

THE INCIDENCE AND ANTIBIOTIC RESISTANCE OF BACTERIA INVOLVED IN RESPIRATORY TRACT INFECTIONS IN ARGES POPULATION IN 2016-2017

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Abstract

Respiratory tract infections are often caused by a lot of pathogens, which have to overcome host defences; they can be viral, bacterial or fungal infections. Some of pathogens adhere to mucosal epithelial cells or produce enzymes to destroy specific tissue. Upper respiratory tract infections are usually mild infections, but lower respiratory tract infections can determine significant morbidity, even mortality.

The aim of this paper was establish the incidence and antibiotic resistance of bacterial pathogens involved in upper respiratory tract infections in 2016 - 2017 in Arges population. Were investigated 539 subjects and the antibiogram was performed for bacterial strains isolated from nasopharyngeal cavity.

The most frequent bacteria were *S. aureus* and 20% from all strains were resistant to methicilline. The next pathogen, *Str. pyogenes*, was sensitive to penicillin and *Str. pneumoniae* strains were sensitive to all tested drugs.

The staphylococcal and streptococcal infections were more frequent in man than in women, for children under 15 years and adults over 50 years.

The main concern of medical world and entire population regarding the causes of respiratory tract infection still is the staphylococcus and its antibiotic resistance, but the streptococcal infections are important, too.

Keywords: respiratory tract infections, antibiotic resistance, staphylococcus.

1. INTRODUCTION

Respiratory tract infections are often caused by viruses and bacteria. These infections usually determine mild morbidity on upper respiratory tract and occur both in children and adults (Cotton et al., 2008).

The upper respiratory tract has a complex microbial community, with commensals and potential pathogenic bacteria, with synergistic and competitive interactions. The nasopharyngeal microbiome play a major role for the human host and its imbalance admits the colonization with viral or bacterial pathogens, by a dynamic process (Bosch et al., 2013).

The common bacterial pathogens for respiratory tract infections are *Staphylococcus aureus*, *Streptococcus pyogenes*, *Streptococcus pneumoniae*. Also, some respiratory infections can be determined by *Mycobacterium tuberculosis*, *H. influenza*, *Mycoplasma spp.* and *Corynebacterium spp.*

Bacterial pathogens could occur in bacterial complications of viral infections, like otitis media and acute sinusitis.

Because the therapeutically choice depends on etiological agents of infections, the specialists need to know about the viral or bacterial nature of disease. The laboratory tests can contribute to establish the type of infection and, if it is bacterial one, the antibiotic resistance can be indicated. The treatment of respiratory tract infections includes the correct use of antibiotics in terms of the nature of pathogen and presence or absence of complications.

2. MATERIALS AND METHODS

The samples were collected from 539 patients, male (249 patients) and female (290 patients), children and adults, as suspected cases of bacterial respiratory tract infections, during 10 months, in Arges county.

The samples were represented by nasal swab and throat swab. The bacterial cultures were obtained on solid specific media and the bacterial strains were identified.

Clinical samples were cultivated on a blood agar medium and Chapman medium and were incubated on 37°C for 24 hours. The staphylococcus strains produce on these media colonies with certain morphology (. Gram stain, catalase test and latex-agglutination test were performed for identification of *Staphylococcus aureus*.

On the blood agar medium the streptococcus colonies were evaluated by morphology (small, white, with beta-hemolysis. The identification of *Streptococcus* spp. (A group or *Str. pneumoniae* strains) was performed by bacitracin test, optochin test, bile solubility test and agglutination test.

For all *Staphylococcus aureus* strains and *Str. pneumoniae* strains the antibiogram was effectuated. The antibiotic susceptibility of bacterial strains was established by standard disk diffusion method. The Mueller-Hinton agar plates were used. The isolated bacterial strains (bacterial suspension in nutrient broth) were homogenous placed onto the medium surface, and then the antibiotic disks were setup. The plates were incubated at 37°C for 24 hours. The growth inhibition zones were measured and the results were explained as sensitivity, intermediate sensitivity or resistance, according to CLSI standards. During the study, the staphylococcus strains were tested for resistance to methicilline, too.

