# Analysis of nasal and pharyngeal microbiological isolates collected in 2023 in Hospital Trakia – Stara Zagora

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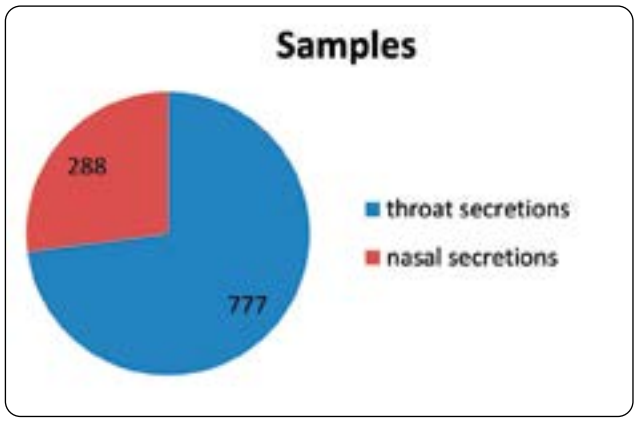
**Abstract**
**Research aim:** Microbiological investigations for ear, nose and throat infections are common in practice. They facilitate a more precise antibiotic therapy for an optimal antibacterial effect. Our research aim is to determine the etiological structure and antibiotic resistance of isolates collected in Medical Centre and Hospital Trakia – Stara Zagora over a period of one year.
**Material and methods**: Information about the etiological structure and antibiotic resistance of isolates in patients from Medical Centre and Hospital Trakia – Stara Zagora was collected and analyzed over a period of one year. Samples from the pharyngeal and nasal areas, perinasal cavities, ear secretions, as well as peritonsillar and other abscesses were tested in a microbiological lab.
**Results**: From the positive microbiological materials, the isolates *S. aureus* and *S. pneumoniae* were found to play a key role. The results from the etiological structure of ENT infections and their resistance to antibacterial drugs administered to inpatients were compared to the results obtained from outpatients.
**Conclusions**: Considering the wide use of antibacterial drugs and the growing antibiotic resistance, the microbiological investigation and monitoring of antibiotic sensitivity of local strains has acquired a greater significance that contributes to the treatment outcome and the health policy in the region.
**Key words**: microbiology, antibiotic resistance, otorhinolaryngology.

## Introduction

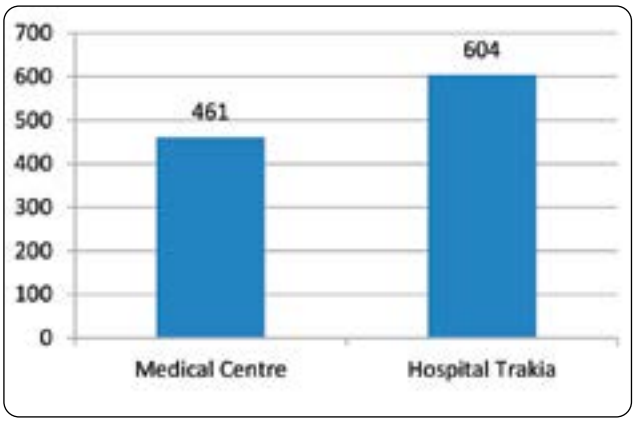
Nose and throat diseases are some of the most prevalent and their treatment commonly involves the use of antibacterial drugs. A number of viruses play a key role, with *Streptococcus pneumoniae, Moraxella catarrhalis* and *Haemophilus influenzae* being the most common pathogenic bacteria. According to literature, 20% of all cases reveal pure viral infection, while 65% include a co-infection with bacterial pathogens [1].

## Material and methods

Over a period of one year (2023) a total of 1065 samples from throat and nasal secretions were obtained and investigated at Medical Centre and Hospital Trakia – Stara Zagora.



