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A Clinicopathological and Microbiological Study of Chronic Otitis Media

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Research Article

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Abstract

Objective: To determine both tubotympanic and atticoantral disease in active chronic otitis media. To identify the microbiological species that cause these two categories, as well as their sensitive medications, by culture and sensitivity testing.

Methods: This was a prospective observational cross-sectional study conducted on Fifty Chronic otitis media patients from the Department of Otorhinolaryngology at Jaipur National University during November 2021 to October 2023. An assessment of the clinical presentation and course of Chronic otitis media and analysis of the microbiological etiology of the disease was done. Clinical assessment included history taking, physical examination, and audiometric testing. Microbiological analysis included culture and susceptibility testing and molecular testing.

Results: Fifty Chronic otitis media patients were included in the study and studied over the course of two years. There were 22 males and 28 females. The most common bacterial etiologies of Chronic otitis media were Streptococcus pneumoniae, Pseudomonas aeruginosa, and Staphylococcus aureus. A mucopurulent type of discharge was seen in most pseudomonas infections (50%). Acinetobacter (100%) and Staphylococcus (75%) both mostly discharged mucopurulent material.

Conclusion: These results provide insight into the management of Chronic otitis media and highlight the importance of proper diagnosis and treatment of the condition.

Keywords: Clinicopathological; Microbiological; Chronic Otitis Media; Otolog

Abbreviation: COM: Chronic Otitis Media.

Introduction

Chronic otitis media (COM) is a common condition that affects the middle ear and is characterized by a chronic

inflammation and accumulation of fluid in the middle ear, accompanied by frequent ear infections [1]. COM is a chronic and progressive condition, and is one of the most common causes of hearing impairment and deafness in children. It is also one of the most frequent causes of hospitalization in childhood, and can lead to long-term complications if left untreated [2]. The middle ear is a small space located between the outer ear and the inner ear, and is responsible for transmitting sound waves from the outer ear to the inner ear. In COM, the infection and inflammation of the middle ear causes a build-up of fluid and pus in the middle ear, resulting in hearing loss [3]. Otitis Media is caused by bacteria, viruses, or fungi and can be classified into two types: acute and chronic. Acute otitis media is caused by a single episode of infection that may last for a short period of time, while chronic otitis media is caused by recurrent episodes of infection that can lead to complications if left untreated [4]. The symptoms of COM vary depending on the severity of the condition, but may include earache, a feeling of fullness in the ear, drainage from the ear, hearing loss, and dizziness [5]. Treatment for COM may include antibiotics to fight the infection, cleaning of the ear canal, and surgery to repair any damage caused by the infection. In addition, hearing aids may be prescribed to help with sensorineural hearing loss caused by COM [6].

COM is a common condition that affects the middle ear and can be a source of hearing loss and deafness in children [7]. It is important for parents to be aware of the signs and symptoms of COM and to seek prompt medical attention if they suspect their child may be suffering from it [8]. Early diagnosis and treatment can help to reduce the risk of complications and long-term hearing loss [9]. In underdeveloped nations SM Sc & Gupat H [10,11], COM is more prevalent. In our country, the disease impact is too high due to the huge population. The prevalence of COM ranges from 65 to 330 million per year worldwide [12]. Southeast Asia, Western Pacific, and African nations are said to bear the majority of the global COM impact [13].

India is among the nations with the highest prevalence rates (prevalence > 4%) [14]. Communities with high rates of overcrowding, poor personal hygiene, and low socioeconomic level are more likely to have COM [15,16]. Due to better housing conditions and the extensive use of antibiotic medication, the incidence of COM has been dropping [17]. Some authors conducted studies on COM Chandrashekharayya SH, et al. [18]. According to one of the authors, histological studies of the mucosa of the middle ear were performed on 100 people diagnosed with COM [19]. The findings were consistent with chronic inflammation, with lymphoplasmacytic infiltrations accounting for the majority of the abnormalities [20].

Granulation tissue was associated with mucopurulent discharge in a small number of cases [13]. Granulation tissue patients are more susceptible to ossicular necrosis [21].

By obtaining an ear swab for culture, sensitivity testing and treating the patient in accordance with the culture report [22], the current research seeks to identify the organisms that are the cause of COM. Analyses and studies are done on the treatment's reaction.

Materials and Methods

This was a prospective observational cross-sectional study conducted on Fifty COM patients of various genders and ages in the Department of Otorhinolaryngology at Jaipur National University from November 2021 to October 2023. The study was conducted after getting prior approval from institutional ethics committee. Informed consent was obtained from the all patients and were randomly recruited for the research. Demographic data pertaining to age, sex, diagnosis was noted.

Inclusion Criteria

All instances of middle ear discharge lasting longer than three months.

