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Sanjoy Das
Assistant Professor,
Department of Otolaryngology and Head Neck Surgery,
Chittagong Medical College,
Chittagong, Bangladesh

Tuli Sen
Outdoor Medical Office (ENT),
Medical Centre Hospital,
Chittagong, Bangladesh

Corresponding Author:
Sanjoy Das
Assistant Professor,
Department of Otolaryngology and Head Neck Surgery,
Chittagong Medical College,
Chittagong, Bangladesh

Assessment of Causative Factors and Clinical Manifestations in Chronic Suppurative Otitis Media

Sanjoy Das and Tuli Sen

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Abstract
Background: Chronic Suppurative Otitis Media (CSOM) is a persistent middle ear infection with prolonged ear discharge, mainly affecting populations in low- and middle-income countries. It significantly contributes to hearing loss, especially in children, impacting language development, education, and quality of life. CSOM arises from multiple factors, including infection, Eustachian tube dysfunction, poor socioeconomic conditions, and inadequate healthcare access. Clinical features such as discharge type and perforation site help identify causative organisms.
Aim of the study: This study aims to investigate the causative organisms and clinical correlates of CSOM in patients presenting to a tertiary care centre.
Methods: This cross-sectional observational study was conducted at Department of Otolaryngology and Head Neck Surgery, Chittagong Medical College Hospital, Chittagong, Bangladesh from January to June 2023. Fifty patients clinically diagnosed with CSOM were included, regardless of age or gender, following informed consent. Exclusion criteria involved acute otitis media, immunocompromised status, and ear trauma. Data were collected through structured interviews, medical record reviews, and clinical examinations. Variables included sociodemographic data, clinical features, medical history, and otoscopic findings. Data were analyzed using SPSS version 26.0.
Results: The study analyzed 50 CSOM patients, with a male predominance (56%) and a mean age of 28.6±12.4 years. Most patients were from rural areas (62%) and had primary or secondary education. Laborers (34%) and students (26%) were commonly affected. The right ear was more frequently involved (42%), with bilateral cases in 24%. Mucopurulent discharge (52%) and hearing loss (92%) were the most common clinical features. Central tympanic membrane perforation (74%) was the most observed otoscopic finding. Granulation tissue was found in 26%, and 60% had a history of upper respiratory infections. Contralateral ear involvement occurred in 24% of cases.
Conclusion: CSOM remains a prevalent and disabling condition in Bangladesh, especially among rural, less-educated, and socioeconomically disadvantaged populations. Typical findings include hearing loss, prolonged ear discharge, and middle ear pathology. Strengthening awareness, early intervention, and improving healthcare infrastructure are essential to mitigate its long-term consequences.

Keywords: Chronic Suppurative Otitis Media (CSOM), Middle Ear Infection, Clinical Correlates and Otitis Media Complications

Introduction
Chronic Suppurative Otitis Media (CSOM) is a persistent inflammation of the middle ear and mastoid cavity, characterized by recurrent or continuous ear discharge (otorrhea) through a perforated tympanic membrane lasting more than 6-12 weeks [1]. It is a significant global health problem, particularly in low- and middle-income countries (LMICs), where it affects approximately 65-330 million people worldwide, of whom about 60% suffer from significant hearing impairment [2,3]. CSOM can lead to severe complications, including hearing loss, intracranial infections, and irreversible damage to the middle ear structures, negatively impacting the patient's quality of life, educational opportunities, and socioeconomic productivity [4]. The etiology of CSOM is multifactorial and includes a combination of microbial infection, Eustachian tube dysfunction, socioeconomic status, environmental exposure, and host factors such as poor nutrition and immune suppression [5]. Clinical manifestations of CSOM vary depending on the duration, severity, and causative organism. The most common symptoms include persistent or intermittent purulent otorrhea, conductive hearing loss, ear fullness, and sometimes pain or vertigo [6].

In the active stage, mucopurulent discharge signifies ongoing infection, whereas in the inactive stage, the ear may be dry with only a central perforation. Clinical correlates, including the type of discharge, perforation site, presence of granulation tissue or cholesteatoma, and degree of hearing impairment, suggest the likely causative organism and guide the management strategy [7]. Several demographic and environmental factors contribute to the development and persistence of CSOM. Children are disproportionately affected due to immature Eustachian tube anatomy and function, exposure to upper respiratory infections, and overcrowded living conditions [8]. Inadequate access to healthcare, frequent use of over-the-counter ear drops and antibiotics, and poor oral hygiene further exacerbate the disease burden in underprivileged communities [9]. Moreover, CSOM-associated hearing loss during critical developmental periods can impair language acquisition and cognitive development, particularly in children, reinforcing the importance of early diagnosis and management [10].The emergence of antibiotic resistance among pathogens causing CSOM poses a major therapeutic challenge. The irrational use of broad-spectrum antibiotics and lack of culture-guided therapy have led to the rise of multidrug-resistant organisms, complicating the management and increasing the risk of complications [11]. Therefore, microbiological profiling and sensitivity testing remain crucial components in the treatment protocol for CSOM patients. In Bangladesh and similar resource-limited settings, the burden of CSOM remains high due to a combination of endemic poverty, environmental pollution, low health literacy, and under-resourced healthcare systems. A better understanding of the causative organisms and their clinical correlations is essential to formulate effective treatment protocols, reduce disease burden, and prevent complications. This study aims to investigate the causative organisms and clinical correlates of CSOM in patients presenting to a tertiary care centre.

