

Bacteriological profile of purulent otitis media at the Avicenna Military Hospital in Marrakech

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World Journal of Advanced Research and Reviews, 2022, 14(01), 194–199

Publication history: Received on 03 March 2022; revised on 06 April 2022; accepted on 08 April 2022

Article DOI: <https://doi.org/10.30574/wjarr.2022.14.1.0306>

Abstract

Chronic suppurative otitis media (CSOM) is a perforated tympanic membrane with persistent drainage from the middle ear. It is an avoidable cause of hearing loss, especially in developing countries. We conducted a prospective study over 8 years (1 January 2014 - 1 January 2022), including 250 patients consulting the Oto-Rhino-Laryngology Department of the Avicenna Military Hospital in Marrakesh, in collaboration with the Laboratory of Microbiology.

It included all non-redundant bacterial species isolated from pus of purulent chronic ear infections sent to the microbiology laboratory. The cytobacteriological analysis was carried out according to the conventional techniques and / or automated method of BD Phoenix™. The antibiotic sensitivity study was carried using the diffusion method in agar medium according to the recommendations of the CA-SFM. There were 147 men and 103 women with a sex ratio of 1.4. The mean age of the patients was 34 years (8 to 82 years). The second and fourth decades represent the most affected age groups. The bacteriological profile was dominated by *Pseudomonas aeruginosa* (40%), followed by *Staphylococcus aureus* (32%) and *Proteus mirabilis* (13%). These different isolates represented low antibiotic resistance levels but all remained sensitive to fluoroquinolones. Five strains of enterobacteria produced derepressed cephalosporinase, and nine strains of Enterobacteria carrying extended spectrum Beta lactamase enzymes. No strain of *Pseudomonas* resistant to ceftazidime was isolated. Gram positive cocci accounted for 38% of the strains. In view of the bacteriological and the sensitivity profiles of the species found in chronic otitis, antibiotics based on fluoroquinolones are recommended.

Keywords: Chronic Otitis Media; Bacterial Isolates; Antimicrobial Resistance; Chronic Otitis Media with Effusion

1. Introduction

Chronic suppurative otitis media (CSOM) is a perforated tympanic membrane with persistent drainage from the middle ear. It is an avoidable cause of hearing loss, especially in developing countries. The bacterial epidemiology of purulent chronic otitis is important and must be updated periodically as the treatment depends on it (1).

The objective of the study is to assess the bacteriological profile of and evaluate the antibiotic susceptibility of strains isolated in the Avicenna military hospital of Marrakesh.

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2. Material and methods

Our study is prospective and was carried out in the microbiology-virology-molecular biology laboratory of the Avicenna Military Hospital in Marrakech in collaboration with the ear, nose and throat department of the same hospital over a period of 8 years (January 1, 2014-January 1, 2022).

The samples were taken from patients who consulted the ENT department.

2.1. Inclusion criteria

- Any patient diagnosed with chronic otitis media after thorough clinical evaluation by an ENT specialist
- Patients who have not received antibiotics (topical or systemic) for at least two weeks
- Patients of all ages

2.2. Exclusion criteria

- Patients with chronic cholesteatomata's otitis media
- Patients who have taken topical or systemic antibiotics within the last two weeks
- Patients who did not give consent

The collection of information was done using a form including the patient's age, sex, history and the clinical examination.

The ear discharge was collected using 2 thin swabs (Alginate or Dacron mounted on a metal rod), one used to perform an extemporaneous spread on a slide, the other being intended for culture. The use of a transport medium for anaerobic bacteria was necessary if the culture was not immediate.

The macroscopic examination allowed us to know the organoleptic characteristics of the samples: odor, appearance and color.

Microscopic examination, after Gram staining, can provide an interesting orientation diagnosis to be communicated rapidly to the clinician.

The samples were examined directly after Gram staining. This allowed the morphology, grouping mode, abundance and polymorphic or monomorphic appearance of the bacterial flora to be assessed, as well as the associated cellular reaction.

2.3. Isolation method

Pus samples were inoculated on culture media appropriate to the objectives of each setting. The culture was done on: standard (blood agar, cooked blood agar, purple bromocresol agar) and selective (cetrimide agar, Chapman) media incubated for 24-48 h at 37 °C.

