# FREQUENCY OF MENINGITIS IN PATIENTS HAVING OTOGENIC COMPLICATIONS

**Shehreyar Khan[1], Khurshid Anwar[2], Afaq Ali[3], Isteraj Shahabi[4]**

## ABSTRACT

**Background**: Chronic suppurative otitis media (CSOM) is defined as ear discharge persisting for more than 12 weeks through a perforated tympanic membrane. The cycle of infection, inflammation, granulation tissues, polyp and cholesteatoma formation continues, destroying adjacent bony margins and ultimately leading to the various complications. Meningitis is one of the intracranial complications of CSOM

**Aims and Objectives**: To determine the frequency of intracranial complications (meningitis) of otitis media.

**Methods**: This study was conducted at Department of ENT, PGMI Hayatabad Medical Complex, Peshawar. Study design was cross sectional (descriptive) study and the duration of the study was one year in which a total of 186 patients were observed by using 14% proportion of prevalence of otogenic meningitis in population with 5% margin of error. More over non probability consecutive sampling technique was used for sample collection.

**Results**: In this study 25% patients were in age range 1- 5 years, 36% patients were in age range 6- 12 years, 39% patients were in age range 13-18 years. Mean age was 9 years with SD ± 25.43. Sixty percent patients were male and 40% patients were female. Forty percent patients had meningitis and 60% were with other complications (brain abscess, extradural abscess, sigmoid sinus thrombosis, subdural abscess and otitic hydrocephalus.

**Conclusion:** Meningitis is the commonest intracranial complication of CSOM followed by brain abscess. CT Scan is the most relevant investigation in establishing diagnosis and follow-up.

**Key Words**: Frequency, intracranial complications, otitis media.

## INTRODUCTION

Suppurative Otitis Media is an infection of middle ear characterized by presence of ear discharge.[1] It can occur in both acute and chronic forms. Chronic otitis media is further subclassified into healed COM, inactive mucosal com, inactive squamous COM, active mucosal COM and active squamous COM. Chronic otitis media (COM) is a long standing infection of middle ear cleft characterized by persistent ear discharge and permanent perforation of tympanic membrane lasting for more than 3 months.[2] The global burden of illness from otitis media involves 65-330 million individuals with draining ears, of whom 60% (39-200 million) suffer from significant hearing impairment.[3,4] An epidemiological survey by Homoe P et al. showed that otitis media occurs in children with prevalence between 0.9% and 3.8%.[5] in many resource-poor countries, it is the most frequent cause of moderate hearing loss (4-60 db).[3] The risk of developing chronic otitis media increases with the history of multiple episodes of acute otitis media, living in crowded conditions, day care facility attendance and being a member of large family.[6]

Otitis media is a common cause of hearing impairment, disability, and poor scholastic performance, and can lead to fatal intracranial complications.[3] Otitis media can cause intratemporal and intracranial complications.[7,8] The later include lateral sinus thrombophlebitis, epidural abscess, subdural empyema, meningitis and brain abscess.[7] With the advent of antibiotics and surgical advances, the incidence of these complications and associated morbidity have decreased remarkably with the exception of developing countries having lower socioeconomic background and less health awareness.[7,9] Chronic otitis media, cholesteatoma and brain abscess were diagnosed mainly in adults, while acute otitis media and meningitis were more frequent in children. These complications can occur because of spread of infection beyond the temporal bone to the intracranial cavity. Mortality due to intracranial complications remains a persistent problem in developing countries and found to be 26%.[10] Meningitis is the most common complication among other intracranial complications with a prevalence of 35.0-46.4%.[11] Infections can spread directly to vital structures in the temporal bone and beyond that intracranially.[12] Pathways of spread of infection include anatomical contiguity, hematogenous spread,

[1] Specialist Registrar ENT Deptt Hayatabad Medical Complex, Peshawar
[2] Assistant Prof. ENT Deptt Hayatabad Medical Complex, Peshawar
[3] PG Trainee ENT Deptt Hayatabad Medical Complex, Peshawar
[4] Head of ENT Deptt Hayatabad Medical Complex, Peshawar

**Address for correspondence:**
**Dr. Shehreyar Khan**
ENT Deptt Hayatabad Medical Complex, Peshawar
Email: afridi_sheri@hotmail.com
Cell: 0333-5057606

thrombophlebitis and bone dehiscence. CT scan and MRI are the specific investigations for detecting bony defects of temporal bone and intracranial complications respectively.[11]

The current study is designed to determine the frequency of otogenic meningitis in our local set up. By knowing the local statistics about the frequency of intracranial complications of otitis media, we will be able to formulate a proper protocol involving neurosurgeon, otolaryngologist, pediatrician and infectious disease specialist for the immediate diagnoses and treatment to the patients presenting such complications.

