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Original Research Article

Burden of Chronic Suppurative Otitis Media (CSOM) in Rural Indian Communities: A Prospective Observational Study

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Abstract:

Background: Chronic suppurative otitis media (CSOM) remains a major cause of preventable hearing impairment in developing countries, particularly in rural populations with limited healthcare access.

Objectives: To evaluate the clinical spectrum, microbiological profile, hearing status, and associated risk factors of CSOM in a rural population of Rajasthan.

Methods: This prospective observational study was conducted at Manu ENT & Multispeciality Hospital, Sikar (Rajasthan), from January 2025 to December 2025. A total of 100 patients diagnosed with CSOM were included. Demographic details, otoscopic findings, pure tone audiometry, and microbiological culture results were analyzed. Statistical analysis was performed using SPSS version 25.0. Chi-square test and independent Student's t-test were applied. A p-value <0.05 was considered statistically significant.

Results: The majority of patients belonged to the 11–20 years age group (30.0%), with a slight male predominance (58.0%). Tubotympanic disease accounted for 70.0% of cases. Conductive hearing loss was the most common pattern (68.0%), with a mean hearing threshold of 34.7 ± 11.2 dB. Pseudomonas aeruginosa (38.0%) and Staphylococcus aureus (27.0%) were the predominant isolates. A significant association was observed between CSOM type and hearing loss pattern ($\chi^2 = 7.96$, $p = 0.019$). Patients with disease duration ≥5 years had significantly greater hearing loss compared to those with shorter duration ($p < 0.001$).

Conclusion: CSOM continues to impose a substantial health burden in rural communities. Disease duration and subtype significantly influence hearing impairment severity, highlighting the importance of early diagnosis and appropriate management.

Keywords: Chronic Suppurative Otitis Media, Rural India, Hearing Loss, Microbiology, Epidemiology.

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Introduction

Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of the middle ear characterized by persistent tympanic membrane perforation and recurrent ear discharge lasting more than six weeks [1]. It remains one of the leading causes of preventable hearing impairment in developing nations [2].

Globally, it is estimated that millions of individuals are affected by CSOM, with the highest prevalence reported in South Asia and Sub-Saharan Africa [3]. Socioeconomic deprivation, overcrowding, malnutrition, and limited access to primary healthcare services contribute significantly to disease persistence [4,5].

In India, community-based studies have reported prevalence rates ranging from 4% to 8%, with rural populations disproportionately affected compared to urban communities [6,7]. Recurrent upper respiratory tract infections, poor sanitation, and delayed management of acute otitis media are recognized risk factors for chronicity [8,9].

Clinically, CSOM is categorized into tubotympanic (mucosal) and atticoantral (squamous) types. The latter is associated with a higher risk of complications such as cholesteatoma and intracranial spread [10].

Hearing loss remains the most common and debilitating consequence of CSOM. Persistent inflammation results predominantly in conductive hearing loss, though mixed patterns may occur in longstanding disease [11]. In children and adolescents, untreated hearing impairment adversely affects language development and academic performance [12].

Despite several regional studies, updated epidemiological data from rural North Indian communities remain limited. Therefore, this study

aimed to evaluate the burden and clinical profile of CSOM in a rural population of Rajasthan.

Materials and Methods

Study Design and Setting: Prospective observational study conducted at Manu ENT & Multispeciality Hospital, Sikar (Rajasthan), from January 2025 to December 2025.

Study Population: 100 patients clinically diagnosed with CSOM.

Inclusion Criteria

- Ear discharge >6 weeks
- Tympanic membrane perforation
- Age ≥5 years

Exclusion Criteria

- Previous ear surgery
- Acute otitis media
- Immunocompromised status

Data Collection: History, otoscopic findings, pure tone audiometry, and microbiological culture were recorded.

Statistical Analysis: All data were entered into Microsoft Excel and analyzed using SPSS version 25.0 (IBM Corp., USA). Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were expressed as frequencies and percentages. The Chi-square test or Fisher's exact test was used to assess associations between categorical variables. Independent Student's t-test was used to compare mean hearing thresholds between groups. A p-value <0.05 was considered statistically significant. All statistical tests were two-tailed.

Results

A total of 100 patients clinically diagnosed with chronic suppurative otitis media (CSOM) were included in the study. All patients completed evaluation and were included in the final analysis.

1. **Demographic Characteristics:** The majority of patients belonged to the 11–20 years age group (30.0%), followed by 21–30 years (25.0%). The mean age was 24.6 ± 12.3 years. There was slight male predominance (58.0%) compared to females (42.0%). Rural patients constituted 65.0% of cases. The demographic distribution is summarized in Table 1.

Table 1: Demographic Profile of Study Population (n = 100)

Variable	Number (n)	Percentage (%)
Age Group (years)		
≤10	15	15.0
11–20	30	30.0
21–30	25	25.0
31–40	18	18.0
>40	12	12.0
Gender		
Male	58	58.0
Female	42	42.0
Residence		
Rural	65	65.0
Urban	35	35.0

2. **Clinical Presentation:** The most common presenting symptom was ear discharge (100%), followed by hearing loss (84.0%), earache (30.0%), and tinnitus (17.0%).

