MICROBIOLOGICAL PROFILE OF EAR DISCHARGE IN CHRONIC SUPPURATIVE OTITIS MEDIA

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ABSTRACT

BACKGROUND

Chronic suppurative otitis media (CSOM) is defined as the inflammation of the mucous membrane of the middle ear cleft which includes the middle ear cavity, mastoid antrum, the mastoid air cells and the Eustachian tube. Complex interactions between the environment, microbes, and host are thought to lead to the development of this multifactorial disease. Understanding of the microbiology of chronic otitis media is important for efficient and effective treatment, and prevention of complications and antibiotic resistance. Thus, the study was conducted with the aim to determine the bacteriological agents implicated in discharging ears of the patients of CSOM and to determine the associated clinco-epidemiological factors among the patients of CSOM.

MATERIALS AND METHODS

This hospital-based descriptive study was conducted in 100 patients attending the ENT OPD in Fakhruddin Ali Ahmed Medical College, Barpeta, Assam from July 2016 to June 2017. Detailed clinical history and demographic data were collected and analysed. Ear discharge was collected and microbiological profile was evaluated.

RESULTS

One hundred patients after fulfilling the inclusion and exclusion criteria were chosen for the study. 31-40 years age group was most commonly involved with male preponderance. Microbiological analysis of ear discharge showed that Gram-negative bacteria accounted for 76% and Gram-positive bacteria were found in 34% cases. Gram-negative bacteria included Pseudomonas aeruginosa 24%, Klebsiella spp. 19%, Proteus spp. 12% and Escherichia coli 10%. The Gram-positive aerobes identified included Staphylococcus spp. 15%. The most common anaerobes identified were Bacteroides spp. in 1%, Peptostreptococcus spp. in 1% cases. Fungal growth was seen in 5% cases. Diphtheroids were seen in 3% cases.

CONCLUSION

Continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity of isolates is necessary to decrease the potential risk of complications by early institution of appropriate treatment. Our study emphasised the need of proper identification of microbiological profile of the cases of CSOM in order to facilitate early institution of proper treatment.

KEYWORDS

Chronic Suppurative Otitis Media, Bacterial Isolates.

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BACKGROUND

Chronic suppurative otitis media (CSOM) is defined as a perforation of the tympanic membrane, with persistent drainage of pus from the middle ear, lasting at least six weeks.[1] It is the inflammation of the mucous membrane of the middle ear cleft which includes the middle ear cavity, mastoid antrum, the mastoid air cells and the Eustachian tube.[2] The global burden of illness from CSOM is estimated to involve about 65 to 330 million individuals with draining ears, 60% (39 to 200 million) of whom suffer from significant hearing impairment.[3] Over 90% of the burden is borne by developing countries in Southeast Asia, the Western Pacific Region, and Africa.[3]

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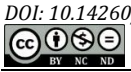

CSOM often begins as an acute infection of the middle ear, acute otitis media (AOM), which occurs in up to 80% of children by the age of 3.[4,5] While most cases resolve spontaneously, a small minority of patients progress to a chronic phase characterised by chronic purulent ear discharge through a perforated tympanic membrane with associated inflammation of the mastoid and middle ear mucosa and hearing loss. CSOM can occur with or without cholesteatoma (epithelial inclusion cyst).

The pathogenesis of CSOM remains poorly understood. Complex interactions between the environment, microbes, and host are thought to lead to the development of this multifactorial disease.[5,6,7]

It has previously been assumed that a healthy individual's ear is sterile.[8,9] Infections in the middle ear are thought to occur when pathogens enter the middle ear through the external ear canal or Eustachian tube. Bacteria have remained the most important aetiological agents in suppurative or discharging otitis media. Studies on microbiologic diagnoses of CSOM differ in regard to patient age, geography, and the presence of complications such as cholesteatomas, and these inconsistencies likely impact some of the variation in reported pathogens. Other theories to explain the persistent nature of this disease and repeated infection include toxin production by P. Aeruginosa,[10]

microbes embedding within the dead/damaged tissue (Cholesteatoma),[11,12] formation of biofilms,[13,14] recurrent bacterial infection from the nasopharynx not covered by the antibiotics prescribed,[15] or development of antibiotic resistance.[16,17]

Understanding of the microbiology of chronic otitis media is important for efficient and effective treatment, and prevention of complications and antibiotic resistance. In view of these, it is important to document the trend, to aid in appropriate treatment of this condition and help prevent its complications which may arise if otitis media is not treated or is improperly treated. This paper, therefore, aims to determine the bacteriological agents implicated in discharging ears of the patients of CSOM and to determine the associated clinco-epidemiological factors among CSOM patients attending the ENT OPD in Fakhruddin Ali Ahmed Medical College, Barpeta, Assam.

