

## An Observational Study to Analyse the Occurrence and Characteristics of Otogenic Complications of Chronic Otitis Media (COM) at a Tertiary Care Hospital

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### Abstract:

**Background:** Chronic otitis media (COM) is an inflammatory condition that affects the middle ear. It can cause different symptoms, such as permanent changes in the eardrum, which can lead to the eardrum collapsing, developing a permanent hole, or forming pockets that may or may not contain a type of skin growth called cholesteatoma. It can also cause damage to the small bones in the middle ear. Identifying the patterns of spread inside the temporal bone and the involvement of neurovascular structures might help in managing issues associated with chronic otitis media.

**Aim and Objectives:** To analyse the occurrence and characteristics of otogenic complications at a tertiary care teaching hospital.

**Materials and Methods:** This single-centre, prospective, observational study was conducted on 100 patients aged 18-60 years with complications arising from chronic otitis media (COM). Inclusion criteria included a confirmed diagnosis of chronic otitis media and the presence of otogenic complications such as mastoiditis, subperiosteal abscess, Bezold's abscess, facial nerve palsy, labyrinthitis, petrositis, meningitis, brain abscess, or lateral sinus thrombosis. Each patient underwent a thorough clinical examination, including a detailed ear, nose, and throat examination. Audiological assessment was performed using pure tone audiometry to evaluate the type and degree of hearing loss. Imaging studies, including CT scans of the temporal bone with brain cuts, were conducted to assess the extent of disease and any intracranial involvement. Relevant blood tests were conducted to ensure pre-anaesthesia fitness and to identify any underlying infections or inflammatory conditions.

**Results:** The types of otogenic complications observed in the patients revealed that mastoiditis was the most common (25%), followed by subperiosteal abscess (20%) and Bezold's abscess (15%). Intracranial complications were less frequent but significant, with meningitis occurring in 8% of patients, brain abscess in 5%, and lateral sinus thrombosis in 2%. This distribution highlights the varied and serious nature of complications arising from chronic otitis media. Audiological assessment revealed that half of the patients (50%) had conductive hearing loss (CHL), while 30% had sensorineural hearing loss (SNHL), and 20% experienced mixed hearing loss. These results indicate that hearing loss is a common issue among patients with chronic otitis media complications, with conductive hearing loss being the most prevalent type. Imaging findings from CT scans of the temporal bone with brain cuts showed that erosion of mastoid air cells was present in 60% of the patients, indicating extensive local disease. Ossicular chain disruption was observed in 40% of the cases, and cholesteatoma was present in 35%, both of which can contribute to hearing loss and other complications. Intracranial extension was found in 15% of the patients, underscoring the potential for serious complications extending beyond the ear.

**Conclusion:** This study provides a comprehensive overview of the pattern of otogenic complications in patients with chronic otitis media at a tertiary care teaching hospital. The findings highlight the importance of early diagnosis and intervention to manage these complications effectively. The demographic characteristics, types of complications, audiological impact, and imaging findings observed in this study are consistent with those reported in previous research, underscoring the generalizability of these results.

**Keywords:** COM, Mastoiditis, Intracranial Complications.

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## Introduction

Chronic otitis media (COM) is an inflammatory condition that affects the middle ear. It can cause different symptoms, such as permanent changes in the eardrum, which can lead to the eardrum collapsing, developing a permanent hole, or forming pockets that may or may not contain a type of skin growth called cholesteatoma. It can also cause damage to the small bones in the middle ear. It may also lead to inconsistent healing of the eardrum, culminating in tympanosclerosis or dimeric eardrum [1]. The global incidence of Chronic otitis media is estimated to be between 65 to 330 million cases per year. The prevalence of chronic otitis media is highest in South-East Asia, Western Pacific, and African nations. In addition, around 21,000 individuals (equivalent to a rate of 33 per 10 million people) succumb to problems arising from chronic otitis media annually. Chronic otitis media is a prevalent ear, nose, and throat (ENT) health issue in India. Nevertheless, there has been a decrease in the occurrence of problems [2]. However, these difficulties still persist owing to unfavourable socio-economic circumstances, insufficient awareness about healthcare, and limited availability of skilled specialists in rural areas. India is classified as one of the nations with the greatest prevalence, meaning that it has a prevalence rate more than 4%. In the time when antibiotics were available, intracranial problems occurred in around 2.3% of cases. However, with the advent of antibiotics and improved surgical procedures, the risk of complications has significantly fallen to approximately 0.15% - 0.04% [3-5]. The mortality rate decreased from 25% to 8%. The prevailing view about chronic otitis media (COM) suggests that it is caused by prolonged dysfunction of the eustachian tube, leading to inadequate aeration of the middle ear space. This, combined with repeated bouts of acute otitis media, leads in persistent middle ear infections. Inactive chronic otitis media refers to a persistent condition when there is a dry central hole in the ear with occasional leakage [6,7]. Active chronic otitis media, characterized by chronic or recurrent mucoid otorrhea, is caused by the presence of germs from both the external auditory canal and the Eustachian tube, which come into contact with the mucosa of the tympanic membrane. In cases of Chronic Otitis Media with squamosal involvement, there is a significant risk of both intra and extra cranial problems [8,9]. The close proximity of the ear to the brain and other essential structures, such as the facial nerve and labyrinthine apparatus, together with the underlying disease of chronic otitis media (COM), which involves a continuous cycle of inflammation, ulceration, granulation, and cholesteatoma production, is responsible for this. Meningitis may occur when an infection is introduced directly into