3. RESULTS AND DISCUSSIONS

Among 539 cases of potential respiratory tract infections investigated in our study, 11% (57 cases) were confirmed as bacterial infections (Figure 1).

The most frequent pathogen was *Staphylococcus aureus* (70% from positive cases), next pathogens were *Streptococcus pyogenes* and *Streptococcus pneumoniae* (Figure 2).

Even some bacterial species occur in nasopharyngeal cavity under healthy conditions (Bosch et al., 2013), they interact with other bacteria and can due to respiratory disease.

Our study reveals the presence of three etiological agents in respiratory diseases, more frequent in children (14.04%) than in adults, some cases were registered for elder patients (over 50 years).

The incidence of upper respiratory tract infections was higher for man than for women (Figure 4), but proportions fluctuated for different age groups and for different etiologic agents of disease.

The results of antibiogram test showed the methicillin - resistant phenotype of *Staphylococcus aureus* in 20% of cases, while 80% of staphylococcus strains were sensitive to oxacillin and cefoxitin (this method being the best predictor of methicillin resistance in *S. aureus* - Velasco et al., 2005).

For *Streptococcus pyogenes* strains the most adequate antibiotic is still penicillin, because the bacteria are sensitive to this antimicrobial agent, especially in acute pharyngitis (Hirschmann, 2002).

The *Str. pneumoniae* strains were tested to oxacillin, erythromycin, clarithromycin, levofloxacin and were sensitive to all tested antimicrobial agents.