Methodology & Materials

This cross-sectional observational study was conducted at Department of Otolaryngology and Head Neck Surgery, Chittagong Medical College Hospital, Chittagong, Bangladesh from January to June 2023. The study included 50 patients clinically diagnosed with CSOM, irrespective of age and gender, who provided informed consent. CSOM was defined as chronic inflammation of the middle ear and mastoid cavity, characterized by ear discharge through a perforated tympanic membrane lasting more than 6 weeks.

Inclusion Criteria

- Patients of any age and gender with a clinical diagnosis of CSOM.
- Duration of ear discharge > 6 weeks.

Exclusion Criteria

- Patients with acute otitis media or otitis externa.
- Patients with immunocompromised conditions.
- History of trauma or foreign body in the ear.

Data Collection Procedure

After obtaining ethical clearance and informed consent, data were collected using a structured questionnaire and clinical examination checklist. Information was gathered through patient interviews, review of medical records, and direct clinical and otoscopic examination by ENT specialists.
The following variables were recorded:

- **Sociodemographic details:** Age, sex, residence, education, occupation
- **Clinical features:** Laterality, duration and type of discharge, associated symptoms (hearing loss, tinnitus, vertigo)
- **History:** URTI, previous ENT surgery, family history of CSOM
- **Otoscopic findings:** Type of tympanic membrane perforation, granulation/polyps, mucosal condition, mastoid tenderness, opposite ear status

Data Analysis

Collected data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Descriptive statistics were used to summarize the data. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were presented as frequencies and percentages.

Results

The study assessed 50 patients with Chronic Suppurative Otitis Media (CSOM), revealing a mean age of 28.6 ±12.4 years, with a higher prevalence among males (56%) compared to females (44%) (Table 1). Most participants resided in rural areas (62%) and had varying educational levels, with the majority having primary (34%) or secondary (30%) education. Laborers (34%) and students (26%) were the most common occupational groups. Clinically, the right ear was more frequently affected (42%), with bilateral involvement in 24% of cases (Table 2). The average duration of ear discharge was 14.2±8.7 months, with mucopurulent discharge being the most common type (52%). Hearing loss was reported in 92% of patients, while 38% experienced tinnitus and 24% had vertigo. A history of upper respiratory tract infection (URTI) was noted in 60% of cases. Otoscopic examination showed central tympanic membrane perforations in 74% of patients, while 58% had Inflamed middle ear mucosa and 26% had cholesteatoma (Table 3). The majority had normal opposite ear status (70%). Regarding treatment, 62% received medical therapy, 18% underwent surgery, and 20% received combined treatment (Table 4). Treatment compliance was good in 76% of cases, and 80% of patients showed clinical improvement at follow-up, demonstrating the effectiveness of appropriate management strategies in CSOM.

Table 1: Sociodemographic Characteristics of Patients with CSOM (n = 50)

Variable	Frequency (n)	Percentage (%)
Age (years, Mean ± SD)	28.6 ± 12.4	
Sex		
Male	28	56.00
Female	22	44.00
Residence		
Urban	19	38.00

Rural	31	62.00
Educational Status		
Illiterate	8	16.00
Primary	17	34.00
Secondary	15	30.00
Higher	10	20.00
Occupation		
Student	13	26.00
Service Holder	8	16.00
Laborer	17	34.00
Others (Housewives, etc.)	12	24.00

Table 2: Clinical Characteristics of CSOM Patients (n = 50)

Variable	Frequency (n)	Percentage (%)
Laterality of CSOM		
Right Ear	21	42.00
Left Ear	17	34.00
Bilateral	12	24.00
Duration of Discharge (Mean ± SD)	14.2 ± 8.7 months	
Type of Discharge		
Mucoid	9	18.00
Mucopurulent	26	52.00
Purulent	15	30.00
Hearing Loss		
Present	46	92.00
Absent	4	8.00
Tinnitus	19	38.00
Vertigo	12	24.00
Headache	8	16.00
History of URTI	30	60.00
Previous ENT Surgery	7	14.00
Family History of CSOM	11	22.00

Table 3: Otoscopic Findings of CSOM Patients (n = 50)

Variable	Frequency (n)	Percentage (%)
Type of Tympanic Membrane Perforation		
Central	37	74.00
Marginal	8	16.00
Attic	5	10.00
Middle Ear Condition		
Normal middle ear mucosa	7	14.00
Inflamed middle ear mucosa	29	58.00
Presence of Cholesteatoma	13	26.00
Granulation Tissue / Polyps Present	13	26.00
Opposite Ear Status		
Normal	35	70.00
CSOM	12	24.00
Other	3	6.00

Table 4: Treatment and Clinical Outcome (n = 50)

