



Frequency of Different Bacterial Species and their Antibigram among Patients with Chronic Otitis Media

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Authors' contributions

This work was carried out in collaboration among all authors. Authors MFB and AH designed the study, performed the statistical analysis and wrote the protocol, author SB wrote the first draft of the manuscript. Authors AU and SF managed the analyses of the study. Author UZ managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To find out the frequency of different bacterial species and their antibiogram among the patients of chronic suppurative otitis media.

Study Design: Descriptive cross-sectional.

Place and Duration of Study: The study was conducted at the ENT department of Bahawal Victoria hospital between July to December 2020.

Methodology: About 50 patients presented with unilateral or bilateral ear discharge and diagnosed as a case of chronic suppurative otitis media were included in the study. The disk diffusion method was used on Mueller-Hinton Agar to detect antimicrobial susceptibility. Multiple drugs were tested

for checking antimicrobial susceptibility. The data were analyzed by using Statistical Package for the Social Sciences (SPSS) version 20.

Results: The mean age of the study participants was 13.89 ± 12.37 years. The majority of participants were from a younger age group i.e. less than 10 years of age with female predominance. It had been found that the majority of cases (51%) were having *Staphylococcus aureus* infestation followed by *Pseudomonas aeruginosa*, *Escherichia coli* and very few with *Proteus mirabilis*. On the other hand, multiple drugs were tested to find out the antimicrobial susceptibility among the cases of chronic otitis media and the results reported that all the bacterial species were susceptible to Ceftriaxone while the other antibiotics were having a variable response for different strains of bacteria.

Conclusion: Results concluded that the *Staphylococcus aureus* was the most common organism followed by *Pseudomonas aeruginosa*, *Escherichia coli* and very few with *Proteus mirabilis*. It is important to identify the pathogenic organism and its sensitivity pattern before prescribing any antibiotic.

Keywords: Otitis media; chronic suppurative otitis media; antibiogram; *Staphylococcus aureus*; ceftriaxone.

1. INTRODUCTION

There is a globally higher prevalence rate of chronic suppurative otitis media and is defined as any middle ear infection that leads to inflammation of either middle ear, Eustachian tube or inner ear [1,2]. In 2004, the world health organization (WHO) reported that the prevalence of chronic otitis media is about 5.2% among the population of South East Asia, focusing on these statistics one can say that it is one of the most critical health problems of our country [3]. The most common route of transmission infection to middle ear is through the Eustachian tube which is why there is a higher prevalence rate of otitis media among children. The reason behind is that they are having horizontally lie Eustachian tube with smaller size and are more prone to develop infection because of lower immunity against bacteria. Globally it raises the mortality rate up to more than 50,000 children annually [4].

The most common complication of chronic suppurative otitis media is hearing loss that may be either conductive or sensorineural. Developing countries are highly affected by these complications and Pakistan is one of them. Many factors are responsible for its higher prevalence in developing countries including poor socioeconomic status, improper sanitation, overcrowding, poor hygienic condition and malnutrition [5].

The most common pathogen involved in chronic otitis media include *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *E. coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Aspergillus* and

Candida species but their extent of complication varies with the geographical area. In rural areas due to lack of health facilities while up to some extent in urban areas, the physician treat the otitis media as per their preferences including ear drops and systematic antibiotics, instead of doing culture and sensitivity test of ear discharge, because of this negligence there is an increased rate of developing resistance against antibiotics, decrease drug efficacy and poor cost-effectiveness [6,7]. It is imperative to have adequate knowledge about antibiogram for prescribing an effective drug and minimize the resistance rate among the patients with chronic otitis media [8,9]. So the current study aims to find out the frequency of different bacterial species and their antibiogram among the patients of chronic suppurative otitis media.

2. METHODOLOGY

A descriptive cross-sectional study was conducted at the ENT department of Bahawal Victoria hospital between July to December 2020. The sample size was calculated by using the open Epi calculator and was 50. The inclusion criteria for the study were the patients presented with unilateral or bilateral ear discharge and diagnosed as a case of chronic suppurative otitis media. Detailed history and clinical examination were performed and noted over the proforma. The disk diffusion method was used on Mueller-Hinton agar to detect antimicrobial susceptibility. Current guidelines of CSLI [10] for antibiogram which are separate for Gram positive and Gram negative bacteria were used. Many drugs including ampicillin (30 mg),

augmentin (30 ug), ofloxacin (5 ug), cephalixin (30 ug), cephradine (30 ug), ceftriaxone (30 ug), cefotaxime (30 ug) and erythromycin (10 ug) were tested for checking antimicrobial susceptibility. Sterilized forceps were used to place these drugs on pre-streaked agar plates. The sensitivity and resistance of bacteria were interpreted based on of manufacturer’s standard zone. The data was analyzed by using Statistical Package for the Social Sciences (SPSS) version 20. All the qualitative variables were presented as frequency and percentages while the numerical variables as mean with standard deviation.

3. RESULTS

The mean age of the study participants was 13.89 ± 12.37 years. On the basis of age, they were classified into 6 groups, among them the majority of participants were from younger age group i.e. less than 10 years of age. Out of total

50 participants, female cases were predominant consisting of about 64% of the total. The majority of the cases were having unilateral infection about 76% while very few (24%) were having bilateral involvement. The demographic characteristics of study participants are presented in Table 1.

Different bacteria are responsible for causing chronic otitis media as presented in Fig. 1. It had been found that the majority of cases (51%) were having *Staphylococcus aureus* infestation followed by *Pseudomonas aeruginosa*, *Escherichia coli* and very few with *Proteus mirabilis*. On the other hand, multiple drugs were tested to find out the antimicrobial susceptibility among the cases of chronic otitis media and the results reported that all the bacterial species were highly sensitive to Ceftriaxone while the other antibiotics were having variable response for different strains of bacteria as mentioned in Table 2.