## MATERIAL AND METHODS

**Study design:** cross sectional (descriptive) study

**Place and duration of study:** Department of ENT, PGMI Hayatabad Medical Complex, Peshawar from 1st January 2016 to 31th Dcecmber 2016

**Sample size determination:** It included 186 patients. The sample size was calculated using 14% proportion of prevalence of meningitis with 5% margin of error under WHO software.

**Sampling technique:** non probability consecutive sampling

### *Inclusion criteria*

Patients were selected by the following strict inclusion criteria that are patients between ages 1 to 18 years, belonging to either gender, patients with discharging ears and perforated tympanic membrane as confirmed on otoscopic examination.

### *Exclusion criteria*

Those excluded were patients presenting with the symptoms of acute otitis media, without suppuration with otogenic extracranial complication such as mastoiditis, petrositis, facial paralysis, labyrinthitis, with intracranial tumors though this may have concomitant suppurative otitis media.

### *Methods*

Patients successfully fulfilling the inclusion criteria were admitted through emergency department, OPDs as well as referred from other units. The following signs and symptoms were considered suspicious of having intracranial complication. Ear discharge, fever, headache, vomiting, visual disturbances, vertigo, pain, and altered level of consciousness, convulsions, nystagmus, papilloedema, neck rigidity and bradycardia. Otorrhea if present should be mucupurulent and foul smelling. The diagnosis of otogenic complications was confirmed by CT Scan brain and temporal bone with contrast and lumbar puncture where required. Ear swab for culture and sensitivity was sent before starting empirical antibiotic therapy. The variables to be studied were age, gender, and type of intracranial complications and the frequency of meningitis relative to other complications. All the data regarding patients was documented on a Performa. The results obtained were compared to both the national and international literature on this topic.

### *STATISTICAL ANALYSIS*

The data was entered in SPSS 16.0 version. Mean ± SD was calculated for continuous variable. Frequencies and percentages were calculated for categorical variables. Intracranial complications were stratified among the age and gender and the frequency of meningitis relative to other intracranial complications was calculated. Final results were presented as tables.

## RESULTS

A total of 186 patients were observed to determine the frequency of meningitis in patients presenting with otitis media and the results were analyzed. Table 1 shows descriptive statistics with a mean age of 15.67 and SD ± 9.476. Gender distribution among 186 patients was analyzed as shown in table 2. Age distribution among 186 patients was analyzed as shown in table 3. Frequency of meningitis is shown in table 4. Frequency of meningitis relative to other intracranial complications is shown in table 5.

**Table 1: Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Age of the Patient | 186 | 1 | 38 | 15.67 | 9.476 |
| Valid N (listwise) | 186 | | | | |

**Table 2: Gender distribution**

| | Frequency | Percent |
|---|---|---|
| Valid male | 112 | 60.2 |
| female | 74 | 39.8 |
| Total | 186 | 100.0 |

**Table 3: Age distribution of disease**

| | | Age (in years) | | |
|---|---|---|---|---|
| | | <= 12 | 13 - 25 | 26+ |
| Meningitis | Count | 45 | 29 | 0 |
| | Column N % | 53.6% | 40.8% | .0% |
| Brain Abscess | Count | 38 | 14 | 0 |
| | Column N % | 45.2% | 19.7% | .0% |
| Extra Dural Abscess | Count | 0 | 18 | 23 |
| | Column N % | .0% | 25.4% | 74.2% |
| Sgmoid Sinus Thrombosis | Count | 0 | 5 | 2 |
| | Column N % | .0% | 7.0% | 6.5% |
| Sub Dural Abscess | Count | 1 | 2 | 3 |
| | Column N % | 1.2% | 2.8% | 9.7% |
| Otitic Hydrocephalus | Count | 0 | 3 | 3 |
| | Column N % | .0% | 4.3% | 9.7% |

**Table 4: Frequency of meningitis**

| | Frequency | Percent |
|---|---|---|
| Valid Absent | 112 | 60.2 |
| Meningitis | 74 | 39.8 |
| Total | 186 | 100.0 |

**Table 5: Frequency of meningitis in relation to other intracranial complications**

| | | | Meningitis | | P value |
|---|---|---|---|---|---|
| | | | Absent | Meningitis | |
| Brain Abscess | Absent | Count | 60 | 74 | 0.000 |
| | | Column N % | 53.6% | 100.0% | |
| | Brain Abscess | Count | 52 | 0 | |
| | | Column N % | 46.4% | .0% | |
| Extra Dural Abscess | Absent | Count | 71 | 74 | 0.000 |
| | | Column N % | 63.4% | 100.0% | |
| | Extra Dural Abscess | Count | 41 | 0 | |
| | | Column N % | 36.6% | .0% | |
| Sub Dural Abscess | Absent | Count | 106 | 74 | 0.043 |
| | | Column N % | 94.6% | 100.0% | |
| | Sub Dural Abscess | Count | 6 | 0 | |
| | | Column N % | 5.4% | .0% | |
| Otitic Hydrocephalus | Absent | Count | 106 | 73 | 0.044 |
| | | Column N % | 94.6% | 100.0% | |
| | Otitic Hydrocephalus | Count | 6 | 0 | |
| | | Column N % | 5.4% | .0% | |