MATERIALS AND METHODS

This hospital-based descriptive study was conducted in the patients attending the ENT OPD in Fakhruddin Ali Ahmed Medical College, Barpeta, Assam from July 2016 to June 2017. Following are the criteria of choosing the patients for the study.

Inclusion Criteria

All patients with actively draining CSOM irrespective of nature, amount, odour after getting proper consent were included.

Exclusion Criteria

1. Patients with history of foreign body ear and/or infection of external auditory canal.
2. Patients on antibiotic or antifungal treatment (Ear drops or systemic) within the previous two weeks.
3. Patients with draining ears of less than two weeks duration.

All the 100 cases of actively draining CSOM attending the ENT OPD in Fakhruddin Ali Ahmed Medical College, Barpeta, Assam from July 2016 to June 2017 after fulfilling the inclusion and exclusion criteria were included in the study.

A detailed clinical history including age, gender, duration of discharge and antibiotic therapy was taken for all included patients. Patients of any age, both genders, unilateral or bilateral draining ears, resulting from CSOM of more than two weeks, were included in the study. Demographic data together with the patient's medical history and physical examination findings were noted down.

Sampling method

The study comprised of collection of discharge specimens from draining ears on the first day of contact with the patient. The ears were inspected first; discharge from the outer part of the ear canal was then cleaned by suction. A sterile swab stick was then introduced through a sterile aural speculum placed in the external auditory canal, and each specimen was collected from the bony part of the ear canal (Inner two-thirds) or the middle ear cavity. Discharge specimens were collected from both ears for patients with bilateral draining. Each collected specimen was immediately placed in an anaerobic jar, under aseptic conditions, and transported, within one hour of collection, to the microbiology laboratory for routine microbiological culture and identification.

For bacterial isolation, the specimens were inoculated on blood agar, MacConkey's agar, chocolate agar and Robertson's cooked meat medium for aerobic and anaerobic cultures. For anaerobic bacteria, anaerobic blood agars were incubated in an anaerobic jar to permit recovery of anaerobic pathogens. For fungi isolation, a part of the pus specimen was cultured on Sabouraud's dextrose agar. The culture plates were incubated at 37 °C for 24 to 48 hours. Anaerobic culture plates were incubated for seven days to allow growth of anaerobes, which grow slowly compared to aerobes. The isolates from the culture plates were identified using Gram staining, colony morphology, catalase, coagulase, oxidase, and biochemical strips. For fungal growth, Lactophenol cotton blue was used for final identification, and culture was for no less than seven days.

Statistical Analysis

Data were analysed statistically in GraphPad Software 2017 Inc version. Age of the patients were arranged with mean age with standard deviation.

RESULTS

This study was conducted in the Department of ENT, FAAMCH, Barpeta for a duration of six months from January 2017 to June 2017 on 138 patients after fulfilling the inclusion and exclusion criteria. However, only 100 patients cooperated in the study with subsequent followup with investigation reports. Hence, 100 patients were chosen for the study. All the findings were documented and summarised as follows.

Age in Years	No. of Patients	% of Patients
<10	8	8
11-20	18	18
21-30	15	15
31-40	27	27
41-50	19	19
>51	13	13

Table 1. Age Distribution

31-40 years age group was most commonly involved with 27% cases followed by 41-50 years, 21-30 years, 11-20 years, 51 years and above and less than 10 years.

Gender	No. of Cases	% of Cases
Male	64	64
Female	46	46

Table 2. Gender Distribution

64% cases were male while 46% cases were female. Male to female ratio was 1.39:1 which indicates male preponderance over female.

Socioeconomic Status	% of cases
Class I (>Rs. 5522)	7
Class II (Rs. 2761 - Rs. 5521)	12
Class III (Rs. 1657- Rs. 2760)	33
Class IV (Rs. 828-Rs. 1656)	38
Class V (<Rs. 828)	10

Table 3. Socioeconomic Distribution

According to Modified B.G. Prasad Socioeconomic classification, study population was divided into five classes.

Class IV was most frequently involved followed by class III, class II, class V and class I.