The identification of the strains was based on the study of their morphological, cultural and biochemical characteristics by means of Biomérieux's API 20 miniaturized identification galleries or by an automated method on BD Phoenix™ which at the same time allowed the determination of the antibiogram by the minimum inhibitory concentration (MIC) method. The sensitivity of the strains to antibiotics was also studied by the conventional method of disc diffusion in agar medium and by the automated BD Phoenix™ method.

The reading and interpretation criteria were those of the Antibiogram Committee of the French Society of Microbiology.

The demonstration of ESBL production in our laboratory was carried out using the synergy test between amoxicillin + clavulanic acid and a 3rd generation cephalosporin.

3. Results

During the study period, 250 patients were included. There were 147 males and 103 females, giving a sex ratio of 1.4:1.

The average age of the patients was 34 years, ranging from 8 to 82 years.

The distribution of patients according to age groups shows two peaks: one between 11 and 20 years (n= 72) and the second between 31 and 41 years (n= 70).

Of the 210 samples analyzed, 132 were culture positive (53%) and 118 were culture negative (47%).

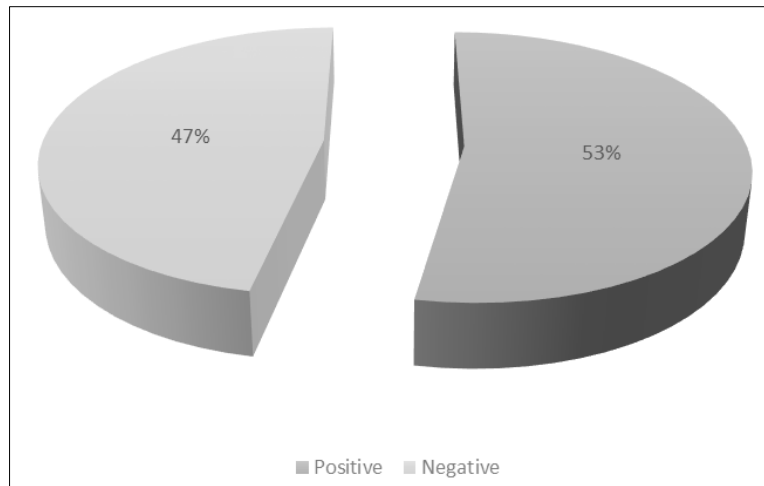


Figure 1 Distribution of culture results (n= 250)

The bacteriological profile was largely dominated by Gram-negative bacilli (68%).

Pseudomonas aeruginosa was isolated in 40% of cases, enterobacteria in 22% of cases and a single *Achromobacter xylooxidans*.

Gram-positive cocci: represented mainly by *Staphylococcus aureus* founded in 32% of cases.