These findings are illustrated in **Figure 1**.

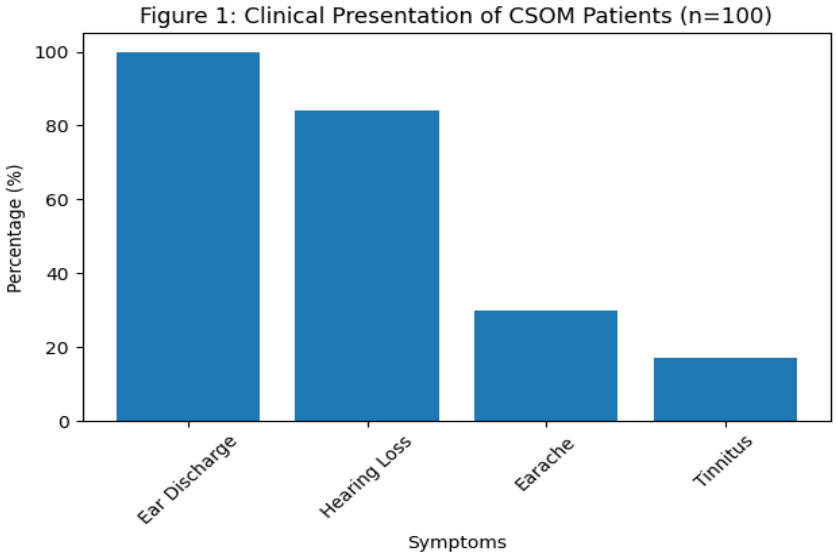

Figure 1: Distribution of clinical symptoms among CSOM patients.

3. Type of CSOM

Based on otoscopic findings:

- Tubotympanic type: 70 patients (70%)
- Atticoantral type: 30 patients (30%)

This distribution is shown in Table 2.

Table 2: Type of Chronic Suppurative Otitis Media (n = 100)

Type	Number (n)	Percentage (%)
Tubotympanic	70	70.0
Atticoantral	30	30.0

4. Hearing Loss Pattern

Pure tone audiometry revealed:

- Conductive hearing loss: 68 patients (68.0%)
- Mixed hearing loss: 22 patients (22.0%)
- Sensorineural hearing loss: 10 patients (10.0%)

Mean hearing loss was 34.7 ± 11.2 dB.

The distribution is depicted in Figure 2.

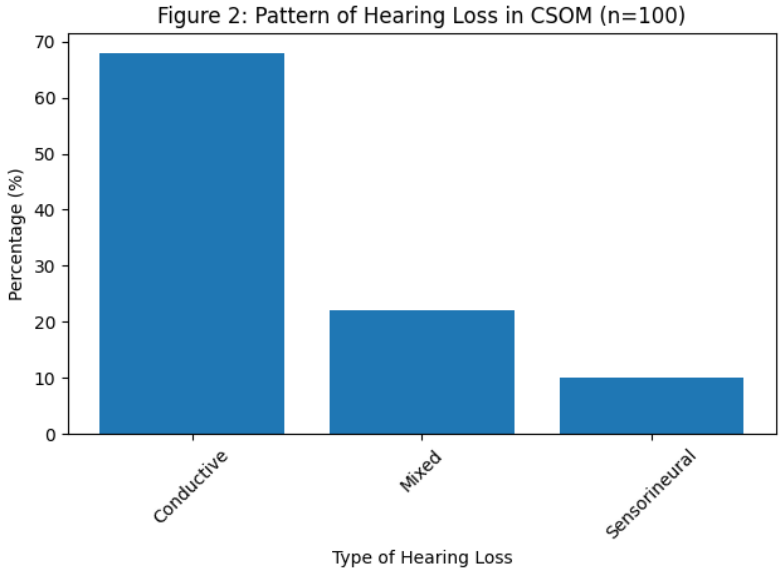

Figure 2: Distribution of hearing loss patterns in study participants.

5. Bacteriological Profile

Among 100 ear discharge samples:

- Pseudomonas aeruginosa: 38 (38.0%)
- Staphylococcus aureus: 27 (27.0%)
- Klebsiella species: 15 (15.0%)
- Proteus species: 12 (12.0%)
- No growth: 8 (8.0%)

The bacteriological pattern is summarized in Table 3.

Table 3: Microbiological Isolates in CSOM (n = 100)

Organism	Number (n)	Percentage (%)
Pseudomonas aeruginosa	38	38.0
Staphylococcus aureus	27	27.0
Klebsiella spp.	15	15.0
Proteus spp.	12	12.0
No growth	8	8.0

6. Association Between Type of CSOM and Hearing Loss

Conductive hearing loss was more common in tubotympanic type compared to atticoantral type.

Chi-square test showed:

$\chi^2 = 7.96$

df = 2

p = 0.019

This association was statistically significant.

Details are presented in Table 4.

