

Patterns of antibiotic use, microbiology and antimicrobial susceptibility in pediatric complicated upper respiratory tract infections

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Introduction

Bacterial upper airways diseases are found to be the most common reason for ambulatory antibiotic use [4]. It is known that pathogens and their antimicrobial susceptibility tend to change with time and may have regional differences. Furthermore, some recent studies have found that 30-50 % of ambulatory antibiotic use due to upper airways diseases were unnecessary [2; 3]. This endangers that accepted standards of care will not meet the current therapeutic needs, thereby local monitoring is required.

A number of children tend to have recurrent bacterial infections of upper airways as a consequence of primarily viral upper respiratory tract infection (URTI). Recurrent bacterial complications of URITs increase treatment volume including antibiotic use and cause significant economical loss for family and society [1].

Thus, the study **objectives** were to investigate regional etiological features of URTI complications and antimicrobial susceptibility of causative bacteria.

Materials and methods

Total: * 214 children (6.0 (3.7; 12.0) years) with primarily viral URITs complicated with acute otitis media (AOM) or acute bacterial rhinosinusitis (ARS);

Study groups: * The **main** group - 86 children with recurrent course of AOM / ARS (4 or more episodes during per year); * The **comparison** group - 128 children with lower rate of AOM and/or ARS.

Investigation key points: * Preceding patterns of antibiotic use; * Nasopharyngeal secretions / middle ear exudates bacteria isolates and antimicrobial susceptibility.

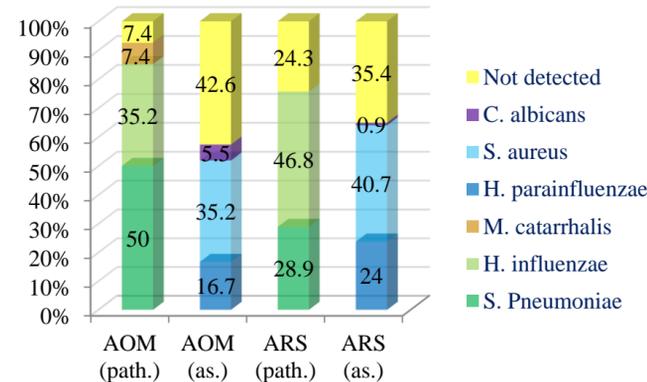
Statistical significance level – 5 %.

Results

In the current episode of URTI AOM as consequence of primary viral disease occurred in 31.8 % of children; ARS – in 68.2 % of children.

The proportions of pathogenic and associated bacteria isolates are reflected in **Figure 1:**

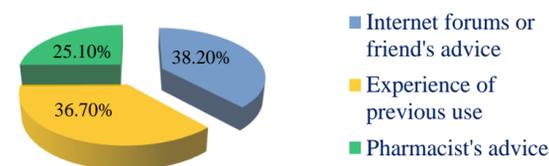
Figure 1. The proportions of pathogenic and associated bacteria, %



In children with recurrent versus episodic bacterial complications of URITs the following differences were found.

* **Higher rate of antibiotic use without a prescription:** 2.0 (0.0; 2.3) times vs. 0.0 (0.0; 1.0) times a year ($p < 0.0001$). 100.0 % of parents in I group practiced self-prescription of antimicrobials for their child vs. only 25.8 % in II group ($p < 0.0001$) (**Figure 2**).

Figure 2. Sources of information for self-prescription



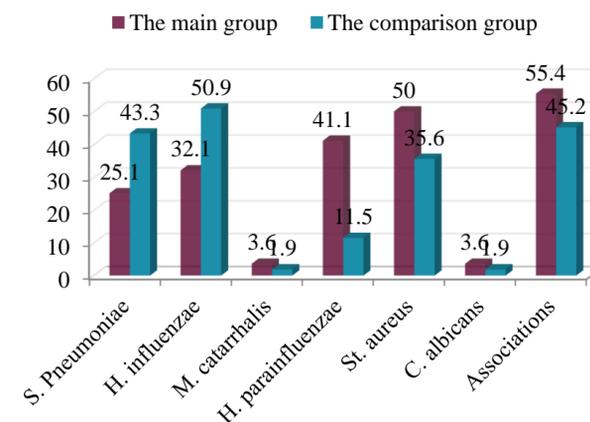
* **Lower proportion of successfully isolated**

bacterial pathogens. Bacteria were detected in 65.1 % of cases in the main group and in 81.3 % of cases in the comparison group ($p = 0.008$). Measured totally, failure rate of microbiological testing in the study was standard and accounted to 26.5 % in AOM, 24.5 % in ARS.

* **Lower rate of *Streptococcus pneumoniae* and nontypeable *Haemophilus influenzae* (pathogenic bacteria), and higher rate of *Haemophilus parainfluenzae* and *Staphylococcus aureus* (non-causative or associated agents) isolates (**Figure 3**).**

Higher percentage of cultures demonstrated gross growth of non-causative bacteria isolates in absence of the pathogenic bacteria was observed in the main group: 21.1 % in AOM and 48.7 % in ARS versus 0.0 % and 12.33 % in the comparison group respectively ($p < 0.01$). Associations of two non-causative bacterial agents were obtained only in the main group.

Figure 3. Frequency of causative and non-causative bacteria in study groups, %



* **Lower ampicillin susceptibility** of *S. pneumoniae* and *St. aureus* strains (88.2 % and 86.7 % vs. 97.1 % and 91.7 % in the comparison group respectively, $p < 0.05$).

Conclusions

* Etiology of postviral AOM and ARS in the Dnipropetrovsk region (Ukraine) generally corresponds to global trends. In general pediatric population pathogens are highly sensitive to first-line and second-line antibiotics. Amoxicillin expected effectiveness is 90.3 % in AOM and 98.4 % in ARS in children with low frequency of respiratory bacterial infections.

* Recurrent bacterial complications of URITs are associated with increased use of systemic and topical antimicrobials, including use without medical prescription; consequently, causative bacteria and mucosal co-agents have a higher level of amoxicillin resistance. Amoxicillin expected effectiveness is 80.0 % and 94.7 % respectively in AOM and ARS in children with high frequency of respiratory bacterial infections.

* All the foregoing substantiates the need for further regular microbiological monitoring in these children as they have strong preconditions for bacterial antibiotic resistance upsurge.

Literature cited

- Arguedas A., Kvaerner K., Liese J. et al. 2010. Otitis media across nine countries: Disease burden and management. *International Journal of Pediatric Otorhinolaryngology* 74(12):1419-24
- Grossman Z., del Torso S. et al. 2012. Antibiotic prescribing for upper respiratory infections: European primary paediatricians' knowledge, attitudes and practice. *Acta Paediatrica* 101(9):935-40.
- Hersh A.L., Fleming-Dutra K.E. et al. Frequency of first-line antibiotic selection among US ambulatory care visits for otitis media, sinusitis, and pharyngitis. 2016. *JAMA Internal Medicine* 176(12):1870-1872.
- Mehrotra A., Linder J.A. Tipping the balance toward fewer antibiotics. 2016. *JAMA Intern Med.* 176(11):1649-1650.