

## Original Article

# Antimicrobial susceptibility patterns of Bacterial Isolates from patients attending Ear, Nose, and Throat Department of a Tertiary Care Hospital in Burdwan, West-Bengal, India.

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## Abstract

**Background:** The susceptibility of the most common causative pathogens drives empiric initial antibiotic therapy for bacterial infections. This cross-sectional study was conducted to detect the infection trends and antibiotic susceptibility patterns of patients attending the Burdwan medical college and hospital (BMCH), West Bengal.

**Methodology:** A prospective study was conducted for six months, from August 2021 to January 2022, at the department of microbiology (BMCH), West Bengal. Isolation of bacteria and fungus was performed from clinical samples obtained from patients attending the department of the ear, nose, and throat (ENT) of BMCH. A total of 84 samples were collected from patients with suspected ENT infections. Types of samples taken include pus, fluid, tissue, and throat, nasal, and ear swabs.

**Results:** Bacterial growth was observed in 55(65.47%), of which gram-positive and gram-negative bacterial isolates were found in 31(56.36%) and 21(38.18%) samples, respectively. 3(5.45%) gram-positive bacilli were grown, and 14(16.66%) samples were positive for fungal growth.

**Conclusion:** Antibiogram of gram-positive isolates showed maximum susceptibility to vancomycin and least to ciprofloxacin, whereas gram-negative isolates showed maximum susceptibility to amikacin and least to ciprofloxacin.

## Keywords

Antibiogram, Vancomycin, Amikacin, Infection, Antimicrobial Resistance.



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## Introduction

Otorhinolaryngological infections may result in significant disability in the daily life of a diseased person<sup>1</sup>. The ear, nose, and throat are interconnected organs of the human body and are susceptible to colonization by a broad spectrum of bacteria (pathogenic or commensal)<sup>2</sup>. Pyogenic infections of Ear, Nose, and Throat (ENT) may contribute to many deafness cases and, finally, learning disabilities in children<sup>3</sup>. Ear infections such as chronic suppurative otitis media (CSOM) have many severe complications in developing countries like India. The difficulties may be extracranial or intracranial<sup>4</sup>. Otitis media is the most common seasonal childhood infection, causing annual 50,000 death globally in children under five years<sup>5</sup>, and the cause of 98% of cases of otitis media is micro-organisms<sup>6</sup>.

Chronic nose and throat infections are also a serious matter of concern, and the viral infection of the upper respiratory tract starts to subside, pyogenic infections of ENT set in<sup>7</sup>. Bacteria like *staphylococcus spp*, *klebsiella pneumoniae*, *streptococcus pneumoniae*, *pseudomonas aeruginosa*, *proteus mirabilis*, *haemophilus influenza*, and *enterococcus sp.* are isolated from the majority of ENT infections<sup>8</sup>. Bacterial biofilm makes the CSOM more vulnerable, and the incidence of opportunistic fungal infections has been overlooked. Nasal vestibulitis and furuncles are caused by *Staphylococcus aureus* due to nose picking and excessive nose blowing<sup>9</sup>. Nowadays, Mucormycosis poses an alarming threat, especially after COVID-19. Sensitive antifungal drugs and surgical debridement reduce morbidity and mortality of mucormycosis<sup>10</sup>.

Prompt identification of clinical features, early laboratory diagnosis, and immediate management save a patient's life and reduce the risk of complications. Indiscriminate use of antibiotics may cause antimicrobial resistance (AMR). The Global Antimicrobial Resistance Surveillance System (GLASS) was launched in May 2015 by World Health Organization to support a standardized approach for AMR data collection, analysis, and sharing at a global level<sup>11</sup>. The present

study was conducted to detect the infection trends and antibiotic susceptibility patterns of patients attending the Department of ENT. Burdwan Medical College and Hospital (BMCH), West Bengal.

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## Methodology

A prospective study was conducted for six months, from August 2021 to January 2022 at the Department of Microbiology, Burdwan Medical College and Hospital (BMCH), West Bengal. Isolation of bacteria and fungus was performed from clinical samples obtained from patients attending the Department of Ear, Nose, and Throat (ENT) of BMCH. A total of 84 samples were collected from patients with suspected ENT infections. The study was conducted as the declaration of Helsinki, and ethical clearance was obtained from the institutional ethical committee (BMC/I.E.C/065 dated 29th June 2021).