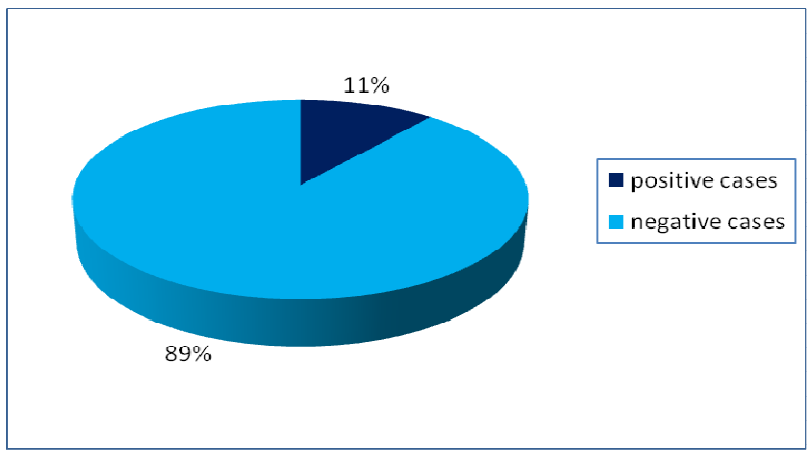


Figure 1. The incidence of respiratory tract infections

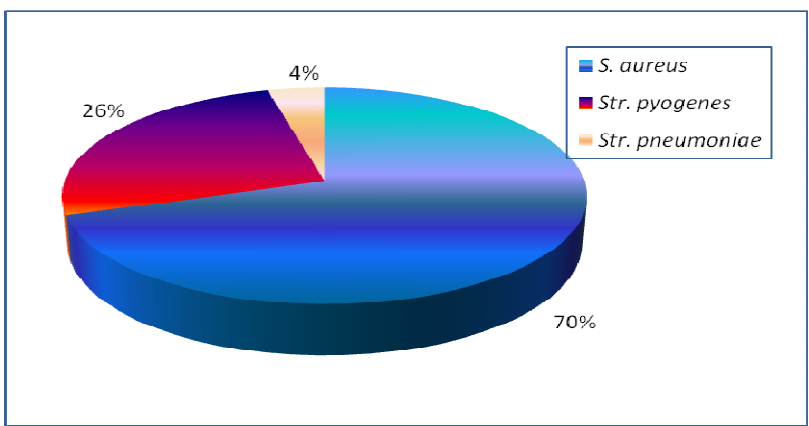


Figure 2. The incidence of etiologic bacterial agents in respiratory diseases

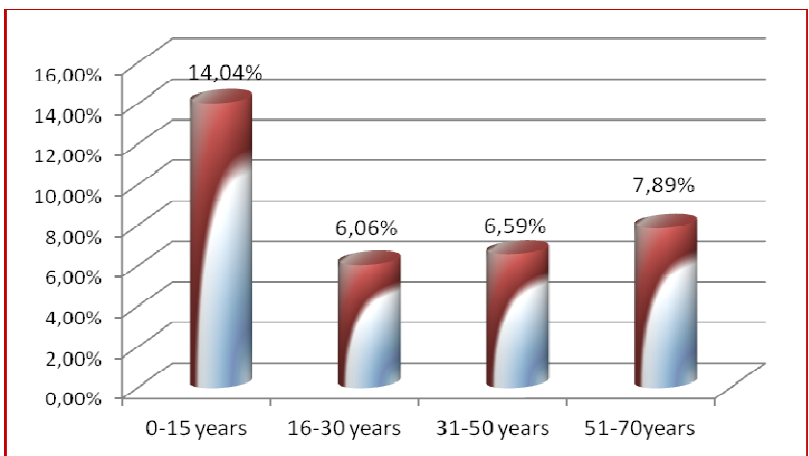


Figure 3. The incidence respiratory diseases by age groups

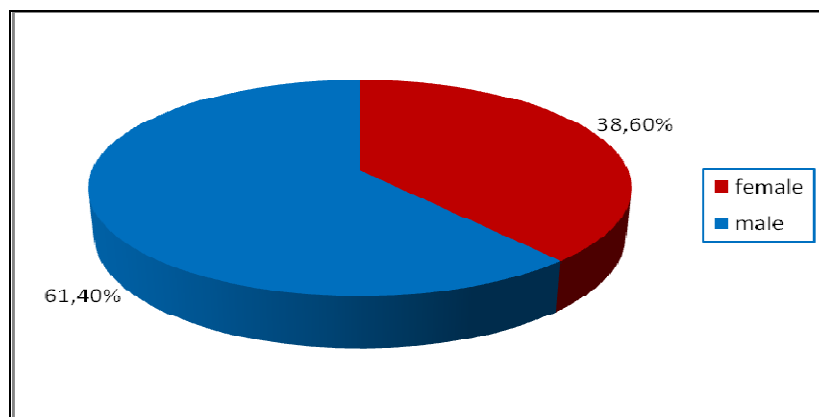


Figure 4. The incidence respiratory diseases by gender

4. CONCLUSIONS

The incidence of respiratory tract infections in this study was 11%, higher in man than in women (61.4%, respectively 38.6%), with some variations for age groups.

The incidence of these diseases by age group revealed higher values for children under 15 years and for adults over 50 years.

For isolated *Staphylococcus aureus* strains the sensitivity to methicillin was 80%, the *Streptococcus pneumoniae* strains was sensitive to all tested antimicrobial drugs.

The major concern of medical personnel is the asymptomatic carriers of group A streptococci and the antibiotic resistance of *Staphylococcus aureus* strains. These two species are common inhabitants of upper respiratory tract and they often cause acute infections.

5. REFERENCES

- Cotton, M.F., Innes, S., Jaspan, H., Madide, A., Rabie, H. (2008). Management of upper respiratory tract infections in children. *S Afr Fam Pract*, 50(2), 6–12.
- Bosch, A., Biesbroek, G., Trzcinski, K., Sanders, E., Bogaert, D. (2013). Viral and Bacterial Interactions in the Upper Respiratory Tract. *PLOS Pathogens* 9(1), 1-12. e1003057.
- Hirschmann, J.V (2002). Antibiotics for common respiratory tract infections in adults. *Arch Intern Med*, 162(3), 256-264. doi:10.1001/archinte.162.3.256.
- Velasco, D., Tomas, M., Cartelle, M., Beceiro, A., Perez, A., Molina, F., Moure, R., Villanueva, R., Bou, G. (2005). Evaluation of different methods for detecting methicillin (oxacillin) resistance in *Staphylococcus aureus*. *Journal of Antimicrobial Chemotherapy*, 55(3), 379–382. <https://doi.org/10.1093/jac/dki017>.