

# Acute otitis media in children of Ismailia city: a bacteriological study

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## Introduction

Acute suppurative otitis media is a very common health problem associated with emerging resistant organisms that require special attention.

## Aim

The aim of this study was to determine the most common infecting microorganism causing acute suppurative otitis media in Ismailia city and to determine the organism's sensitivity to antibiotics.

## Patients and methods

This investigation was a cross-sectional study carried out in multiple hospitals and primary care clinics in Ismailia city targeting patients below 18 years of age. Each patient underwent history taking and a clinical examination. An ear swab and a nasopharyngeal specimen were taken and sent for culture and sensitivity testing.

## Results

A total of 2003 patients with a mean age of 2.5 years were included in the study, 53.7% of whom were boys and 46.6% were girls. *Haemophilus influenzae* was the most prevalent organism in both the ear swab and nasopharyngeal aspirate culture and was mostly sensitive to amoxicillin–clavulanic acid, followed by azithromycin.

## Conclusion

*H. influenzae* is the most common infecting organism causing acute suppurative otitis media and is highly sensitive to amoxicillin–clavulanic acid.

## Keywords:

infecting organisms, ismailia, otitis media

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## Introduction

Acute otitis media is the second most common infection in children and the most common reason for antibiotic consumption [1]. Children below 7 years of age are more susceptible to otitis media as they have underdeveloped Eustachian tubes and less resistance to infections compared with adults [2]. Most pediatricians and otolaryngologists prescribe antibiotics for patients with acute suppurative otitis media on an empirical basis and rarely perform culture and sensitivity studies for the determination of the kind of antibiotics that may help in complete eradication of the infecting microorganism. Adding to that is the emergence of resistant infecting microorganisms. It was estimated that about 30–70% of *Streptococcus pneumoniae* causing acute otitis media are resistant to penicillin and amoxicillin [3,4]. The paucity of effective and broad-spectrum antibiotics with a wide safety margin increases the complexity of the current problem, especially with the inappropriate use of antibiotics, leading to failure of treatment against acute otitis media.

The aim of this study was, first, to identify the most frequent infecting microorganism(s) causing acute otitis media affecting children of Ismailia and, second, to

determine the antibiotic most effective against the identified microorganisms. This would help in future planning for an effective first-line treatment for acute otitis media in children presenting to the outpatient clinics of hospitals in Ismailia city.

## Patients and methods

This was a descriptive cross-sectional study in which 203 patients below 18 years of age were randomly selected from those attending the otolaryngology outpatient clinics of the Suez Canal University Hospital, Ismailia General Hospital, Health Insurance Hospital, and Primary Healthcare Units. All children presented with acute suppurative otitis media. Each child underwent assessment by history taking and clinical examination to ensure the diagnosis of acute suppurative otitis media and discharge from ears.

Samples of discharge from ears were collected from patients using sterile microswabs, and nasopharyngeal aspiration was performed using a sterile catheter in a sterile mucus trap. Each sample was labeled and sent to the microbiology laboratory of Suez Canal University Hospital, where it was cultured on MacConky agar,

nutrient agar, and blood agar and incubated at 37°C for 24h. The cultures were examined after 24h for significant growth and were subcultured on blood and nutrient agar, followed by incubation for another 24h for identification of the morphology of the organism; this was followed by Gram staining and biochemical tests for identification of the poorly characterized organisms. These procedures were followed by antibiotic sensitivity testing using amoxicillin, azithromycin, cefuroxime, erythromycin, trimethoprim, amoxicillin–clavulanic acid, and clindamycin, excluding quinolone antibiotics as they cannot be used in children.

## Results

A total of 2003 patients with acute otitis media and discharge from ears were included in the study, 53.7% of whom were boys and 46.6% were girls with ages ranging from 6 months to 10 years; their mean age was 2.5 years. Among them, 65% were from rural areas and 35% from urban areas. Fever and earache were the main presenting symptoms and the duration of symptoms before ear discharge was 2 days in 34% and 4 days in 64% of the patients.

Cultures from the ear swab and nasopharyngeal aspirate reveal that *Haemophilus influenzae* is the most frequent organism, detected in 32 and 21.9% of samples, respectively, followed by *S. pneumoniae*, found in 30.5 and 19.7% of the samples, and *Moraxella catarrhalis*, found in 18.2 and 18.7% of samples, respectively. In the ear swab cultures, *H. influenzae*, *S. pneumoniae*, and *M. catarrhalis* were the most commonly detected, followed by *Staphylococcus aureus* and *Streptococcus pyogenes*, whereas in the nasopharyngeal specimens mixed cultures of *H. influenzae*, *S. pneumoniae*, and *M. catarrhalis* were the most common, followed by *S. aureus*. *S. pyogenes* was the least frequently detected organism.

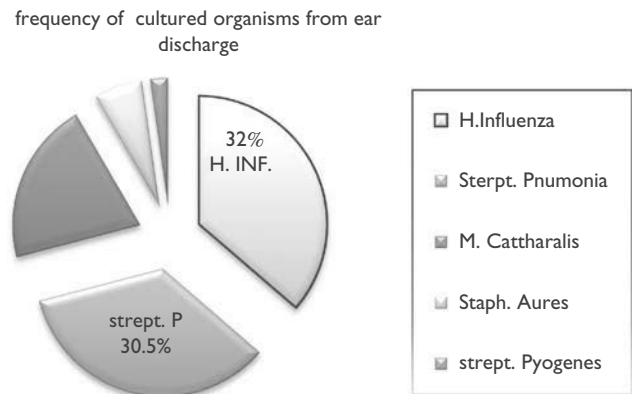
Amoxicillin–clavulanic acid was the most effective antibiotic with a sensitivity of 96%, followed by azithromycin (73.7%), cefuroxime axetil (70%), and amoxicillin (65%) (Figs 1–3).