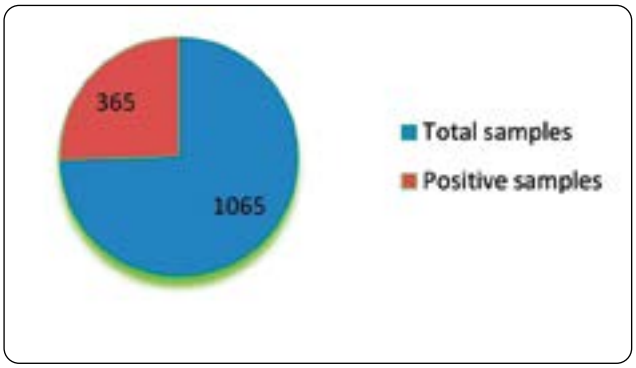

*Pharyngeal secretions – 777*
*Nasal secretions –288*




*Samples from Medical Centre Trakia Stara Zagora – 461*
*Samples from Hospital Trakia Stara Zagora – 604*

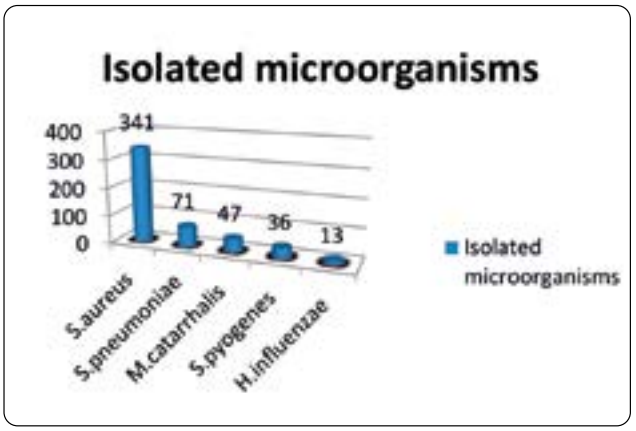
## Results

Out of the 1065 investigated samples, positive results were found in 365 (34%) of all cases. More than one microorganism was discovered in several of the samples.




The most common isolated microorganisms were:

***S. aureus*** – 341 (93%), ***S. pneumoniae*** **–** 71 (19%), ***M. catarrhalis*** – 47 (13%), ***S. pyogenes*** – 36 (10%), ***H. influenzae*** – 13 (4%)




The following pathogens were more rarely isolated:

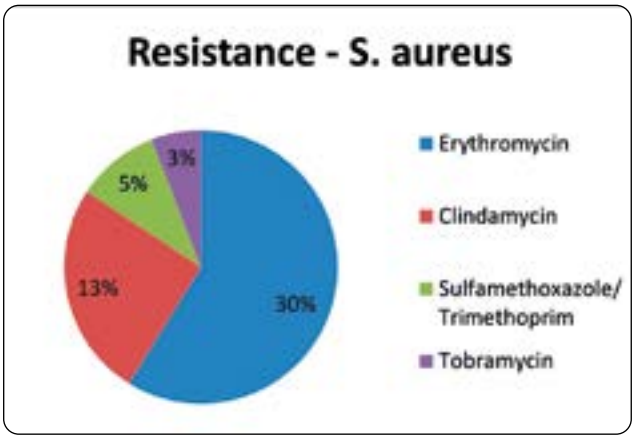
*K. pneumoniae* – 4, *P. aeruginosa* – 3, *Candida glabrata* – 1, *C. freundii* - 1

The isolates were tested against different antibiotics:

***S. aureus***

Tested against: Cefoxitin, Erythromycin, Clindamycin, Moxifloxacin, Teicoplanin, Rifampin, Linezolid, Tobramycin and Amikacin.