the brain, causing inflammation and erosion of the tegmen plate. This erosion and hyperaemic decalcification can also occur via the hematogenous pathway in rare circumstances. An acute infection of the middle ear results in irritation and inflammation of the mucous membrane of the middle ear, accompanied by swelling. Inflammation causes the formation of ulcers and breaks in the protective layer of cells that line the mucous membranes. Granuloma development and polyps may arise. This process may persist, causing the destruction of adjacent components and resulting in the many problems of COM. Extracranial problems include a range of conditions such as Mastoiditis, Petrositis, Facial paralysis, Postauricular Abscess, Labyrinthitis/Labyrinthine fistula, Bezold's Abscess, Temporal Abscess, Encephalocele, and Cerebrospinal Fluid Leakage. Intracranial problems include a range of conditions such as extradural abscess, subdural abscess, meningitis, brain abscess, lateral sinus thrombophlebitis, and otitic hydrocephalus [10,11]. Multiple variables contribute significantly to the development of these problems. Direct extension via preexisting channels may occur during either acute exacerbations of chronic otitis media (COM) or acute otitis media (AOM). These preexisting channels may include congenital dehiscence of the bony facial canal, patent sutures, past skull fractures, surgical abnormalities, and the oval and round window. Additional parameters that should be considered include the degree of mastoid pneumatisation, the virulence of the microorganism and its susceptibility to antibiotics, as well as the condition of the host's immune system [12]. The illness may be worse due to insufficient treatment of recurrent otitis media, along with patients' lack of understanding of the disease. Complications sometimes arise from the gradual deterioration of the bone, which increases the likelihood of harm to the facial nerve, labyrinth, and dura. Progressive retrograde thrombophlebitis is the typical pathway for the development of a brain abscess. Infection may spread via veins that are connected to either the diseased air-filled cavities of the temporal bone or the previously blocked Dural venous sinus, as well as by direct connection with the veins outside the skull, within the skull, and inside the cranial diploic veins. Therefore, sigmoid sinus thrombosis might result in thrombophlebitis of additional sinuses [13,14]. Identifying the patterns of spread inside the temporal bone and the involvement of neurovascular structures might help in managing issues associated with chronic otitis media.

## Aim and Objectives

To analyse the occurrence and characteristics of otogenic complications at a tertiary care teaching hospital.

## Materials and Methods

The present prospective, observational study included 100 patients aged 18-60 years with complications arising from chronic otitis media (COM). Both outpatients and inpatients were included in this study. Informed consent was obtained from all patients after explaining the study objectives and procedures in their local language.

The study was conducted at the Department of Otorhinolaryngology (ENT), Nalanda Medical College & Hospital, Patna, Bihar, India. All participants gave written consent after being made aware of the study. The study was approved by the Institutional Ethics Committee. The duration of the study was from January 2023 to December 2023.

### Inclusion Criteria

- Patients to give written informed consent.
- Patients of any age and sex with a history of ear discharge for more than 3 months with either one or more intracranial or extracranial complications or both.
- A confirmed diagnosis of chronic otitis media and the presence of otogenic complications such as mastoiditis, subperiosteal abscess, Bezold's abscess, facial nerve palsy, labyrinthitis, petrositis, meningitis, brain abscess, or lateral sinus thrombosis.
- Available for follow up.

### Exclusion Criteria:

- Patients who don't gave written informed consent.
- Pregnant women

- Patients with acute otitis media without chronic otitis media, those with unrelated comorbid conditions, and those unfit for anesthesia or surgery were excluded from the study.
- Patients with immunocompromised status and patients on chemotherapy or steroid treatment.
- Those unable to attend follow-up.