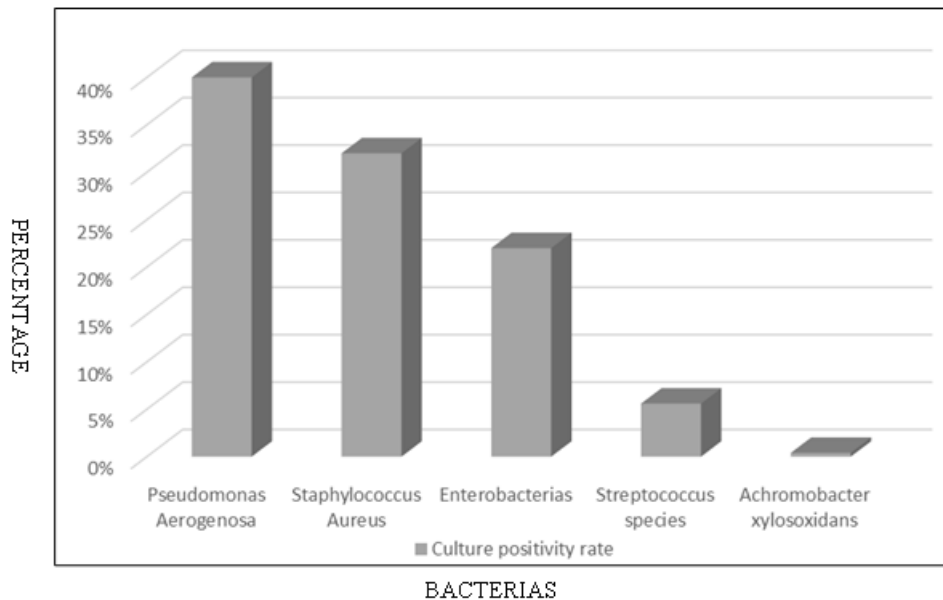


Figure 2 Distribution of bacteria isolated from chronic otitis

The enterobacteria were distributed as follows:

- *Proteus mirabilis* was isolated in 17 cases (58.6%), *Proteus vulgaris* in 5 cases (17.2%), *Morganella morganii* in 3 cases (10.4%), *Citobacter Freundii* in 3 cases (10.4%) and *Klebsiella pneumoniae* in 1 case (3.4%).

- *Pseudomonas aeruginosa* strains isolated in our study were susceptible to ticarcillin in 70% of cases, 92% of strains were susceptible to ciprofloxacin and 48% were susceptible to aminoglycosides. No strains resistant to ceftazidime or imipenem were isolated from the pus of the otitis analyzed.

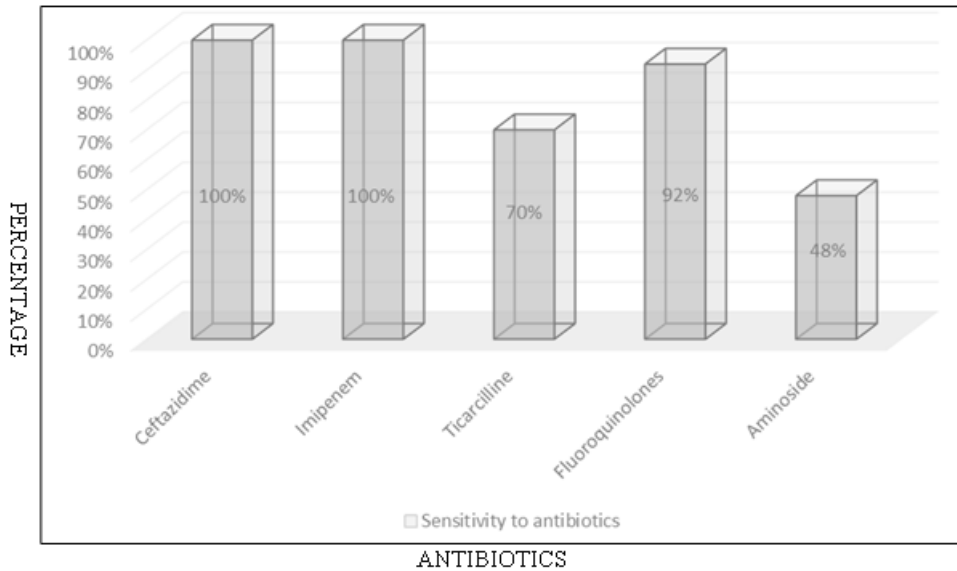


Figure 3 The sensitivity of *Pseudomonas aeruginosa* to antibiotics

Of the thirty strains of *Staphylococcus aureus* isolated, four were resistant to meticillin (MRSA) while all were susceptible to glycopeptides, pristinamycin and rifampicin.