Samples were taken using the recognized aseptic protocol. Types of samples taken include pus, fluid, tissue, and throat, nasal, and ear swabs. Samples were immediately transferred to the Laboratory in the Department of Microbiology, BMCH, for processing and analysis. A standard nichrome loop was used to inoculate on Nutrient agar, Blood Agar, MacConkey's agar, and Sabouraud's dextrose agar (SDA). The culture plates were observed for the growth of micro-organisms after aerobic incubation at 37°C for 24 h, and colony characteristics were inspected and recorded. After gram staining, the pathogens were identified based on the characteristics and standard biochemical tests.

The suspension of the isolate was matched with 0.5 McFarland standard suspension as a turbidity standard. Lawn cultures of the isolate were done on the Mueller-Hinton Agar (MHA) plates and then incubated at 37°C overnight for antibiotic susceptibility testing. Antimicrobial susceptibility testing was done for all the isolates using Kirby-Bauer disc diffusion method on MHA, adhering to standard CLSI guidelines. Antibiotics were procured from Himedia laboratories, Mumbai, and some samples were processed in Phoenix (BD).

Fungal cultures were processed using the conventional method. For statistical treatment of the data, SPSS and Microsoft Excel were used.

## Results

Of the total 84 case samples tested, bacterial growth was observed in 55(65.47%), of which

gram-positive and gram-negative bacterial isolates were found in 31(56.36%) and 21(38.18%) samples, respectively.

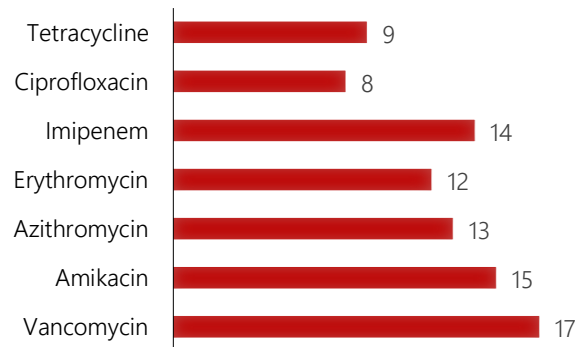
3(5.45%) gram-positive bacilli were grown, and 14(16.66%) samples were positive for fungal growth.

**Table 1: Frequency of bacterial & fungal isolates.**

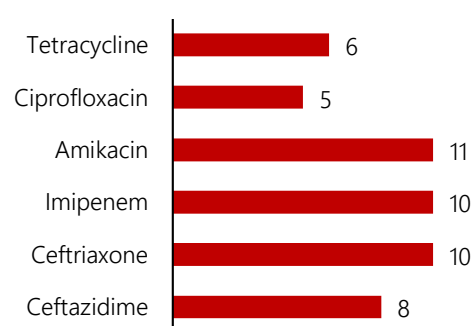
Variables	n(%)
<b>Bacterial isolates</b>	<i>Actinomyces Sp</i>
	2(3.64)
	<i>Corynebacterium Diphtheriae</i>
	1(1.82)
	<i>Enterococcus Faecium</i>
	1(1.82)
	<i>Enterococcus Faecalis</i>
	2(3.64)
	<i>Streptococcus Pyogenes</i>
	1(1.82)
	<i>Proteus Mirabilis</i>
	1(1.82)
	<i>Burkholderia Sp</i>
	1(1.82)
	<i>Arcanobacterium Heamolyticum</i>
	1(1.82)
	<i>Klebsiella Oxytoca</i>
	5(9.09)
	<i>Cons</i>
	7(12.73)
	<i>Klebsiella Pneumonia</i>
	8(14.55)
	<i>Pseudomonas Sp</i>
	11(20.00)
	<i>Staphylococcus Arureus</i>
	14(25.45)
<b>Fungal isolates</b>	<i>Candida Non-Albicans</i>
	1(7.14)
	<i>Candida Albicans</i>
	2(14.29)
	<i>Zygomycetes</i>
	2(14.29)
	<i>Sporothrix Schenckii</i>
	1(7.14)
	<i>Penicillium Sp.</i>
	1(7.14)
	<i>Aspergillus Flavus</i>
	1(7.14)
	<i>Aspergillus Fumigatus</i>
	2(14.29)
	<i>Aspergillus Niger</i>
	4(28.57)

**Table 2: Distribution of Samples in the E.N.T. department.**

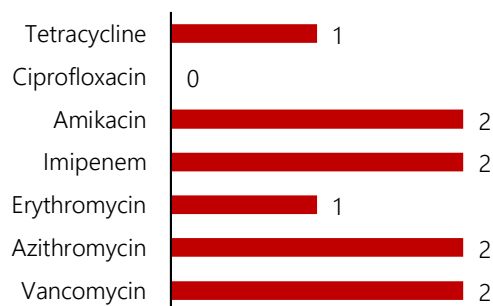
Variables	Total	Bacterial	Fungal
<b>Ear</b>	39	31	8
<b>Nose</b>	13	9	4
<b>Throat</b>	17	15	2