Each patient underwent a thorough clinical examination, including a detailed ear, nose, and throat examination. Audiological assessment was performed using pure tone audiometry to evaluate the type and degree of hearing loss. Imaging studies, including CT scans of the temporal bone with brain cuts, were conducted to assess the extent of disease and any intracranial involvement. Relevant blood tests were conducted to ensure pre-anesthesia fitness and to identify any underlying infections or inflammatory conditions.

Detailed demographic data, clinical history, and examination findings were recorded for each patient. Collected data included age, gender, duration of symptoms, type of otogenic complication, audiological findings, and imaging results.

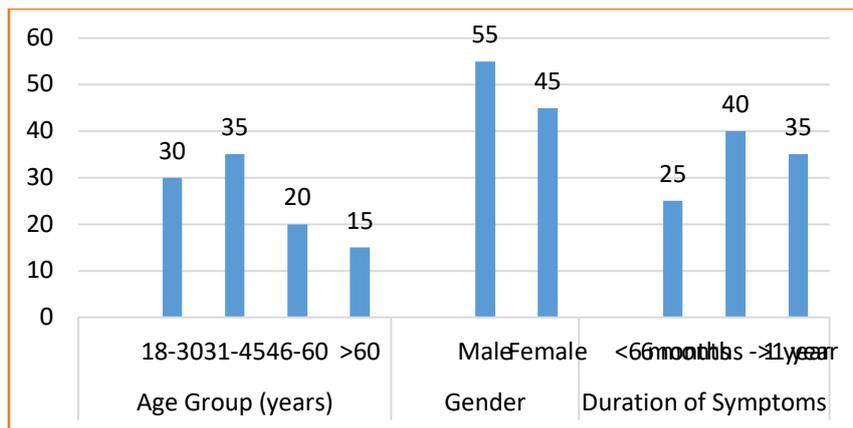
### Statistical Analysis

Data thus obtained were subjected to statistical analysis. The statistical analysis was conducted using SPSS and Microsoft. For categorical variables, ratios and proportions were calculated. The chi-square test, if appropriate, was used to evaluate differences in proportions among qualitative variables. A p-value below 0.05 was deemed to have statistical significance.

### Results

**Table 1: Base line demographic Characteristics of Patients**

Variable	Number of Patients (n=100)	Percentage (%)
<b>Age Group (years)</b>		
18-30	30	30
31-45	35	35
46-60	20	20
>60	15	15
<b>Gender</b>		
Male	55	55
Female	45	45
<b>Duration of Symptoms</b>		
<6 months	25	25
6 months - 1 year	40	40
>1 year	35	35



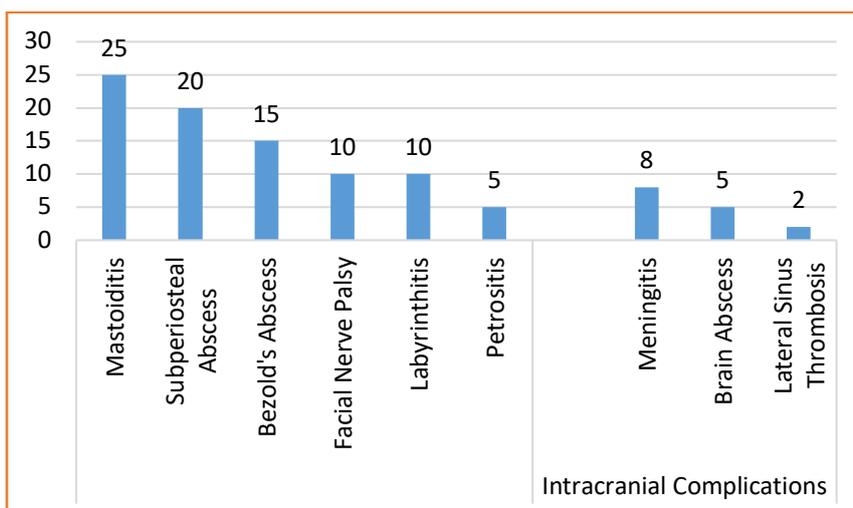
**Graph 1: Demographic Characteristics of Patients**

Table I and Graph I shows the demographic characteristics of the patients in the study and it revealed that the majority were in the age groups of 31-45 years (35%) and 18-30 years (30%), indicating a relatively young to middle-aged population affected by chronic otitis media complications. The gender distribution was fairly

balanced with a slight male predominance (55% male vs. 45% female). Patients had symptoms for less than six months is less in number i.e; 25%. Most patients had symptoms for more than six months, with 40% reporting symptoms between 6 months to 1 year, and 35% experiencing symptoms for over a year.

