

Bacteriological Trends of Chronic Mucosal Otitis Media in a Tertiary Care Hospital in the Northern Region of Bangladesh

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ABSTRACT

Background: Chronic otitis media (COM) is a disease of multiple etiology caused by bacteria and its importance lies in its chronicity and awful complications. The microbiological study shows the growth of a lot of organisms, frequently multiple and those differ based on geographical variation, patient population, climate and many other factors.

Objective: To evaluate current bacteriological trends of ear infections in patients with chronic otitis media which will be beneficial for appropriate treatment as well as for reducing complications. The study also focuses on rapid diagnosis through exploring the other factors like, age and sex wise distribution, socioeconomic status, distribution of patients according to type of dwelling, bathing habit of patients.

Methods: This cross-sectional, observational study was conducted in the Department of ENT and Head-Neck Surgery, Rangpur Medical College Hospital in Rangpur, a northern district of Bangladesh, over a period of 6 months on a total of 80 patients who had attended outpatient and inpatient department. Aural swab was taken from the discharging ears which were inoculated on blood agar and MacConkey's agar media. Organism pattern was then tabled based on the culture reports.

Results: The most common bacteria causing COM was *Pseudomonas aeruginosa* in (45.0%) followed by *Staph. aureus* (27.5%), mixed isolates in 8.75%, *E. coli* in 5%, *Proteus* in 3.75%, *S. pneumoniae* in 2.5% and *Klebsiella* in 1.25%.

Conclusion: The study proved to be useful for clinicians in management of COM and its complications. Early and effective microbiological diagnosis and intervention is the best solution. From this study, it is observed that *Pseudomonas aeruginosa* is the commonest pathogen for bacterial ear disease followed by *S. Aureus*.

Keywords: Chronic otitis media, ear infection, aerobic bacteria, bacteriological trends

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INTRODUCTION

Chronic otitis media (COM) is a chronic inflammation of the middle ear cavity with recurrent discharge through tympanic membrane perforation for a period of 3 months or more irrespective of the etiology or pathogenesis.¹ The causes and pathogenesis of COM are multifactorial.² The disease usually begins in childhood as an acute infection of the middle ear.³ It is much prevalent in low socioeconomic societies of developing countries because of poor hygiene, recurrent upper respiratory tract infection, overcrowding, malnutrition and inadequate health care,⁴ where poorer rural community has a significantly higher prevalence rate than the urban.⁵ According to World Health Organization (WHO), COM is the neglected tropical diseases due to its

higher prevalence in developing countries. Approximately 31 million people developed COM around the world every year.⁶ Globally, 21 000 individuals succumb yearly to COM complications. The average global incidence rate of COM is estimated at 4.76/1000 individuals, totaling 31 million cases (all ages) per year; among the patients, 22.6% are below 5 years of age.⁷ The persistence of low grade infections and antibiotic resistance are caused by widespread haphazard, half-hearted and indiscriminate use of antibiotics and poor follow up. that makes obligatory periodic surveillance of microbiological profile of COM.^{8,9}

To prescribe appropriate antibiotics for treatment and to prevent complications, it is mandatory to know the types of bacteria responsible for the event of suppuration.¹⁰ The most common bacterias found in COM are *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus spp.* and *Klebsiella spp.*, with methicillin-resistant *Staphylococcus aureus* (MRSA) isolated in some cases. However, depending on the geographical area and other factors, the type of bacteria associated with COM alters.¹¹ Various complications associated with the disease are irreversible local destruction of middle ear structures, facial palsy, serious intracranial and extracranial complications.¹² The assay of the local pattern of infection is essential to establish efficient treatment as the untreated cases can lead to these wide range of complications.⁵ This study was undertaken to isolate the present bacteriological trends in the patients suffering from COM.

METHODS

This cross-sectional, observational study was conducted at the Department of ENT and Head-Neck Surgery, Rangpur Medical College Hospital in Rangpur, a northern district of Bangladesh, from January to June of 2019. The study was conducted upon a total of 80 patients who had attended outpatient and indoor department of ENT and Head-Neck Surgery, Rangpur Medical College Hospital having chronic mucosal otitis media. They aged between 6 to 55 years.

Inclusion criteria:

1. Chronic mucosal otitis media (active variety)
2. Patient not receiving systemic and topical antibiotics at least for last 7 days.

3. Both male and female patients are included.
4. Age between 6 years to 55 years.
5. Willing to participate in the study & have given written consent.