Clinical Presentation	% of Cases
Ear discharge only	41
Hearing loss only	14
Ear discharge and hearing loss	22
Ear discharge + hearing loss+ earache and/or tinnitus	13
Ear discharge and complications	10
Table 4. Distribution of Clinical Presentation	

In this study, otorrhoea was the most common presenting symptom. This was followed by otorrhoea with hearing loss, hearing loss only & otorrhoea with hearing loss with tinnitus & earache & complications.

Clinical Features	% of Cases
Deviated nasal septum	24
Pharyngotonsillitis	14
Sinusitis	11
Aural polyp	12
Adenoid hypertrophy	5
Table 5. Distribution of Associated Clinical Features	

Besides clinical presentations of CSOM, all the cases were evaluated for associated clinical features. It was observed that 24% cases had Deviated nasal septum, 14% had Pharyngotonsillitis, 11% had sinusitis, 12% cases had aural polyp and 5% cases had adenoid hypertrophy.

Characteristics Features	No. of Cases
Discharge Type	
Purulent	41
Mucopurulent	28
Mucoid	15
Blood stained	16
Amount	
Profuse	63
Scanty	37
Odour	
Foul smell+	32
Foul smell-	68
Table 6. Characteristics of Ear Discharge	

In our study, 41% cases had purulent discharge, followed by mucopurulent (28%), mucoid (16%) and blood-stained discharge (12%). 63% cases had profuse otorrhoea while 37% cases had scanty ear discharge. 32 % cases had foul smelling discharge.

Type of Perforation/Retraction	No. of Cases
Small perforation (< 25%)	13
Medium (25-50%)	19
Large (50%-75%)	16
Subtotal (>75%)	14
Total	**11**
Marginal	9
Attic	10
Retraction pocket	8
Table 7. Distribution of Type of Tympanic Membrane Perforation/Retraction	

In our study, it was observed that medium perforation of tympanic membrane was seen in 19 % cases. 16 %, 14 %, 13% & 11% cases had subtotal, large, total small TM perforation respectively. Attic perforation, marginal perforation, Retraction pocket was seen in 10%, 9% & 8% respectively.

Bacterial Organisms	Frequency (%)
Pseudomonas aeruginosa	24
Klebsiella spp.	19
Staphylococcus spp.	15
Proteus spp.	12
Streptococcus spp.	10
Escherichia coli	10
Fungal	5
Diphtheroids	3
Bacteroides spp.	1
Peptostreptococcus	1
Table 8. Distribution of Bacteriology in Ear Discharge	

On Gram staining, Gram-negative bacteria accounted for 76% and Gram-positive bacteria were found in 34%. Bacteriological observation was categorised into aerobes and anaerobes. The most common aerobes identified from the specimens were Gram-negative bacteria, which included Pseudomonas aeruginosa 24%, Klebsiella spp. 19%, Proteus spp. 12% and Escherichia coli 10%. The Gram-positive aerobes identified included Staphylococcus spp. 15%. Anaerobes were also isolated from the specimens. The most common anaerobes identified were Bacteroides spp. in 1%, Peptostreptococcus spp. in 1% cases. Fungal growth was seen in 5% cases. Diphtheroids were seen in 3% cases.

DISCUSSION

CSOM is a major public-health problem, and India is one of the countries with high-prevalence where urgent attention is needed. It is a persistent disease with great risk of irreversible complications. CSOM is an important cause of preventable hearing loss particularly in the developing world[18] and a reason of serious concern, particularly in children, because it may have long-term effects on early communication, language development, auditory processing, educational process, and physiological and cognitive development which in turn has substantial economic burden on the health care system. Poor living conditions, overcrowding, poor hygiene and nutrition have been suggested as a basis for the widespread prevalence of CSOM in developing countries.

In our study, we found that 31-40 years age group was most commonly involved with 27% cases followed by 41-50 years, 21-30 years, 11-20 years, 51 years and above and less than 10 years. The mean age was 33.6 ± 12.93 years.

Our study also found that 64% cases were male while 46% cases were female. Male to female ratio was 1.39:1 which indicates male preponderance over female. Chirwa et al[19] in their study found that males were more affected than females, and this was similar to findings reported from the Ethiopian study by Melaku et al.[20]

In this study, otorrhoea (41%) was the most common presenting symptom. This was followed by otorrhoea with hearing loss, hearing loss only & otorrhoea with hearing loss with tinnitus and earache and complications. Van Hasselt P et al[21] also found that otorrhoea was also the most common presenting symptom.