Variable	Frequency (n)	Percentage (%)
Treatment Type		
Medical	31	62.00
Surgical	9	18.00
Combined	10	20.00
Compliance with Treatment		
Good	38	76.00
Poor	7	14.00
Irregular	5	10.00
Outcome at Follow-up		
Improved	40	80.00
No Change	7	14.00
Worsened	3	6.00

Discussion

Chronic Suppurative Otitis Media (CSOM) remains a significant public health concern, especially in low- and middle-income countries like Bangladesh, due to its high prevalence, chronicity, and potential to cause irreversible hearing impairment. The present study assessed the sociodemographic, clinical, and otoscopic characteristics of CSOM in 50 patients, offering valuable insight into the local disease burden and associated risk factors. The mean age of the study participants was 28.6±12.4 years, with the highest number of cases observed in young adults. This finding is consistent with studies conducted in India and Nigeria, where CSOM predominantly affects individuals in the productive age group, potentially impacting socioeconomic development due to reduced hearing and communication ability [12, 13]. The slightly higher male prevalence (56%) may reflect sociocultural dynamics in healthcare-seeking behavior, where males are more likely to access medical services in patriarchal societies [14]. Most (62%) of the cases in this study were from rural areas, indicating a higher burden of CSOM in resource-poor communities. Limited access to healthcare, poor hygiene, and lack of awareness about ear infections contribute to rural populations, as noted in studies from Nepal and Pakistan [15, 16]. The educational profile revealed that 34% of patients had only primary education, and 16% were illiterate. This further supports the association between low education levels and increased CSOM prevalence due to poor health literacy and delayed treatment-seeking [3]. Occupationally, laborers (34%) and students (26%) were the most affected groups. Manual laborers often work in dusty environments and are exposed to unhygienic conditions, predisposing them to upper respiratory tract infections (URTI) and subsequent ear infections. Students may be exposed to recurrent URTIs in crowded educational settings. In this study, 60% of patients reported a recent or past history of URTI, reinforcing its role as a major precipitating factor for CSOM. This association has also been well-documented in a study by Bluestone [17], highlighting that persistent Eustachian tube dysfunction and nasopharyngeal infections can predispose to chronic middle ear infections. The clinical presentation in our study was consistent with the classical features of CSOM. Right ear involvement was most common (42%), followed by left ear (34%) and bilateral disease (24%). The average discharge duration was 14.2±8.7 months, indicating the disease's chronic and often neglected nature. Mucopurulent discharge was the predominant type (52%), followed by purulent (30%) and mucoid (18%), which aligns with other studies indicating secondary bacterial infection of chronic perforations [18]. Hearing loss was present in 92% of the patients, emphasizing the disabling potential of the disease. Additional symptoms such as tinnitus (38%), vertigo (24%), and headache (16%) further contributed to morbidity. 22% of patients reported a family history, suggesting a possible genetic or shared environmental predisposition. Similar findings were noted in studies by Acuin and others, who have proposed a combination of genetic susceptibility and familial exposure to pathogens or poor hygiene practices as contributing factors [19]. Otoscopic examination revealed that central perforations were the most common (74%), in line with previous studies describing tubotympanic (safe) disease as the more frequent subtype [1, 20]. However, the presence of marginal (16%) and attic perforations (10%) indicated atticoantral (unsafe) disease in a notable subset of patients. Inflamed middle ear mucosawas present in 58% of patients, and cholesteatoma in 26%, indicating an advanced stage of disease in a significant proportion. Cholesteatoma, if left untreated, can lead to serious complications such as intracranial infections and facial nerve palsy [21]. The presence of granulation tissue or polyps (26%) further confirmed the chronic inflammatory nature of the disease. Most patients (62%) received medical treatment, which included antibiotics, aural toileting, and topical preparations, while 18% underwent surgical intervention, and 20% received a combination of both. These findings align with standard management protocols where conservative treatment is preferred initially, and surgery is reserved for non-responders or those with complications like cholesteatoma or ossicular erosion [22]. Encouragingly, treatment compliance was good in 76% of cases, and 80% of patients showed clinical improvement at follow-up. This highlights the effectiveness of early diagnosis and consistent treatment in improving CSOM outcomes [24]. However, 14% showed no improvement, and 6% worsened, underlining the need for more aggressive treatment or surgical evaluation in select cases.

Limitations of the study: Although this study provides meaningful data, it has limitations, such as a relatively small sample size and lack of microbiological culture analysis, which would have enriched the understanding of causative organisms and antibiotic sensitivity patterns. Future research should incorporate microbiological profiles and long-term treatment outcomes to improve management protocols.

Conclusion and Recommendations

This study highlights the significant burden of Chronic Suppurative Otitis Media (CSOM) among patients, particularly in rural and socioeconomically disadvantaged populations in Bangladesh. Most cases involved young adults with a high prevalence of hearing loss, mucopurulent discharge, and central tympanic membrane perforation. Key contributing factors included poor education, occupational exposure, and recurrent upper respiratory tract infections. The findings underscore the importance of early diagnosis, public health education, and improved access to ENT services. Targeted interventions focusing on prevention and timely management can reduce complications, enhance quality of life, and minimize the long-term impact of CSOM on affected individuals.

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