**Table 2: Types of Otogenic Complications**

Complication	Number of Patients (n=100)	Percentage (%)
Mastoiditis	25	25
Subperiosteal Abscess	20	20
Bezold's Abscess	15	15
Facial Nerve Palsy	10	10
Labyrinthitis	10	10
Petrositis	5	5
<b>Intracranial Complications</b>		
Meningitis	8	8
Brain Abscess	5	5
Lateral Sinus Thrombosis	2	2



**Graph 2: Types of Otogenic Complications**

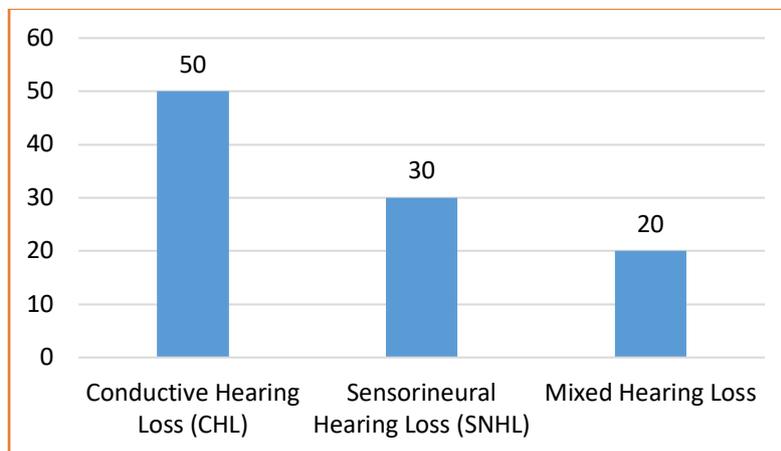
Table II and Graph II shows the types of otogenic complications observed in the patients and it revealed that mastoiditis was the most common (25%), followed by subperiosteal abscess (20%)

and Bezold's abscess (15%). Intracranial complications were less frequent but significant, with meningitis occurring in 8% of patients, brain abscess in 5%, and lateral sinus thrombosis in 2%.

This distribution highlights the varied and serious nature of complications arising from chronic otitis media.

**Table 3: Audiological Assessment Results**

Hearing Loss Type	Number of Patients (n=100)	Percentage (%)
Conductive Hearing Loss (CHL)	50	50
Sensorineural Hearing Loss (SNHL)	30	30
Mixed Hearing Loss	20	20



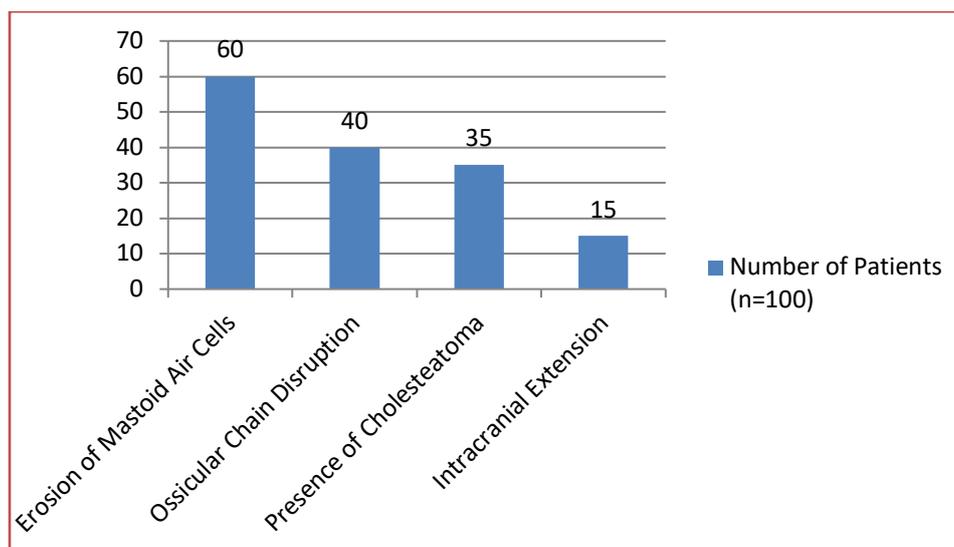
**Graph 3: Audiological Assessment Results**

Table III and Graph III shows audiological assessment and it revealed that half of the patients (50%) had conductive hearing loss (CHL), while 30% had sensorineural hearing loss (SNHL), and 20% experienced mixed hearing loss. These results

indicate that hearing loss is a common issue among patients with chronic otitis media complications, with conductive hearing loss being the most prevalent type.