Besides clinical presentations of CSOM, all the cases were evaluated for associated clinical features. It was observed that 24% cases had deviated nasal septum, 14% had Pharyngotonsillitis, 11% had sinusitis, 12% cases had aural polyp and 5% cases had adenoid hypertrophy.

In our study, 41% cases had purulent discharge, followed by mucopurulent (28%), mucoid (16%) and blood-stained discharge (12%). 63% cases had profuse otorrhoea while 37% cases had scanty ear discharge. 32 % cases had foul smelling discharge. in the study by Chirwa et al,[19] the pus drainage was mainly purulent and foul smelling in 76.2% and mucopurulent and odourless in (23.8%. This was similar to a study in Bangladesh, where aural drainage was mucoid or mucopurulent in 80% of patients with tubotympanic CSOM and foul smelling, scanty ear drainage was present in 88% of patients with atticoantral CSOM.[22]

In our study, it was observed that medium perforation of tympanic membrane was seen in 19% cases. 16%, 14%, 13% & 11% cases had subtotal, large, total small TM perforation respectively. Attic perforation, marginal perforation, Retraction pocket was seen in 10%, 9% & 8% respectively.

On Gram staining, Gram-negative bacteria accounted for 76% and Gram-positive bacteria were found in 34%. Bacteriological observation was categorised into aerobes and anaerobes. The most common aerobes identified from the specimens were Gram-negative bacteria, which included Pseudomonas aeruginosa 24%, Klebsiella spp. 19%, Proteus spp. 12% and Escherichia coli 10%. The Gram-positive aerobes identified included Staphylococcus spp. 15%. Anaerobes were also isolated from of the specimens. The most common anaerobes identified were Bacteroides spp. in 1%, Peptostreptococcus spp. in 1% cases. Fungal growth was seen in 5% cases. Diphtheroids were seen in 3% cases.

OA Afolabi et al[23] studied the pattern of bacterial isolates which showed that Pseudomonas aeruginosa was the most prevalent bacterial organism found in the middle ear of the respondents with chronic suppurative otitis media which is similar to findings elsewhere[24,25,26] and is followed by Klebsiella spp. as the second commonest. Kumar H et al[27], Shymla R et al,[28] Osazuwa F et al[29] and Mansoor T et al[30] found Pseudomonas as the most prevalent organism in the isolates from the ear of the patients of CSOM.

Prakash et al[31] in their study isolated Coliforms including Klebsiella pneumoniae and Escherichia coli from 9.42% and 7.33% cases respectively, and these findings were similar to the reports by Mansoor et al[30] who reported the same to be 8% and 4% whereas Poorey and lyer et al[32] reported a high-incidence for Klebsiella in their study (25.4%). A recent study by Shyamala and Reddy et al[28] showed a little different trend where E. coli was reported in 12% and Klebsiella in 5% of cases. More frequent isolation of faecal bacteria like E. coli, Klebsiella and water bacteria like Pseudomonas indicates that individuals are at high-risk of infection due to poor hygiene conditions.

Ibekwe et al[33], Maji et al[34] and Indudharan et al[35] who found negligible anaerobic isolates in their studies similar to our study. Fungal infections of the middle-ear are common as fungi thrive well in moist pus. Prakash et al[31], Kumar et al[27] and Osazuwa H el al[29] found fungal isolates in 12.25%, 15% and 8.8% cases of CSOM respectively against 5% cases in our study.

When results of our study were compared with the findings of other researches, it was clear that microbial profile and of CSOM has been changing with due course of time. Geographical variation and difference inpatient population studied could be the possible factor for variability.

CONCLUSION

Chronic suppurative otitis media is one of the most common infectious diseases worldwide. CSOM like other chronic disease can limit an individual's employability and quality of life. Experts declare that when prevalence of CSOM is > 3%, it must be targeted as a high-priority disease. In developing country like India, burden of infectious disease is relatively higher in the not so strong health care system. Hence, continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity of isolates is necessary to decrease the potential risk of complications by early institution of appropriate treatment. Our study found higher incidence of CSOM in 31-40 years age group and in male patients of lower socioeconomic status with microbiological profile showing isolates of Pseudomonas aeruginosa 24%, Klebsiella spp. 19%, Staphylococcus spp. 15%, Proteus spp. 12% and Escherichia coli 10%. The disparity in findings from previous research can be attributed to the variation in climate, community environment, patient population, and indiscriminate use of antibiotics. Hence, our study emphasised the need of proper identification of microbiological profile of the cases of CSOM along with antibiotic sensitivity (although not analysed in the study) in order to facilitate early institution of proper treatment.

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