

# Current microbiological pattern and role of respiratory syncytial virus infection in children with acute otitis media in South Jeddah

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## Introduction

Otitis media is one of the most commonly encountered pediatric ENT diseases. Antibiotic resistance is increasing partly because of their overuse and largely because of changing microbiological strains leading to the disease. In this study, we aimed to determine the current microbiological pattern of the disease in children.

## Participants and methods

Ear discharges of 200 children with acute otitis media between 6 and 14 years of age were microbiologically examined.

## Results

Virus-only infection was positive in 13% of patients, 30% were only bacterial (48% of which is *Proteus mirabilis*), and 57% had combined viral and bacterial infections.

## Conclusion

Changing trends in microbiological patterns warrant further researches to achieve better prevention and treatment.

## Keywords:

bacterial, otitis media, viral

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## Introduction

Otitis media is an inflammation of the mucosa and lining of the middle ear cleft. There are several types of otitis media; the three most important types are acute, chronic and otitis media with effusion [1]. AOM, which is generally considered a bacterial disease, is more likely a bacterial complication of viral URI. However, a viral agent alone can also cause signs and symptoms of AOM. Concurrent viral infection can enhance and prolong the middle ear inflammation or delay bacterial clearance.

Respiratory syncytial virus (RSV) is a common human respiratory virus and a leading etiological agent of the lower respiratory tract infections in infants and younger children. Asymptomatic infections are uncommon. The most common manifestation of infection is a moderately severe upper respiratory tract infection, with signs such as rhinorrhea, cough, and fever. Infected children (30–50%) have physical signs of lower respiratory tract infection [2].

Occasionally, these symptoms are accompanied by a middle ear infection. Recently, it has been postulated that RSV is one of the common viruses affecting and adding to the etiology of otitis media [3].

Monoclonal antibodies for a direct immunofluorescence assay of cell smears for RSV provide an

efficient, economic, and sensitive means of rapid diagnosis of RSV and can be readily incorporated into a routine clinical laboratory. Samples can be tested singly or in batches as needed. The availability of a rapid direct immunofluorescence assay screening reagent for the detection of multiple common respiratory viruses within 1–2 h of sample collection could be very beneficial in terms of patient management and infection control [4].

A better understanding of the mechanisms of viral and bacterial interaction in AOM will lead to new strategies for more effective treatment and the successful development of respiratory virus vaccines will offer effective prevention for this very common childhood disease [5].

## Participants and methods

This study is a cross-sectional observational study; 154 patients with 200 discharging ears presenting to our ENT clinic at Hai Aljameaa Hospital in south Jeddah were enrolled in our study in 2011. They were clinically diagnosed with acute otitis media with discharging

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ears. Their age ranged between 6 and 14 years. The male to female ratio was 1.3 : 1.

An informed consent was obtained from all patients and IRB approval was obtained.

Specimens were collected throughout the year, but the majority of them were obtained during the Hajj period.

Three sterile swabs were used to obtain aural discharge from each discharging ear. One was used for the detection of RSV by direct immune-fluorescence using the IMAGEN RSV test according to the manufacturer's procedure, the second was used to prepare a direct film with Gram's stain, and the last was used for isolation and identification of aerobic bacterial pathogens.

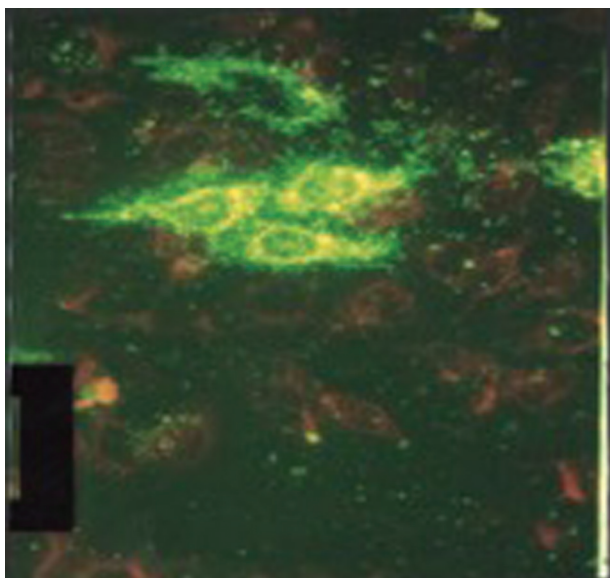
The IMAGEN RSV test includes monoclonal antibodies conjugated to fluorescein isothiocyanate. The conjugated antibodies bind specifically to viral antigens present in all strains of human RSV. The reagent is used in a one-step direct immunofluorescence technique. Fig. 1 shows the immunofluorescence of the virus.

