ORIGINAL ARTICLE

Pathogenic Microbiological Flora Recovered From Ear, Nose And Throat Specimens In A Regional Hospital In Kosovo

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Abstract

Background: *to investigate the recovery of pathogenic bacteria, fungi and parasites isolated from ear, nose and throat specimens in large population group in a secondary health care institution.*

Methods: *retrospective study, results of all microbiologic cultures submitted from the outpatient clinic of a large, secondary health care practice, for the time period January 2001 until December 2005 were identified from a microbiologic specimen database. The results from these cultures were entered into a database, tabulating site from which the culture was taken, from whom the material was sent and the type of organism recovered.*

Results: *from a total of 17 362 specimens, 88% results in the normal bacterial flora. Remaining 12% were pathological bacterial, fungal and parasite flora: 1218 from ear specimens, 376 from nose and 474 from throat specimens. In 40% of cases material was sent by primary health care provider, in 52% of cases material was taken during systematic screening and only in about 8% the material was sent from an ENT specialist. the most frequent pathogens isolated from ear specimens are Staphylococcus saprophiticus and aureus, 24.6 and 17.7%, followed by Pseudomonas auriginosa in 13.2%; from nose specimens the most often isolated pathogenic bacteria is Staphylococcus aureus in 52.4%, Streptococcus spp. in 16% and Branhamella in 13% of nose specimens. From the throat specimens Staphylococcus aureus in 48.7%, Enterococcus in 13.3%, Streptococcus β-haemolyticus gr. A in 11.8% and Streptococcus β-haemolyticus gr. B in 8.4% of cases.*

Conclusions: *Staphylococcus spp, Pseudomonas, Escherichia and Streptococcus spp. are leading pathogens from ear, nose and throat specimens, so further investigation on appropriate antibiotics use and bacterial resistance will be welcome.*

KEY WORDS: *microbiology flora, pathogenic bacteria and fungi, ear and nose and throat specimens*

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Introduction

Antimicrobial agents play an important role in the therapy of many otolaryngologic disease processes. Otolaryngologists are frequently called upon when infectious disorders of the ear, nose and throat become chronic or standard first-line antibiotics fail. Therefore, the data described here primarily reflect experience with chronic conditions and refractory acute infections within the head and neck.[1]

Developments and refinements in antibiotic therapy have allowed the medical management of many infectious conditions within the head and neck earlier treated by surgical therapy. Antimicrobial therapy is now considered first line treatment not only for acute infections of the head and neck but also for chronic conditions such as chronic rhinosinusitis, otitis media with effusion and suppurative chronic otitis.[2]

The goal of this study is to investigate the recovery of pathogenic bacteria, fungi and parasites isolated from ear, nose and throat specimens in large population group, as out-patient and in-patients, analyzed in the Microbiology Laboratory of Regional Hospital of Gjilan, Kosovo, one of the five regional hospitals operating in Kosovo, with a population of approximately 2.5 million inhabitants. This medical institution covers a region inhabited of approximately 500.000 inhabitants.

Matherial and Methods

All microbiologic cultures submitted from the outpatient and in-patient based large, secondary health care practice, for the time period January 2001 until December 2005 were identified from a microbiologic specimen database. The results from these cultures were entered into a database, tabulating who sent the material, site from which the culture was taken and the type of organism recovered. Positive bacterial cultures were further categorized into groups based on their Gram staining criteria. The site of culture was segregated into groups, ear, nose/paranasal sinuses and throat. Antibiogram on available antibiotics is not investigate in this study. The antimicrobial resistance in this series needs further research.

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Results

There was a total number of 17 362 specimens taken from ear, nose and throat. As is shown in **table I**, from total number of specimens, in 88 % is isolated normal flora, than only in 12 % an pathogenic microorganism is isolated. Ear specimens presents only 13 %, but among ear specimens there were 51 % of pathogenic flora isolated. Nose specimens presents 39 % of total number, with pathogenic flora isolated only in 5.5 %. Finally, throat specimens presents the larger group, 48 % of all specimens, with pathogenic flora in about 6 % of specimens isolated.

The **table II** shows who sent the material for microbiology exam. In 40 % of cases material was sent from out-patient clinics (ENT, general practitioner, paediatric clinics, etc.), in 52 % of cases material was taken during systematic screening (school attendants, hotels and restaurants employers, etc) and only in about 8 % the material was sent from in-patient based medical institutions.