Exclusion criteria:

1. Chronic mucosal otitis media (inactive)
2. Chronic squamous otitis media
3. Otomycosis
4. Otitis externa
5. Immunocompromised patient-DM, CKD

We developed structured questionnaire, a preformed data sheet was used to collect data. After taking a meticulous history about discharge, duration, site, socioeconomic condition, general and systemic examination was done. Thorough examination of ear, nose and throat was done in all cases. Aural swab was taken from the discharging ear on the first day of attending, by using sterile swab stick and aural speculum. All care was taken to avoid surface contamination. Collected swabs were inoculated on blood agar and MacConkey's agar media. The culture plates were incubated aerobically at 37°C up to 48 hours.⁸

After incubation, the plates were examined for growth of any suspicious organism. The isolated organisms were stained by gram stain and morphological study was done. Then the organism was identified by observation of pattern of hemolysis on blood agar media, motility test and standard biochemical test. The organism pattern was then tabled on the basis of the culture reports. All information was endorsed in the data sheet.

Collected data were coded, kept confidential and processed and analyzed using computer software SPSS (Statistical Package for Social Sciences) for Windows (version 20.0). The test statistics used for analysis of data were t-test (for comparison of data presented in quantitative scale). For any analytical test the level of significance was 0.05 and $p < 0.05$ was considered statistically significant. The study was approved by the Ethical Review Committee of Bangladesh College of Physicians and Surgeons (BCPS), Dhaka, Bangladesh.

RESULTS

Among the 80 patients, the age distribution shows that most of them were in the 16-25 years age group (36.25%) and minimum cases were in the 46-55 years age group (5%) (Table-I). The study included 80 diagnosed cases of COM comprising of 45(56.25%) were male and 35(43.75%) were female; male-female ratio was 1.4:1. Regarding Socioeconomic status, maximum 41(51.25%) patients came from lower class, 34(42.5%) from middle class and 5(6.25%) from higher class. 51(63.75%) patients came from rural areas and the rest 29(36.25%) from urban areas (Fig. 1). Out of 80 patients, 60(75.0%) patients used to take bath in pond and river and 3(3.75%) by supply water (Fig. 2). Among 80 bacterial isolates, Pseudomonas aeruginosa was the predominant bacterium in 36(45.0%) followed by Staphylococcus aureus in 22(27.5%), mixed isolates in 7(8.75%), E. coli in 4(5%), Proteus in 3(3.75%), Streptococcus pneumoniae in 2(2.5%) and Klebsiella in 1(1.25%) (Table-II).

Table-I: Age distribution of the patients (n=80)

Age group (in years)	No. of cases	Percentages
6-15	22	27.5
16-25	29	36.25
26-35	13	16.25
36-45	12	15.0
46-55	04	5.0
Total	80	100

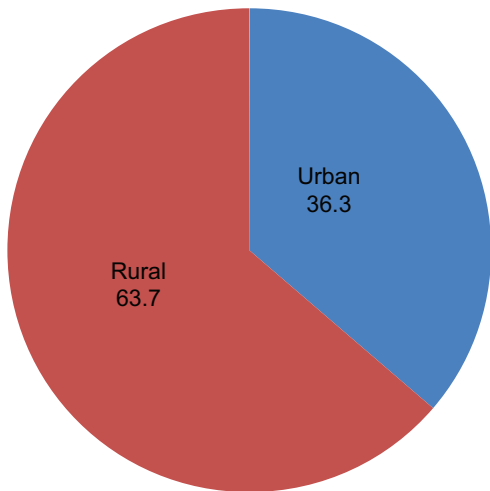


Fig. 1: Dwelling status of the patients (n=80)

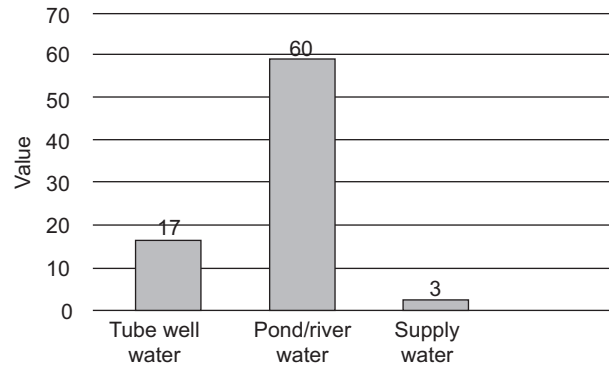


Fig. 2: Pattern of bathing habit of the patients (n=80)

Table-II: Identification of microorganisms in the pus of COM (n=80)

Name of organism	No. of isolates	Percentages
Pseudomonas	36	45.0
Staph. Aureus	22	27.5
Proteus	03	3.75
E. Coli	04	5.0
Strept. Pneumoniae	02	2.5
Klebsiella	01	1.25
Mixed growth	07	8.75
No growth	05	6.25
Total	80	100