Exclusion Criteria

Conditions that resemble COM includes Otitis externa and Acute otitis media.

History Taking and Examination Criteria

Each patient's age, sex, residence, and clinical data, including major complaints, duration of symptoms, predisposing factors, and any prior therapy, were recorded on a case record form. The patient's medical history also included diabetes, hypertension, and Tuberculosis, among others.

Sample Collection

In clinically identified instances of CSOM, ear discharge was collected using aseptic care. The external auditory canal was wiped free of excess discharge. The specimen was then obtained using a sterile swab and forwarded to the Microbiology Department with a request for culture and sensitivity.

Assessment through Direct Smear

A thin smear was prepared on a clean glass slide at the Microbiology Department, and the smear was fixed with 95%

methanol by pouring one or two drops into the smear and letting it sit for at least 2 minutes or until the methanol dried.

The prepared smears were Gram stained and studied using an oil immersion objective to identify the kinds of bacteria present, the number of bacteria, the Gram response, the presence or absence of inflammatory cells, and the percentage of squamous epithelial cells in the sample.

Aerobic Culture

To inoculate blood agar, nutritional agar, and MacConkey agar plates, the discharge was utilized. All the plates were placed in an aerobic environment and heated to 37 degrees Celsius. After 24 hours, 48 hours, and 72 hours, the plates were inspected for signs of development and discarded if no growth was found.

Standard laboratory approaches were applied to identify bacterial pathogens based on their microscopic appearance, staining features, cultural and biochemical properties.

Figure 1: Antibiotic Susceptility Test.

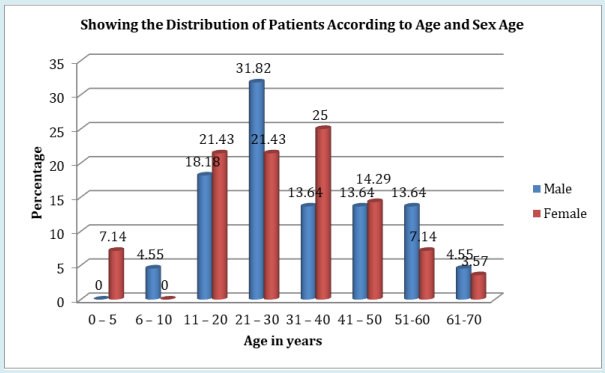

Figure 2: Showing the Distribution of Patients According to Age and Sex.

Using the Kirby-Bauer disc effusion technique, the sensitivity of bacterial isolates to frequently used antibiotics was determined. The concentrations of antibiotics used were: A-10 mg, Ak – 30 mg, Cb – 100 mg, Ci – 30mg.

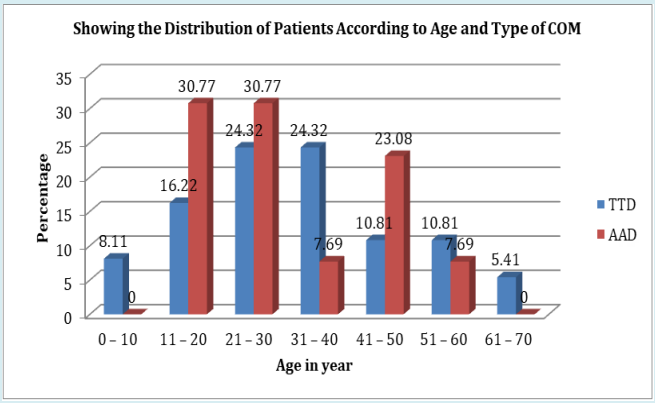

Figure 3: Showing the Distribution of Patients According to Age and Type of CSOM.

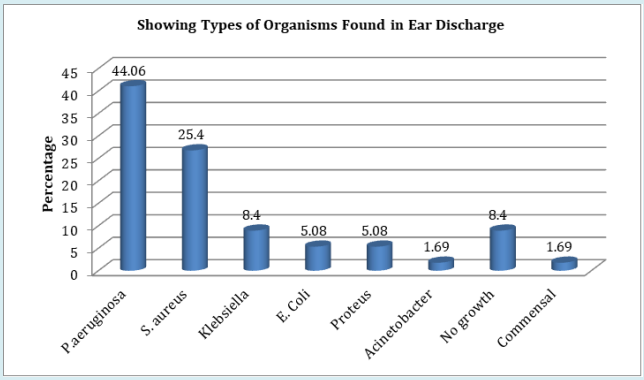

Figure 4: Showing Types of Organisms Found in Ear Discharge.