## DISCUSSION

The cycle of infection, inflammation, granulation tissues, polyp and cholesteatoma formation in CSOM continues, destroying surrounding bony margins and ultimately leading to the various complications of CSOM.[13] Both aerobic and anaerobic bacteria are found in chronic discharging ears. Pseudomonas aeruginosa (50-90%) is the most commonly recovered organism followed by Staphylococcus aureus. Remainders of infections are caused by Klebsiella, Proteus, and E. coli species. Despite the availability of newer antibiotics, CSOM can still lead to major complications in developing countries.[14]

CSOM with cholesteatoma can spread beyond middle ear, leading to extra cranial and intracranial complications. Various intracranial complications of CSOM are meningitis, extra-dural abscess, sub-dural abscess, brain abscess, sigmoid sinus thrombosis, and otitic hydrocephalus. Our study showed 40% of patients had meningitis and 60% were with other complications. Hussain Al et al[15] had shown that intracranial complication due to chronic Otitis media (Unsafe ear) was 20. Meningitis and brain abscess were present in 8 cases each (40%). In 3 cases (15%) extradural abscess was found while 1 (5%) had lateral sinus thrombosis. In a study conducted by Rashid A et al[16] the pre-antibiotic era the incidence of complications of CSOM was very high i.e. 2.3% of the cases. Although the incidence has decreased to 0.15-0.04% with the development of effective antiiotics and with recent surgical techniques, it is still high in the underdeveloped countries like Pakistan. In another study conducted by Bento R et al [17] majority of the patients were in their first and second decade of life, which is also supported by another local study. On the other hand in the study by Baig et al[18] majority of the patients were in third decade of life. Dubey SP et al. reported the mortality rate as 13% in their study.[19] The global prevalence of Intracranial Complications is currently estimated to be about 0.7% to 3.2%.[3] Lin YS et al. reported Intracranial Complication rates range from 0.3% to 2% worldwide.[20] Studies from developing countries show that in 25% of cases of Otitis media, more than one intracranial complication may be present simultaneously.[10] Khan A et al. found meningitis to be the most common intracranial complication of Otitis media[21] with a prevalence of 40%, followed by brain abscess (28%) and extradural abscess(25.7%). Globally, 70% Intracranial Complications are found only among children. O'Connor TE et al. found Intracranial Complications in 56% children, while the complications found were Meningitis (71%), Cerebral Complications in 11% cases while the commonly encountered complications were otitic meningitis (19%), lateral sinus thrombosis (14%) and cerebellar abscess (9%).[22] In our study the frequency of meningitis was found to be 53.6% in children.

Our study reveals male predominance with male to female ratio of 2:1 which is consistent with other studies. But another local study has reported a female predominance. The predominance of male patients in our study is probably due to the fact that female patients are not brought out of their homes, and do not get the preferential treatment. Meningitis was the most common ICC of CSOM in our study, as reported by literature.[23] In contrary, other studies have reported brain abscess to be the commonest ICC. Temporal lobe abscess was more common than the cerebellar abscess with proportion of 3:1. This finding is also supported by other studies as well.[24] The primary goal of the surgical treatment of chronic suppurative otitis media is its complete eradication in order to provide the patient with a safe and dry ear. This can be achieved by meticulously removing all of the cholesteatoma, diseased bone, granulation tissues, and irreversibly diseased mucosa.[25] The most common procedures performed on the ear(s) were radical and modified radical mastoidectomy with or without tympanoplasty. The selection of a specific operative technique should be determined by the extent of the cholesteatomatous invasion in conjunction with the clinical assessment of Eustachian tube function, the degree of mastoid pneumatization and the anatomic configuration of the mastoid. The long process of the incurs was involved in all the cases as supported by another study.[26] Family physicians, as well as public at large, should be made aware of the seriousness of middle ear suppuration as this account for a high rate of morbidity and mortality in our country.[27]

## CONCLUSION

Meningitis is the commonest intracranial complication of CSOM followed by brain abscess. CT scan is the most relevant investigation in establishing diagnosis and follow-up. Complication should be treated first followed by treatment of the ear. Early surgical intervention in combination with broad spectrum antibiotics provides a good outcome