Table 1. Demographic characteristics of study participants

Variables	n= 50 (%)
Age (years)	
1-10	20 (40%)
11-20	15 (30%)
21-30	4 (8%)
31-40	2 (4%)
41-50	4 (8%)
≥ 50	5 (10%)
Gender	
Male	18 (36%)
Female	32 (64%)
Involved ear	
Right ear	20 (40%)
Left ear	18 (36%)
Bilateral	12 (24%)

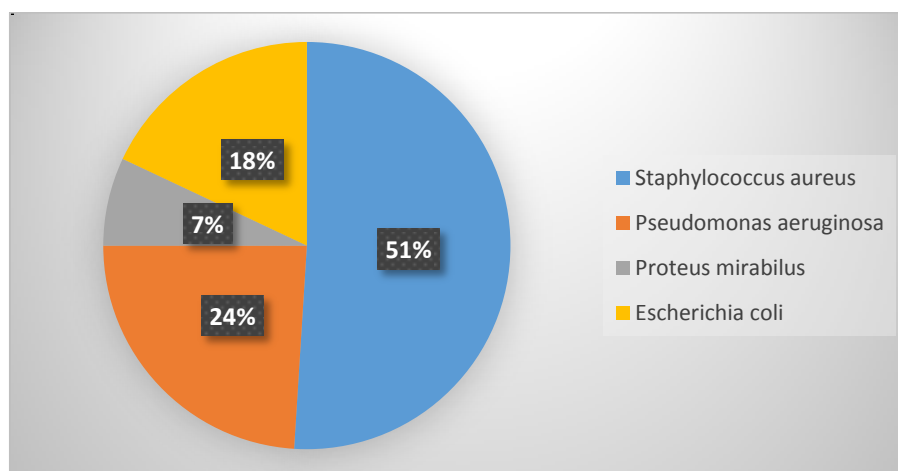


Fig. 1. Frequency of different bacterial species among patient with otitis media

Table 2. Drugs used for testing antimicrobial susceptibility

Bacterial species	Augmentin	Erythromycin	Ampicillin	Ofloxacin	Cephalexin	Ceftriaxone
<i>S. aureus</i>	63.7%	69.4%	7.9%	73.2%	34.1%	85.4%
<i>P. aeruginosa</i>	34.5%	--	19.4%	19.8%	--	26.8%
<i>P. mirabilis</i>	38.2%	--	19.1%	15.1%	--	25.5%
<i>E. coli</i>	68.1%	69.4%	66.6%	99.7%	--	68.2%

4. DISCUSSION

The current study reported that 86% of the cases of otitis media had bacterial infestation which is favored by another study done in the same region of Bahawalpur by Mirza et al reported 89% cases of bacterial infestation in otitis media still another survey conducted by Aslam et al in Rawalpindi, reported about 23.6% prevalence of bacterial infestation. The wide difference between the two cities of the same country is because of the sociodemographic factors as the South area of Punjab is underdeveloped [9,11].

Looking over the most commonly involved bacteria in otitis media is *Staphylococcus aureus*, followed by *Pseudomonas aeruginosa*, *E. coli* and *Proteus mirabilis* with rate of 51%, 24%, 18% and 7% respectively. Comparing it with other studies in Pakistan, a study conducted in Karachi reported *P. aeruginosa* as the most commonly involved pathogen followed by *S. aureus* with rate of 40% and 30.9% respectively [12], same is reported by a study conducted in Dera Ismail Khan at incidence of 45.9% and 26.4% respectively [13]. But a study conducted in Peshawar favored current finding by reporting *S. aureus* as the most common microorganism (28%) followed by *P. aeruginosa* (12%) [14] and is also favored by a study done in Gilgit reported 65.2% *S. aureus* and 15.2% *P. aeruginosa* respectively [15]. A study in Nepal also favored current finding with the prevalence rate of 32.2% *S. aureus* and 26.9% *P. aeruginosa* in the cases of chronic suppurative otitis media [16]. Literature review revealed that both *S. aureus* and *P. aeruginosa* are the major pathogens involved in chronic suppurative otitis media.

The current study reported that females are more affected compared to their male counterparts and are also favored by Naqvi et al. [17]. Among the different age groups, the current study reported that the younger group (less than 10 years of age) was highly affected with chronic suppurative otitis media because of multiple factors including

anatomical, physiological and sociocultural factors [4]. This is also favored by a study in Multan [17].

Focusing over the antibiogram, the most preferred drug for treating an infection with *E. coli* is Ofloxacin because of its higher sensitivity of about 99.7% compared to other antibiotics. Cephadrin was noted as a highly resistant drug because of its unnecessary use in rural areas which is alarming and needs to take action so that further resistance against other antibiotics can be prevented. Isolates of *S. aureus* were also presented a high resistance rate with several commonly used antibiotics but Ceftriaxone was highly affected with a sensitivity rate of 85.4% but *P. aeruginosa* was having poor sensitivity and resistant to almost all antibiotics. These findings were consistent with the study by Naqvi et al. [17].

5. CONCLUSION

Current study concluded that the *Staphylococcus aureus* was the most common organism followed by *Pseudomonas aeruginosa*, *Escherichia coli* and very few with *Proteus mirabilis*. The bacterial susceptibility pattern in chronic suppurative otitis media varies because of multiple sociodemographic factors that why it is important to identify the pathogenic organism and its sensitivity pattern before prescribing any antibiotic.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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