke exposure, awareness regarding chronic ear discharge and improved referral pathways from primary and peripheral centres. Because the heaviest disease burden lies in

socioeconomically vulnerable groups, preventive interventions should be targeted to those populations where they are most needed.^{1,2}

The cross-sectional design identifies associations but cannot establish temporal causality. Nevertheless, the findings remain valuable because they describe the clinical and social reality of CSOM in a tertiary care population from northern Chhattisgarh and are broadly consistent with published literature.

Overall, the study demonstrates that chronic suppurative otitis media continues to impose a substantial burden of hearing loss and unsafe disease in this setting. More importantly, it shows that severe disease is strongly associated with modifiable social and environmental determinants. Early diagnosis, routine hearing assessment, treatment of associated upper airway pathology and community-based preventive strategies remain essential if the burden of chronic ear disease is to be reduced.

Limitations

The study was hospital-based and may therefore overrepresent symptomatic, chronic, or severe cases compared with the general community. Convenience consecutive sampling may have introduced selection bias. Some behavioural and environmental exposures were based on patient or caregiver recall and may be subject to recall bias. The study was conducted at a single tertiary care institution, which may limit generalizability to other settings.

CONCLUSION

The present study concludes that chronic suppurative otitis media remains a common and clinically important disorder among patients attending the tertiary care centre. Mucosal disease was the predominant form, but squamous chronic otitis media and cholesteatoma constituted a substantial proportion of cases, indicating a significant burden of unsafe disease.

Ear discharge and hearing loss were the most frequent presenting complaints and conductive hearing loss was the most common audiological pattern. However, the presence of mixed components highlights the long-term auditory impact of persistent disease. Low socioeconomic status, malnutrition, bottle feeding, overcrowding, indoor cooking exposure and upper respiratory tract infection showed significant association with severe disease, with several factors remaining independent predictors on multivariate analysis. The study therefore establishes that CSOM in this setting is closely linked to social deprivation and adverse household environment and that effective control requires both appropriate otologic management and broader preventive strategies.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Dhanelia T, Armo U, Dani P, Minj A, Gupta S, Singh BR. Clinical profile and associated risk factors of chronic suppurative otitis media in a tertiary care centre: a cross-sectional study. *Int J Otorhinolaryngol Head Neck Surg* 2026;12:719-25.