## Discussion

Historically, the microorganisms causing acute otitis media have not changed significantly over time [5]. Although in some patients with acute otitis media the condition resolves spontaneously, the majority still receive antibiotics aiming at rapid control of the symptoms and increasing the chance of resolution and preventing possible complications [6].

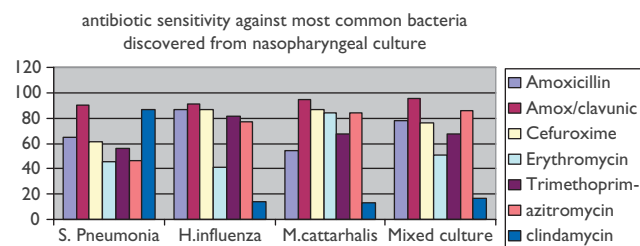
The constant use of antibiotics during management of acute otitis media by specialists such as general practitioners, pediatricians, internists, and otolaryngologists, mostly on an empirical basis, has led to the emergence of resistant serotypes causing pneumococcal infections that are responsible for a serious and life-threatening infection [7].

**Figure 1**



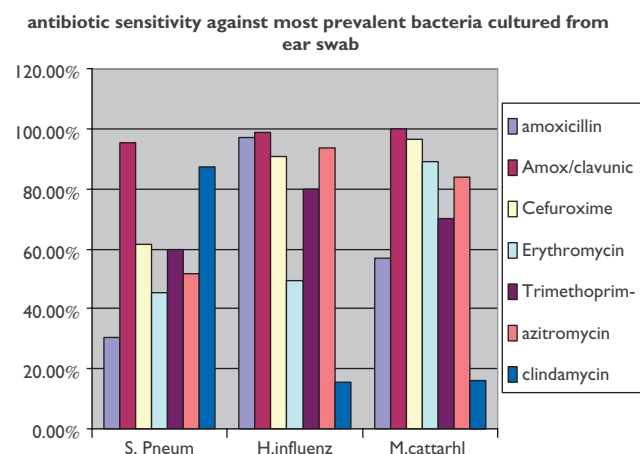
The percentage of different microorganisms cultured from ear discharge.

**Figure 2**



Antibiotic sensitivity against the most common bacteria cultured from the nasopharyngeal specimen.

**Figure 3**



Antibiotic sensitivity against the most prevalent bacteria cultured from ear swabs.

The aim of this study was to determine the most prevalent organism(s) causing acute otitis media in patients attending the outpatient clinics in different hospitals and centers of Ismailia city, either in urban or rural areas of Ismailia governorate, and to determine the antibiotics to which the cultured organism(s) is(are) sensitive, especially those that can be used in children,

hence aiming to create a protocol for acute otitis media antibiotic management among different specialties to limit antibiotic abuse.

Children below 6 years of age represent the main bulk of the study population and this is compatible with the fact that children are more prone to acute otitis media because of immaturity of the immune system and the anatomical characteristics of the Eustachian tube that change with age [8].

Although 65% of the study population resided in rural areas and the remaining 35% in urban areas, there were no differences in the cultured microorganisms from either area.

*H. influenzae* was the most commonly cultured pathogen in both the ear swab and nasopharyngeal aspirate (65 and 22%, respectively), followed by *S. pneumoniae* in the ear swab samples, whereas in the nasopharyngeal aspirate mixed infection with *H. influenzae*, *S. pneumoniae*, and *M. catarrhalis* was seen. In comparison with other studies carried out in Latin America, it was found that *H. influenzae* was predominant over *S. pneumoniae* as the most common organism causing acute otitis media [5].

*M. catarrhalis* was the third most common with a frequency of occurrence of 18.2%, similar to the results of the studies from Turkey (15%) and Finland (23%) [9,10]. However, this result is different from that of the study from Columbia that yielded no positive test for *M. catarrhalis* [11].

Amoxicillin–clavulanic acid was the most effective antibiotic in cultures from ear swabs. The sensitivity of *H. influenzae* was 98.5%, that of *S. pneumoniae* was 95.2%, of *M. catarrhalis* was 100%, of *S. aureus* was 81.8%, and of *S. pyogenes* was 100%, with an overall sensitivity of 96%. These results are consistent with those of the study from Turkey, in which the overall sensitivity was 95%, and the study from Mexico, in which it was 97% [9,12]. These results are also consistent with the study from Spain that concluded that the overall sensitivity against amoxicillin–clavulanic acid was usually above 95% [13].

Azithromycin was the second most effective antibiotic with 73% sensitivity, followed by cefuroxime (70%). Amoxicillin–clavulanic acid is a relatively expensive, although affordable, antibiotic compared with amoxicillin in Egypt and in developing countries. The price of amoxicillin–clavulanic acid is almost triple that of

amoxicillin, which adds to the burden of the already exhausted healthcare budget.

Overall, ~88.1% of cultured specimens yielded pathogenic bacteria, whereas about 12% of specimens revealed no pathogenic bacteria. This may be because of the possibility of the presence of viral, mycoplasma, chlamydial, or fungal infections that may cause acute otitis media. Therefore, these organisms may be the reason for negative cultures obtained from middle-ear exudates in the event of otitis media [14].

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## Acknowledgements

### Conflicts of interest

There are no conflicts of interest.

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