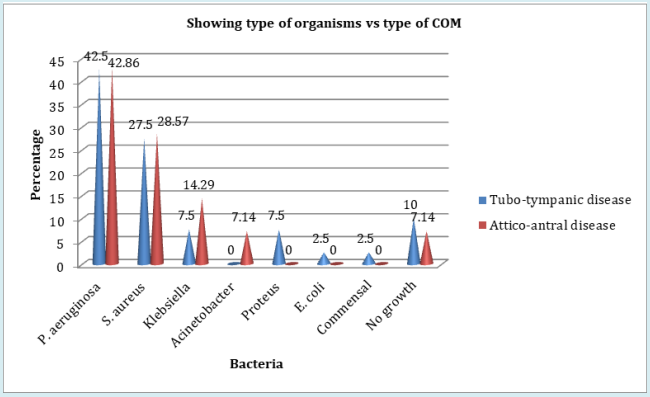

Figure 5: Showing type of Organisms Vs Type of COM.

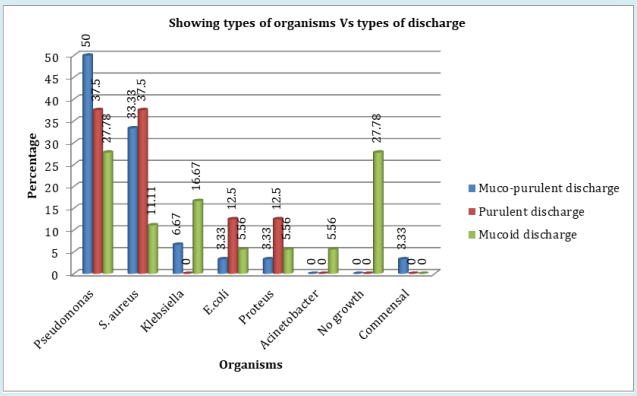

Figure 6: Showing Types of Organisms Vs Types of Discharge.

Results

Fifty CSOM patients of various genders and ages were included in the study. There were 22 males and 28 females. 50 cases were chosen at random and studied over the course of two years. Demographic details of patients were illustrated in Table 1.

Age in year	Male	%	Female	%
0 – 5	0	0	2	7.14
6 – 10	1	4.55	0	0
11 – 20	4	18.2	6	21.4
21 – 30	7	31.8	6	21.4
31 – 40	3	13.6	7	25
41 – 50	3	13.6	4	14.3
51-60	3	13.6	2	7.14
61-70	1	4.55	1	3.57
Total	22	100	28	100

Table 1: Showing the Distribution of Patients According to Age and Sex.

Age in year	Tubo-tympanic	%	Atticoantral	%
0 – 10	3	8.11	0	0
11 – 20	6	16.2	4	30.8
21 – 30	9	24.3	4	30.8
31 – 40	9	24.3	1	7.69
41 – 50	4	10.8	3	23.1
51 – 60	4	10.8	1	7.69
61 – 70	2	5.41	0	0
Total	37	100	13	100

Table 2: Showing the Distribution of Patients According to Age and Type of COM.

A mucopurulent type of discharge was seen in the majority of pseudomonas infections (50%).

Acinetobacter (100%) and Staphylococcus (75%) both mostly discharged mucopurulent material.

Infection with Klebsiella (66.67%) and E. coli (50%) often resulted in mucoid discharge. It is fascinating to learn that mucoid discharge was present in every case of no growth. The link between bacteria and discharge was evaluated using chi square, and it was shown to be statistically nonsignificant.

Pseudomonas has a high sensitivity to A (84.6), Cb (69.2%), and Ak (65.4%), with a maximum sensitivity to Ci (92.3%). S. aureus has high sensitivity for Ak (75%). Klebsiella has high sensitivity to Ci and A. (both being 83.3%). Acinetobacter has 50% sensitivity to A, Ak, Ci, and Cb. Coagulase negative staphylococcus had 100% sensitivity to Ak and high sensitivity to A. Proteus shown great sensitivity to Ak, Cb (66.7%), as well as 100% sensitivity to Cf and A. Ak, Cf, A caused 100% sensitivity in E. coli.

Total number of ears examined – 59 (Table 3)

Organisms	Number of discharges	Percentage
P. aeruginosa	26	44.06
S. aureus	15	25.4
Klebsiella	5	8.4
E. Coli	3	5.08
Proteus	3	5.08
Acinetobacter	1	1.69
No growth	5	8.4
Commensal	1	1.69
Total	59	100

Table 3: Showing Types of Organisms Found in Ear Discharge.

Some patients had more than one ear discharge, and each one was tested for bacteria separately. P. aeruginosa was found to be the most common bacterial infection (44.06%) among the patients. The least number of bacteria was Acinetobacter (1.69%). It is interesting to know that about 8% of the discharges didn't have any bacteria. Majority of the infection among the study patients had tubo-tympanic disease (74%). Majority of the organisms were Gram negative organisms (68%) and Gram positive were (27%). 13% of the infection did not have any growth (Table 4).