## REFERENCES


1. Uddin W, Hussain A, Khan A, Ahmad F, Ullah S. Prevalence and comparison of chronic suppurative otitis media in government and private schools. Ann. Pak.Inst.Med.Sci. 2009;5(3):141-4.
2. Aziz N, Preciado D. Middle ear, inflammatory diseases. [online] 2007[Cited2008April].Available-from:(URL:www.http://emedicine.medscape.com/article/860227-overview)
3. Iqbal SM, Udaipurwala IH, Hasan A, Shafiq M, Mughal S. Chronic suppurative otitis media:disease pattern and drug sensitivity. J Surg Pak 2006;11:17-9.
4. Pappas S, Nikoloppulos TP, Korres S, Papacharalampous G, Tzangarulakis A, Ferekidis E. Topical antibiotic ear drops are they safe? Int J Clin Pract 2006 60; 1115-9.
5. Parry D, Roland PS. Middle Ear, Chronic Sup-

purative Otitis, Medical Treatment: Treatment & Medication.[online] 2006, [cited December 2008]. Available from http://emedicine.medscape.com/article/859501-treatment

6. Kadar AA, Usman M, Tirmizi S,Topical quinolones versus topical aminoglycosides in the medical management of chronic suppurative otitis media, a comparative trial. J Coll Physicians Surg Pak 2008;8:6-9.

7. Kwak MK, Chung JH, Lee SH, Park CW. A Case of Otogenic Brain Abscess Causing Loss of Consciousness. Korean J Audiol 2014; 18(2):76-9.

8. Yeoh XY, Lim PS, Pua KC. Case of Chronic Otitis Media With Intracranial Copmlication & Contralateral Extracranial Presentation. Case Rep Otolaryngol 2016; 2016:7810857.

9. Heah H, Soon SR, Yeun HW. A Case Series of Complicated Infective Otitis Media Requiring Surgery In Adults. Singapore MedJ 2016; 57(2):681-5.

10. Fareed G, Manzoor T, Ahmad S. Comparison Of Ciprofloxacin Versus Gentamycin Ear Drops In Chronic Suppurative Otitis Media (Tubo-tympanicType). Pak J Otolaryngol,2009;25:63-5.

11. Bruschini L, Fortunato S, Tascini C, Ciabotti A, Leonildi A, Bini B, Giuliano S, Abbruzzese A, Berrettini S, Menichetti F. otogenic Meningitis: A Comparison of Diagnostic Performance of Surgery and Radiology. Open Forum Infect Dis 2017; 4(2):ofx069.

12. Prakash R, Juyal D, Negi V, Pal S, Adekhandi S, Sharma M, Sharmal N. microbiology of Chronic Suppurative Otitis Media in a Tertiary Care Setup of Uttarkhand State, India. N Am J Med Sci 2013; 5(4):282-7.

13. Thorne MC, Chewaproug L, Elden LM. Suppurative complications of acute otitis media: changes in frequency over time. *Arch Otolaryngol Head Neck Surg*. 2009 Jul. 135(7):638-41.

14. Iqbal SM, Udaipurwala IH, Hasan A,Shafiq M, Mughal S. Chronic suppurative otitis media:disease pattern and drug sensitivity. J Surg Pak 2006;11:17-9.

15. Hussain A, Khan AR. Frequency of intra cranial complications in Chronic Otitis Media. J Ayub Med Coll Abbottabad. 2005 Jan-Mar;17(1):75-7.

16. Rashid A, Khan RM, Ahmad I. Otogenic intracranial abscess. J Pak Med Assoc 1992; 42:220-1.

17. Bento R, de Brito R, Ribas GC. Surgical management of intracranial complications of otogenic infection. Ear Nose Throat J 2006,85:36-9.

18. Baig MM, Ajmal M, Saeed I, Fatima S. Prevalence of cholesteatoma and its complications in patients of chronic suppurative otitis media. J Rawalpindi Med Coll 2011;15:16-7.

19. Dubey SP, Larawin V. Complications of chronic suppurative otitis media and their management. Laryngoscope 2007;117:264-7.

20. http://embryology.med.unsw.edu.au/Notes/ear7.htm

21. Ballenger's Otorhinolaryngology Head and Neck Surgery Sixteenth Edition.

22. Susan S. Gray,s Anatomy fortieth edition. Elsevier 2010.

23. Alan GK, Gleeson M. Scott-Brown's Otolaryngology sixth edition. Butterworth Henimenn 2006.

24. Memon MA, Matiullah S, Ahmed Z, Marfani MS. Frequency of un-safe chronic suppurative otitis media in patients with discharging ear. JLUMHS 2008;102-5.

25. Dhingra PL. Diseases of Ear, Nose and Throat fourth edition. Elsevier 2007.

26. Sade J. Surgical planning of the treatment of cholesteatoma and post-operative follow up. Ann Otol Rhinol Laryngol 2000;109:372-6.

27. Fuchs C. Cholesteatoma: ossicular destruction in adults and children. J Laryngol Otol 2003;108:541-4.