Statistical analysis using IBM SPSS 22 for Mac statistical software was used to analyze the results.

**Results**

There was no statistically significant difference between males and females or age predilection.

Figure 1



Virus immunofluorescence (green fluorescence).

RSV was present in around 70% of specimens examined, of which 57% also had bacterial infection. Fig. 2 shows the prevalence of bacterial and viral infections of the specimens obtained.

Bacteriological examination and culture showed a higher prevalence (48%) of *Proteus mirabilis* among other causative organisms as indicated in (Fig. 3).

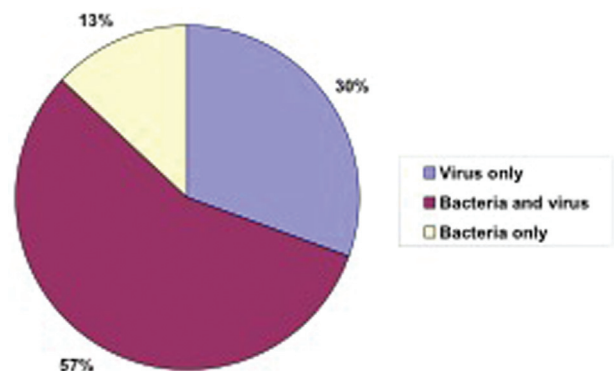
Analysis of the incidence of coinfection between RSV and bacteriological strains showed a highly statistically significant correlation between RSV and *P. mirabilis* infection as shown in (Table 1).

**Discussion**

Increasing resistance to antibiotics together with emerging virulent strains could be partially responsible for the failure or prolonged treatment of otitis media in pediatric age groups.

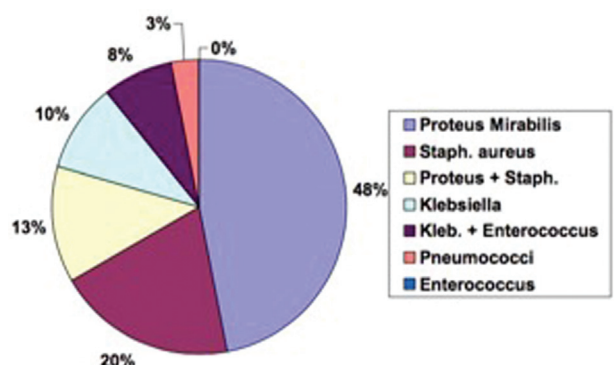
RSV is the major cause of lower respiratory tract disease in infants and young children, causing seasonal epidemics of respiratory illness each year [6].

Figure 2



Viral and bacterial prevalence.

Figure 3



Bacteriological prevalence.

**Table 1 Correlation between respiratory syncytial virus and bacterial strains**

Bacteria	RSV (+) [n (%)]	P value	Significance
<i>Proteus mirabilis</i>	19 (48)	<0.001	HS
<i>Staphylococcus aureus</i>	8 (20)	>0.05	NS
<i>P. mirabilis</i> + <i>S. aureus</i>	5 (13)	>0.05	NS
<i>Klebsiella</i>	4 (10)	>0.05	NS
<i>Klebsiella</i> + Enterococcus	3 (8)	>0.05	NS
Pneumococci	1 (3)	>0.05	NS
Enterococcus	0 (0)	>0.05	NS
Total	40 (100)		

RSV, respiratory syncytial virus.

Klein and colleagues [7–9] reported that RSV was predominant in the middle ear and detected middle ear discharge in 46% of the children studied.

*P. mirabilis* is a gram-negative, rod-shaped bacterium that can be found as part of the micro flora in the human intestine. This organism is not usually a pathogen, but does become a problem when it comes into contact with urea in the urinary tract. From there, infection can spread to other parts of the body [10].

Van Hasselt and colleagues [11,12] reported that the most common bacterial etiologic agents were *Pseudomonas aeruginosa* 26% and proteus 21%. This may indicate the important role played by enterobacteria in OM in developing countries because of low standard and poor hygiene condition.

Also, Philip and Brunell [8] reported that the isolation of a viral agent with a bacterium tended to make these more resistant to antibacterial therapy.

All the previously mentioned studies are consistent with our work, which emphasizes the importance of an RSV survey among pediatric patients together with demonstration of emergent uncommon pathogenic organisms such as *P. mirabilis*.

## Conclusion

Evolution of new organisms causing acute otitis media, such as *P. mirabilis*, together with a higher incidence of coinfection with RSV that might have a cause–effect relationship, as shown in our study, warrants further multicenter studies to validate these results.

Development of an RSV vaccine might help prevent pediatric acute otitis media especially in low standard or highly infectious communities like what happens during pilgrimage season.

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## Conflicts of interest

There are no conflicts of interest.

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