Bacteria	Tubo-tympanic disease	Percentage	Attico-antral disease	Percentage
P. aeruginosa	17	42.5	6	42.86
S. aureus	11	27.5	4	28.57
Klebsiella	3	7.5	2	14.29
Acinetobacter	0	0	1	7.14
Proteus	3	7.5	0	0
E. coli	1	2.5	0	0
Commensal	1	2.5	0	0
No growth	4	10	1	7.14
Total	40	100	14	100

Table 4: Showing Type of Organism's Vs Type of COM.

Discussion

A clinical, pathological and microbiological study of active chronic otitis media was conducted to gain insights into the etiology, pathogenesis, and clinical outcomes of this inflammatory ear condition. Results showed that the most common bacteria isolated from the middle ear fluid were Streptococcus pneumonia, P. aeruginosa, S. aureus, and Klebsiella. In addition, a high prevalence of fungal species was also observed. Moreover, the study identified several risk factors, including age, immunosuppression, and chronic illness, that may increase a person's risk of developing COM. The findings of this study can be used to improve the diagnosis, management, and prevention of COM. Moreover, the results can be used to support the development of new therapies to reduce the burden of this disease (Table 5).

Gram positive organisms	No.	Percentage	Gram Negative organisms	No.	Percentage
S.aureus	15	93.75	P.aeruginosa	23	67.65
Acinetobacter	1	6.25	Klebsiella	5	14.71
-	-	0	E. Coli	3	8.82
-	-	0	Proteus	3	8.82
Total	16	100	Total	34	100

Table 5: Showing Distribution of Gram Positive and Gram-Negative Organisms.

In the developing world, chronic otitis media is regarded as a significant public health issue, and India is one of the countries with a high prevalence where immediate attention is required. It is a chronic condition that carries the potential of developing permanent consequences and is a significant contributor to avoidable hearing loss in both adults and children. Early microbiological identification promotes efficient therapy since chronic otitis media is a condition that has severe morbidity. Therefore, identifying infections and their pattern of antibiotic sensitivity will aid treating doctors in choosing the proper medications, therefore reducing complications and the emergence of resistance strains (Table 6).

Organisms	Muco-purulent discharge	%	Purulent discharge	%	Mucoid discharge	%
Pseudomonas	15	50	3	38	5	27.8
S. aureus	10	33.3	3	38	2	11.1
Klebsiella	2	6.67	0	0	3	16.7
E. coli	1	3.33	1	13	1	5.56
Proteus	1	3.33	1	13	1	5.56
Acinetobacter	0	0	0	0	1	5.56
No growth	0	0	0	0	5	27.8
Commensal	1	3.33	0	0	0	0
Total	30	100	8	100	18	100

Table 6: Showing Types of Organisms Vs Types of Discharge.

Because the bacteria that cause middle ear infections are becoming less sensitive to antibiotics and their patterns are changing, it has become very important to find the organism that is causing the disease. In this study, the number of people with COM was highest among those aged 11 to 20 (42%), then among those aged 0 to 10 (28%). Poorey V.K. and Iyer A.2's (2002) study found that the most common age groups were the first and second decades of life, with the 1–10year age group being the most common (46%), which is different from our study [23]. In this study, 68% of the CSOM participants were men and 32% were women. This shows that COM happens in both sexes. The number of men to women was 2.1 to 1, which suggests that men were more common. In the current study, the disease was found to be more common in the low-income group (62%) than in any other group in society. Our study has some limitations, such as a limited sample size.

Conclusion

59 ears were examined out of 50 cases. In the present collection, only aerobic bacteria were isolated. The most prevalent organism isolated was P. aeruginosa, which was found in 26 (44.06%) samples, followed by S. aureus 15 (25.4%), Klebsiella in 5, E. coli in 3, Proteus in 3, and Acinetobacter in 1. Five (8.4%) of the discharge samples exhibited no growth, while one (1.69%) contained commensal. In the modern time of antibiotics, antibiotic resistance is becoming more prevalent. Human ignorance is the most major contributor to the evolution of antibiotic resistance. As soon as symptoms lessen, people cease taking antibiotics prior to the conclusion of treatment, allowing partly resistant microorganisms to thrive. Such conduct should be discouraged, and patients should be instructed to avoid it.

Therefore, it is crucial that each case of COM should be investigated bacteriologically to avoid the use of unnecessary antibiotics. This will undoubtedly aid in getting a dry ear and avoiding difficulties.

Sources of Financial Support

None

Conflict of Interest Statement

The authors declare no conflict of interest.

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guidelines on human experimentation (Indian- GCP, ICH-GCP, ICMR guidelines) and with the Helsinki Declaration of 1975, as revised in 2008.

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