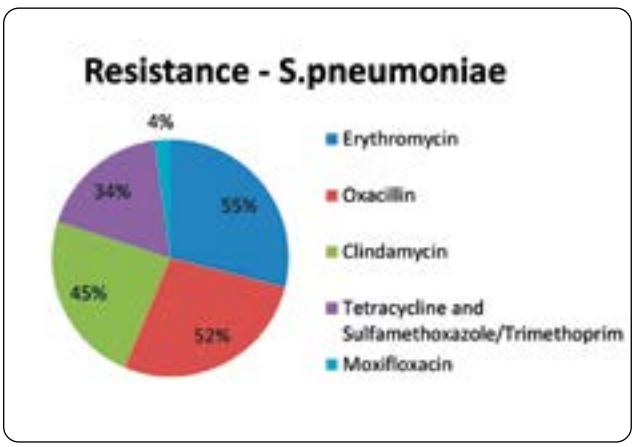
The causing agent was isolated in 341 (93%) of the tested samples and showed highest levels of resistance to Erythromycin – 100 (30%), followed by resistance in 43 of the samples (13%) to Clindamycin, 17 (5%) to Sulfamethoxazole/Trimethoprim, and 3% to Cefoxitin and Tobramycin.




***S. pneumoniae***

The isolated microorganisms were tested against Oxacillin, Erythromycin, Clindamycin, Tetracycline, Teicoplanin, Sulfamethoxazole/ Trimethoprim, Moxifloxacin, Rifampin.

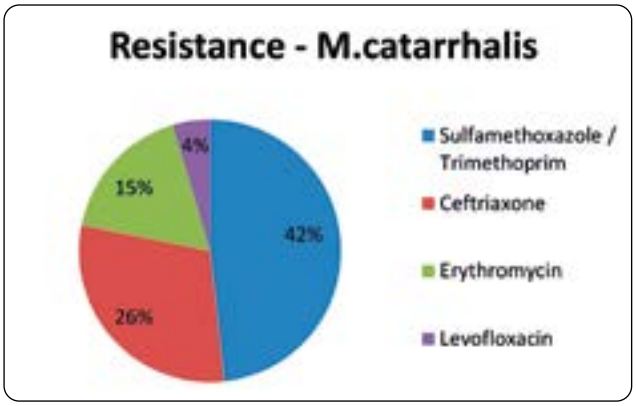
The causing agent was isolated in 71 (19%) of the tested samples. Here the highest levels of resistance were observed in Erythromycin in 39 (55%) of the samples, followed by resistance against Oxacillin 37 (52%), Clindamycin 32 (45%), Tetracycline and Sulfamethoxazole/Trimethoprim 24 (34%) and Moxifloxacin 3 (4%).



### *M. catarrhalis*

The isolated microorganisms were tested against: Amoxicillin/Clavulanic acid, Tetracycline, Levofloxacin, Cefixime, Cefuroxime, Ceftriaxone, Erythromycin and Sulfamethoxazole/Trimethoprim.

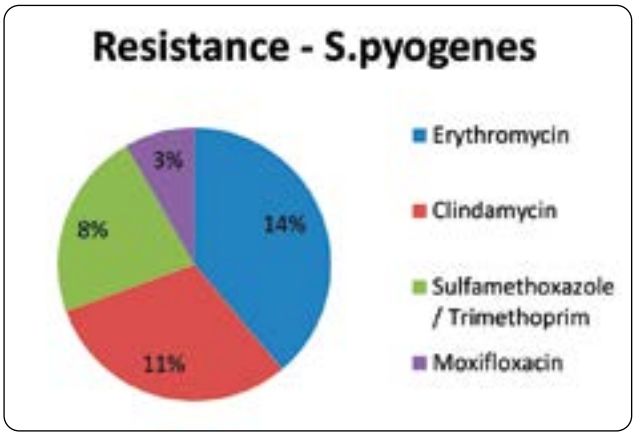
The causing agent was isolated in 47 (13%) of the tested samples. Resistance was found against Sulfamethoxazole/Trimethoprim in 20 (42%), Ceftriaxone 12 (26%), Erythromycin 7 (15%), Levofloxacin 2 (4%).




### *S. pyogenes*

The strains were tested against: Erythromycin, Clindamycin, Tetracycline, Penicillin, Teicoplanin, Sulfamethoxazole/Trimethoprim, Moxifloxacin and Rifampin.