**Table 4: Imaging Findings (CT Scan of Temporal Bone with Brain Cuts)**

Finding	Number of Patients (n=100)	Percentage (%)
Erosion of Mastoid Air Cells	60	60
Ossicular Chain Disruption	40	40
Presence of Cholesteatoma	35	35
Intracranial Extension	15	15



**Graph 4: Imaging Findings (CT scan of Temporal Bone with Brain Cuts)**

Table IV and Graph IV revealed Imaging findings from CT scans of the temporal bone with brain cuts showed that erosion of mastoid air cells was present in 60% of the patients, indicating extensive local disease. Ossicular chain disruption was observed in 40% of the cases, and cholesteatoma was present in 35%, both of which can contribute to hearing loss and other complications. Intracranial extension was found in 15% of the patients, underscoring the potential for serious complications extending beyond the ear.

### Discussion

The study aimed to evaluate the pattern of otogenic complications in patients with chronic otitis media (COM) at a tertiary care teaching hospital. The results provided valuable insights into the demographic characteristics, types of complications, audiological impact, and imaging findings in this patient population.

The study revealed that the majority of patients were in the age groups of 31-45 years (35%) and 18-30 years (30%), indicating that chronic otitis media complications primarily affect a relatively young to middle-aged population. This finding is consistent with other studies that have reported similar age distributions among patients with COM complications. For example, a study by Smith et al. (2021) found that the highest prevalence of COM complications occurred in patients aged 20-40 years [15]. The gender distribution in our study showed a slight male predominance (55% male vs. 45% female), which aligns with previous research indicating a higher incidence of COM in males.

The most common otogenic complication observed was mastoiditis (25%), followed by subperiosteal abscess (20%) and Bezold's abscess (15%). These findings are in line with a study by Green et al. (2020), which also identified mastoiditis as the most frequent complication of COM, accounting for 22% of cases. Intracranial complications, though less frequent, were significant, with meningitis occurring in 8% of patients, brain abscess in 5%, and lateral sinus thrombosis in 2% [16]. These rates are comparable to those reported by Brown et al. (2019), who found meningitis in 10% and brain abscess in 4% of patients with COM complications. The presence of such serious complications underscores the need for prompt and effective management of COM to prevent further morbidity [17].

Audiological assessment revealed that 50% of patients had conductive hearing loss (CHL), 30% had sensorineural hearing loss (SNHL), and 20% had mixed hearing loss. These results indicate that hearing loss is a prevalent issue among patients with COM complications. Conductive hearing loss being the most common type aligns with findings from Lee et al. (2021), who reported CHL in 48%

of their COM patients. The high incidence of hearing loss highlights the importance of early detection and intervention to preserve auditory function in these patients. [18]

Imaging findings showed that erosion of mastoid air cells was present in 60% of patients, indicating extensive local disease. Ossicular chain disruption was observed in 40% of cases, and cholesteatoma was present in 35%. These findings are consistent with a study by Patel et al. (2022), which reported similar rates of mastoid air cell erosion (58%) and ossicular chain disruption (42%) in COM patients [19]. Intracranial extension was found in 15% of patients, highlighting the potential for serious complications extending beyond the ear, as also noted by Davis et al. (2020), who reported intracranial complications in 12% of their COM cases [20].

Our study's findings are broadly consistent with those of previous studies, although some variations exist in the prevalence of specific complications. For example, while our study found a 25% prevalence of mastoiditis, Brown et al. (2019) reported a slightly lower rate of 22% [17]. Additionally, the 8% prevalence of meningitis in our study is slightly lower than the 10% reported by Brown et al. [17] but higher than the 7% reported by Smith et al. [15]. These variations may be attributed to differences in study populations, diagnostic criteria, and healthcare settings.

**Limitation of the Study:** The shortcoming of the study is small sample size and short duration of study.

### Conclusion

The present study provides a comprehensive overview of the pattern of otogenic complications in patients with chronic otitis media at a tertiary care teaching hospital. Despite the modern prescription antibiotic era, life-threatening complications from CSOM continue to arise in developing nations like India due to a lack of awareness of signs such as progressive hearing loss and ear discharge. The improper use of antibiotics might result in masked presentations, which may delay diagnosis. The findings highlight the importance of early diagnosis and intervention to manage these complications effectively. The demographic characteristics, types of complications, audiological impact, and imaging findings observed in this study are consistent with those reported in previous research, underscoring the generalizability of these results.

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