DISCUSSION

COM and its associated complications are the most common conditions seen by the pediatrician, otologist, and the general practitioners now-a-days. It is a condition of the middle ear that is characterized by diligent or intermittent release through an endless aperture of the tympanic layer. Due to puncturing of the tympanic membrane, microorganisms may pick up passage to the center ear by means of the outer ear.² The removed muco-pus from ears with active COM is rarely sterile; therefore a priori and quick microbiological diagnosis ensures effective and prompt treatment to avoid complications. Microbiology cultures yield many organisms and these vary depending on climate, patient population, whether antibiotics have or have not been recently used and so many other conditions.⁸ Due to changing trends of bacteriological profile of otitis media, it has become very imperative to find out the organism causing the disease. As the strains of bacterial isolates responsible for COM are still found to be responsive

to first line drugs, the treatment of COM should be given according to the pattern in the microbiological flora of each discharging ear.^{13,14}

Our study primarily focuses on rapid diagnosis through exploring the factors like, age and sex wise distribution, socioeconomic status, distribution of patients according to type of dwelling, bathing habit of patients and major bacteriological growth patterns responsible for COM in the study area.

Usually, the disease was more common in first and second decades of life. Current study revealed that the major disease burden is before the age of 25 years, a maximum 29 cases (36.25%) were in the (16-25) years age group. These findings are in correlation with that of various studies which were carried out in developing countries.^{2,7,9,11-17}

Young children may develop COM due to unhygienic condition and over gathering in school premises.⁹ In contrast, maximum number of patients in the age group of 6-10 years (41%) were observed by Sharma et al.⁵

COM generally affects both sexes. In our study, males (56.25%) were more commonly affected than females (43.75%) that reflects slight male predominance (1.4:1) which was in accordance with Shrestha et al.¹² and Kazeem et al.,¹⁷ but differs from that of Shrestha et al.,¹⁸ where females (55.2%) are more than males (44.8%). Male predominance may be due to their more exposed way of life, or it might be simple reflection of overall high male attendance in hospital outpatient department or may be due to increased vulnerability of the male child to organisms and apparently decreased attention to personal hygiene compared to the female counterparts in this environment.

The prevalence of COM is greater in lower socioeconomic groups due to poor hygiene and nutritional status as well as lack of health education. In present study, 51.25% of samples were in lower socioeconomic condition. This finding was similar to the study conducted by Hiremath et al.¹³ Generally, poor housing and sanitation are prevalent in rural areas the urban. This study showed 63.75% of patients came from rural areas; this finding was supported by many studies which were carried out in the Southeast Asia region. Study conducted by Biswas et al.¹⁹ also reported the similar results.

Water of the ponds, river or canals is usually polluted which infects the middle ear cleft frequently and also

interrupts to heal the pre-existing tympanic membrane perforation and pathology within the middle ear. About 75% of the individuals, revealed in this study, used to take bath in pond and river, which are in correlation with that of study carried out by Shaheen et al.²⁰

In the present study, of 80 bacterial isolates, *Pseudomonas aeruginosa* was the predominant bacterium in 36(45.0%) followed by *Staphylococcus aureus* in 22(27.5%), mixed isolates in 7(8.75%), *E. coli* in 4(5%), *Proteus* in 3(3.75%), *Streptococcus pneumoniae* in 2(2.5%) and *Klebsiella* in 1(1.25%). Kumar et al.,² Pavani et al.,³ Shilpa et al.,⁸ Hiremath et al.¹³ and Govindaraj et al.¹⁴ found that *Pseudomonas* is the predominant organism (i.e., 54.43%, 34%, 49%, 38.79% and 38%, respectively), in their studies. On the other hand, Neha et al.,¹ Shrestha et al.,¹² Ahmed et al.,¹⁵ and Samanth et al.²¹ observed that *S. aureus* is commonest isolate in (i.e., 39.82%, 44.8% 56.7%, and 35.0% respectively) in their studies.

The observations made from different studies indicate that there can be variation in causative organism based on ethnic, geographic factors. Overall, our study showed significant difference in isolates trends in COM patients compared to previous studies conducted. The variation may be related to differences in geography and local antimicrobial prescribing practices. The limitation of our study is that we did not study the anaerobic bacterial profile in chronic otitis media.

CONCLUSION

Predominantly, COM is a disease of childhood to early adulthood with ear discharge as an early and frequent symptom along with deafness. Early and effective microbiological diagnosis and intervention can decrease the chronicity of COM and prevent long-term complications. From this study, it is observed that *Pseudomonas aeruginosa* is the commonest pathogen for bacterial ear disease followed by *S. Aureus*. The study also showed that chronic mucosal otitis media is associated with many social, economic, and environmental factors. This study was carried over in short period of time and in small number of patients. Therefore, further study with a larger number of samples and longer period is recommended to get a more accurate result.

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