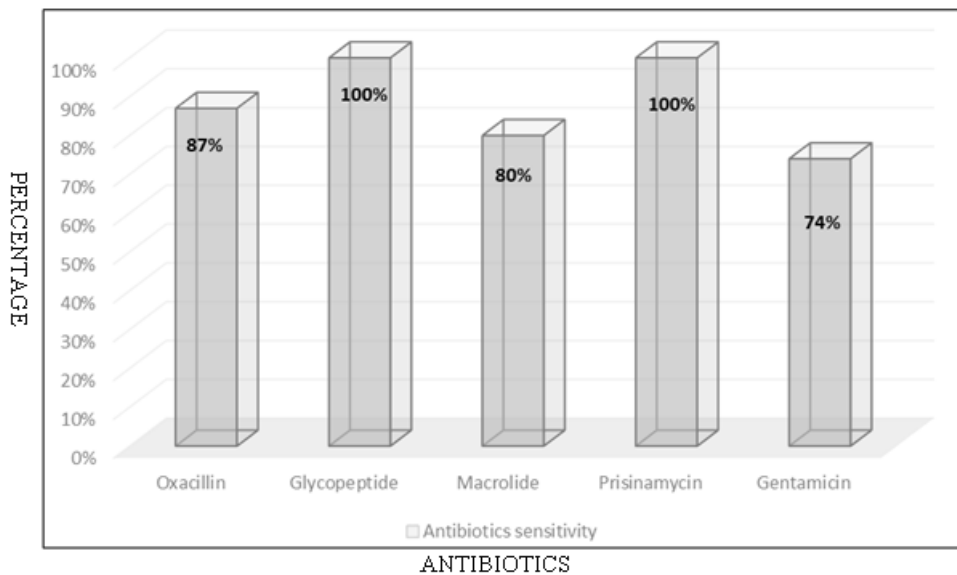


Figure 4 The sensitivity of *Staphylococcus aureus* to antibiotics

4. Discussion

Chronic suppurative otitis media (CSOM) is most often caused by a bacterial infection of the middle ear, and antibiotics are commonly used empirically and can lead to the emergence of resistant strains [1].

The exudate prevents the middle ear ossicles from properly transmitting sound vibrations from the eardrum to the oval window of the inner ear, causing conductive hearing loss [2,3].

In developing countries, the prevalence of purulent chronic otitis media is relatively high, ranging from 6% to 46% in different populations [4, 5].

Indiscriminate use of antibiotics and inadequate patient follow-up have resulted in permanent changes in the bacteriological pattern of the disease. With the advent of new antibacterial, anti-inflammatory, and antihistamine drugs, the assessment of the CSOM bacterial flora becomes important.[6]

In a study conducted by Rathod and al [6] on 490 isolates, Gram- negative organisms predominated by 60.61% over Gram positive organisms (39.38%), *Pseudomonas aeruginosa* (37.95%) was the commonest isolate followed by *Staphylococcus aureus* (21.83%).

Another study conducted by Rath and al [7]on 1230 CSOM pus shows that the most common causal bacteria isolated were *P. aeruginosa* 31,8% followed by *Staphylococcus aureus* 25,2%.

A study conducted by Kazeem and al [8] on 380 isolates shows that *P. aeruginosa* had the highest prevalence of 31.5% while *Staphylococcus aureus* 23.2%.

Our study results match the studies above [3,6–8], the most common causal bacteria isolated was *P. aeruginosa* 40% followed by *Staphylococcus aureus* 32%.

Penicillin-based antibiotics and macrolides have very limited efficacy because resistance rates are high for *P. aeruginosa* and methicillin-resistant *S. aureus* (MRSA), that are the most common organisms encountered in CSOM [3].

These different isolates represented low antibiotic resistance levels but all remained sensitive to fluoroquinolones, imipenem, ceftazidime and glycopeptide. [1, 4–9]

Several studies have shown the in vitro efficacy of ciprofloxacin against many Gram-positive and Gram-negative bacteria including *P. aeruginosa* and methicillin-resistant *Staphylococcus aureus* and no ototoxicity has been reported.[1, 6–9]

5. Conclusion

The bacterial epidemiology of purulent chronic otitis is dominated mainly by *Pseudomonas aeruginosa* followed by *Staphylococcus aureus*.

The choice of antibiotics is based on bacterial epidemiological data which must be updated periodically.

These isolated microbial agents have shown a high sensitivity to ciprofloxacin, which leads us to propose it as a first-line treatment for chronic otitis, given its tolerance and good tissue diffusion.

Compliance with ethical standards

Acknowledgments

This paper and the research behind it would not have been possible without the exceptional support of my supervisor, Lamiae Arsalane. Her enthusiasm, knowledge and exacting attention to detail have been an inspiration and kept my work on track from my first encounter with this research to the final draft of this paper.

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

Informed consent was obtained from all individual participants included in the study.

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