**From Ear**

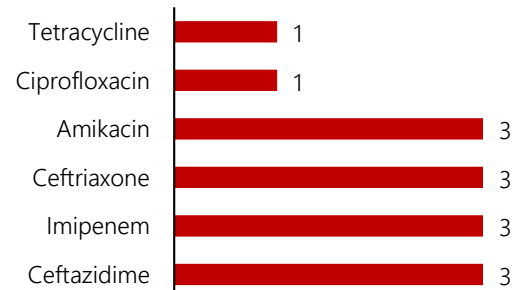
Antibiogram (gram +ve)



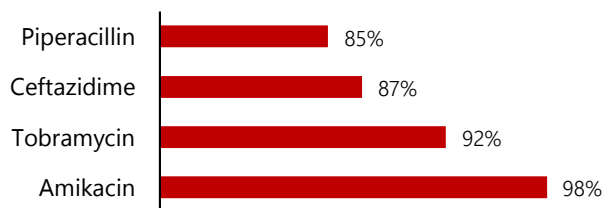
Antibiogram (gram -ve)

**From Throat**

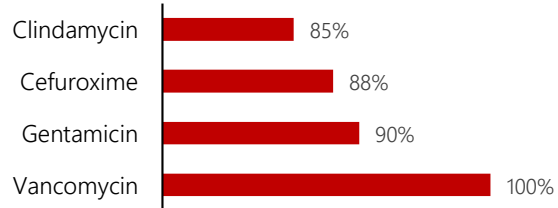
Antibiogram (gram +ve)



Antibiogram (gram -ve)

**From Nose**

Nose (GNB)



Nose (GPC)

**Discussion**

This study depicts the current scenario of ENT infections in patients attending BMCH and their susceptibility to the commonly administered antibiotics. The commonest symptoms discharge from ear and hearing abnormalities, accounting for 65% of the total samples. Samples collected from suspected CSOM cases reveal a high percentage of bacterial colonization (65.47%), predominantly by

gram-positive bacteria (56.36%). Bacterial isolates showed the highest colonization by *staphylococcus aureus* (25.45%), followed by *pseudomonas aeruginosa* (20%) and *klebsiella pneumoniae* (14.54%). Antibiogram of gram-positive isolates showed maximum susceptibility to vancomycin (100%), followed by and least to ciprofloxacin (47%), whereas gram-negative isolates showed maximum susceptibility to

amikacin (100%) and least to ciprofloxacin (45%). Obiajuru and colleagues reported similar observations<sup>12</sup>.

3<sup>rd</sup> and 4<sup>th</sup> generation antibiotics offer higher antibacterial activity and less resistance. In our study, the culture of swabs from the nasal cavity for suspected nasal vestibulitis showed the growth of *Staphylococcus aureus* with susceptibility to all the commonly administered antibiotics. Throat swabs from suspected tonsillopharyngitis cases showed colonization by *klebsiella pneumoniae* and *staphylococcus aureus*, with antibiotic susceptibility similar to isolates from the ear. A similar study have found that ENT infection might cause sleep trouble, like snoring or obstructive sleep apnea<sup>13</sup>.

Azeez observed that micro-organisms were the cause of 98% cases of otitis media at the State Hospital, Oyo<sup>14</sup>. Our study observed that the infection was not influenced by age or gender and personal hygiene and health education reduce the incidence of infection. Infectious diseases account for a big chunk of cases in otorhinolaryngology, and the main causes for this are unhygienic habits on the part of patients, like pond bathing, instilling oil and other substances in ear and nose, improper hand washing before meals, substance abuse, and inserting unsterile ear buds inside the auditory canal<sup>15-17</sup>. Delayed reporting for treatment and misdiagnosis, along with injudicious use of antibiotics, also poses a threat<sup>17</sup>.

## Conclusion

Antibiogram of gram-positive isolates showed maximum susceptibility to vancomycin (100%) and least to ciprofloxacin (47%), whereas gram-negative isolates showed maximum susceptibility to amikacin (100%) and least to ciprofloxacin (45%). This research will assist doctors and microbiologists in developing appropriate antimicrobial policies and improving the prognosis for patients with ear, nose, and throat infections.

## Conflicts of Interest

The authors have no conflicts of interest to declare.

## Acknowledgment

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