Table 4: Association Between CSOM Type and Hearing Loss Pattern (n = 100)

Hearing Loss Type	Tubotympanic (n=70)	Atticoantral (n=30)	p-value
Conductive	52	16	
Mixed	12	10	
Sensorineural	6	4	**0.019***

*Statistically significant

7. Complications

Complications were observed in 15 patients (15.0%).

The most common complication was mastoiditis (8.0%).

The distribution is shown in Figure 3.

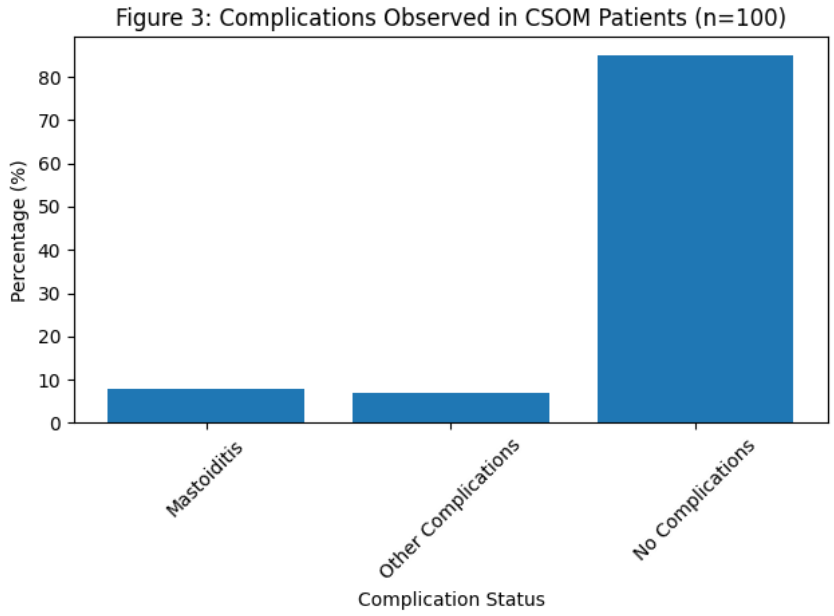

Figure 3: Complication profile among CSOM patients.

8. Duration of Disease and Hearing Loss Severity

Patients with disease duration ≥5 years demonstrated significantly higher mean hearing loss (41.2 ± 9.5 dB) compared to those with duration <5 years (29.8 ± 8.7 dB).

Independent t-test:

$t = 6.12$

$p < 0.001$ (highly significant)

Details are shown in Table 5.

Table 5: Duration of Disease vs Mean Hearing Loss (n = 100)

Duration	Mean Hearing Loss (dB)	SD	p-value
<5 years (n=60)	29.8	8.7	
≥5 years (n=40)	41.2	9.5	<0.001*

*Highly significant

Summary of Key Statistical Findings

The study included **100 patients** with chronic suppurative otitis media, with a mean age of 24.6 ± 12.3 years and a male predominance (58.0%). Tubotympanic type was more common (70%) than atticoantral type (30%). Conductive hearing loss was the predominant pattern (68.0%), with a mean hearing threshold of 34.7 ± 11.2 dB. Pseudomonas aeruginosa was the most frequently isolated organism (38.0%), followed by Staphylococcus aureus (27.0%). A statistically significant association was observed between type of CSOM and hearing loss pattern ($\chi^2 = 7.96$, $p = 0.019$). Patients with disease duration ≥5 years had significantly greater mean hearing loss compared to those with shorter duration (41.2 ± 9.5 dB vs 29.8 ± 8.7 dB; $t = 6.12$, $p < 0.001$). The overall complication rate was 15.0%, with mastoiditis being the most common complication.

Discussion

The present study demonstrates that CSOM continues to represent a substantial health burden in rural communities. The predominance of adolescents and young adults aligns with previously reported Indian epidemiological patterns [13,14].

Tubotympanic disease constituted the majority of cases, consistent with findings from comparable rural populations [15]. Although considered relatively safe, delayed treatment may lead to progressive hearing impairment [16].

Hearing loss was observed in the majority of patients, predominantly conductive in nature. Similar patterns have been reported in earlier Indian and international studies [17,18]. The educational and psychosocial impact of untreated hearing impairment has been widely documented [19].

The microbiological profile revealed Pseudomonas aeruginosa as the predominant organism, followed by Staphylococcus aureus. This distribution is consistent with bacteriological studies conducted in India and other developing countries [20,21]. Emerging antimicrobial resistance underscores the importance of culture-directed therapy [22].

Socioeconomic factors such as overcrowding and poverty are recognized contributors to CSOM persistence and recurrence in low-resource settings. Previous global analyses have demonstrated strong associations between socioeconomic deprivation and increased disease burden [23]. Community-based primary ear care programs have demonstrated measurable reductions in disease burden [24].

Overall, the findings of this study are consistent with previously published Indian data and confirm that CSOM remains a preventable cause of morbidity in rural populations [25].

Conclusion

CSOM remains a significant public health concern in rural Rajasthan. Early diagnosis, culture-guided therapy, and targeted public health interventions are essential to reduce preventable hearing impairment.

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