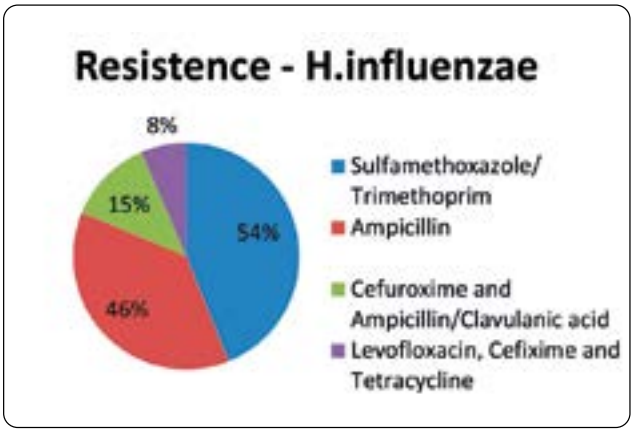
The causing agent was isolated in 36 (10%) of the tested samples. The following levels of resistance were found: Erythromycin in 5 (14%), Clindamycin 4 (11%), Tetracycline and Sulfamethoxazole/Trimethoprim 3 (8%), Moxifloxacin 1 (3%).




### *H. influenzae*

The isolated strains were tested against: Ampicillin, Amoxicillin/Clavulanic acid, Cefixime, Cefuroxime, Tetracycline, Levofloxacin and Sulfamethoxazole/Trimethoprim.

They were isolated in 13 (4%) of the samples – only from nasal secretion. The following data for resistance against the tested antibiotics were found: Sulfamethoxazole/Trimethoprim in 7 (54%), Ampicillin – 6 (46%), Cefuroxime and Ampicillin/Clavulanic acid – 2 (15%), Levofloxacin, Cefixime and Tetracycline – 1 (8%).




## Discussion

The smaller number of investigations over one-year period – 1065 is notable, compared to the previous year 05.2016 – 05.2017 in the same Medical Centre and Hospital, when the studied cases were 2135, showing 50% fewer tested samples. In spite of the lower number of tested materials, the percentage of isolated microorganisms are retained among 35–40% of the samples. The spectrum of isolated microorganisms remains the same, as *S. aureus* preserves its leading position and it is found in the highest percentage of the samples; even the present study shows that the share of *S. aureus* has grown from 68% to 93% of the isolated materials. It is remarkable that the highest levels of resistance of *S. aureus* to macrolides are preserved in 25-30% of all cases [2, 3]. The resistance of *S. pneumoniae* retains its high levels to Erythromycin, Oxacillin, Clindamycin, Tetracycline and Sulfamethoxazole/Trimethoprim. M. Catarrhalis maintains high levels of resistance to Sulfamethoxazole/Trimethoprim,

and in ¼ of all cases to III[rd] generation cephalosporins. *S. pyogenes* still holds a low level of resistance to antimicrobial drugs, as it remains highest to macrolides ranging between 14 and 17%. Macrolides are not indicated for *H. influenzae*, which has an innate mechanism of active efflux, determining a congenital resistance to it. Here, more appropriate will be Cefuroxime and Ampicillin/ Clavulanic acid, due to the high levels of resistance to Sulfamethoxazole/Trimethoprim and Ampicillin in almost half of the cases.

The trends in antibiotic resistance are such that quinolones still show the lowest levels of resistance, whereas the macrolides reach the highest. Considering the wide use of antibacterial

drugs and the growing antibiotic resistance, the microbiological testing and monitoring of the antibiotic sensitivity to the local strains has acquired a particularly high importance for the treatment outcome. The found local data on resistance in our study are valuable for the choice of antibiotic therapy, and the routine monitoring may change the therapeutic approach and facilitate the development of strategies for control on resistant strains.

## Conclusions

- The lower degree of verification and precision in the choice of AB could lead to a worse judgement about the correct choice of AB.
- For this period, the role of *S. aureus* is essential. During the previous study, the most common isolated pathogens were *S. pneumonia*e and *H. influenzae.*
- The resistance to macrolides was significant in *S. aureus, S. pneumonia*e and *S. pyogenes.*
- High resistance to Sulfamethoxazole/ Trimethoprim was observed in *H. influenzae* and *M. catarrhalis.*

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