In the **table III** is shown the range of pathogenic flora isolated from ear specimens: the most frequent pathogen isolated are *Staphylococcus saprophiticus* and *Staphylococcus aureus*, 24.6 and 17.7 %, followed by *Pseudomonas auriginosa* in 13.2 %. The reason of the higher prevalence of *Staphylococcus* is that external otitis is very frequent during summer season. The fungal forms Candida and Aspergillus are in the end of the range.

From nose specimens, the most often isolated pathogenic bacteria is *Staphylococcus aureus* in more than a half of specimens (52.4 %). *Branhamella catarrhalis* is recovered in 13 % of nose specimens, *Streptococcus* species are isolated altogether in 16 % of cases (8 %, 4.2% and 3.7 % respectively). (**Table IV**.)

In the following **Table V** the results of recovered pathogenic flora from throat specimen are ranged. *Staphylococcus aureus*, as in the nose specimens, is the most often recovered bacteria in the about the half of isolates. *Enterococcus* is the second on the range, with 13.3 of cases. The third are *Streptococcus β-haemolyticus gr.A* in 11.8 of cases and *Streptococcus β gr.B* in 8.4 % of cases.

In the **Table VI** are shown the results of all pathological specimens. Leading pathogens are *Staphylococcus aureus* and *saprophiticus* in 47.3% of cases, *Pseudomonas* in 8%, *Escherichia colli* in 5.8 % and *Streptococcus β-haemolyticus gr. A* in 5.5% of cases.

In the last **Table VII**, the distribution of bacteria by categories and type is shown. Gram positive presents the largest group in this series, 64.7 %, Gram negative bacilli presents 29.3%, Gram negative cocci (Branhamella) 2.4%, parasites (Giardia) 1.3% and fungal forms 0.7%.

Table I. Microbiology specimens taken from ear, nose and throat for period 2000-2005 in the Gjilan Regional Hospital, Kosovo

Material taken from:	Normal flora Nr.	%	Pathologic flora Nr.	%	Total Nr.
Ear	1512	62.2 %	918	37.8 %	2430 14 %
Nose	6484	94.9 %	346	5.1 %	6830 39.3 %
Throat	7636	94.2 %	466	5.8 %	8102 46.7 %
Total	**15632**	**90 %**	**1730**	**10 %**	**17362**

Table II. Who sent the material for exam

	Nr.	**%**
Out-patient clinics	4641	40 %
In-patient clinics	912	7.8 %
Systematic screening	6115	52.2 %
Total	11668	100 %

Table III. The range of pathologic flora isolated from of the ear specimens

Type of pathogen	**Nr.**	**%**
Staphylococcus aureus	216	23.5 %
Pseudomonas aeuroginosa	161	17.5 %
Escherichia colli	106	11.5 %
Proteus mirabilis	71	7.8 %
Enterobacter	69	7.5 %
Citrobacter	57	6.2 %
Acinetobacter	44	4.8 %
Proteus vulgaris	37	4 %
Klebsiella pneumoniae	30	3.3 %
Streptococcus β-haemolyticus gr. A	28	3 %
Streptococcus pneumoniae	28	3 %
Enterococcus faecalis	27	2.9 %
Streptococcus β-haemolyticus gr. B	19	2.1 %
Candida albicans	11	1.2 %
Alcaligenes faecalis	4	0.4 %
Streptococcus faecalis	3	0.3 %
Morganella	3	0.3 %
Aspergillus flava	2	0.2 %
Aspergillus nigger	2	0.2%
Total	**918**	**100 %**

Table IV The range of pathogens isolated from nose specimens

Type of pathogen	Nr.	%
Staphylococcus aureus	197	57 %
Branhamella catarrhalis	49	14.2 %
Streptococcus β-haemolyticus gr. A	31	8.9 %
Streptococcus pneumoniae	16	4.6 %
Streptococcus β-haemolyticus gr. B	14	4 %
Proteus mirabilis	6	1.7 %
Proteus vulgaris	4	1.1%
Enterobacter	4	1.1 %
Enterococcus faecalis	4	1.1 %
Salmonella	4	1.1 %
Pseudomonas aeuroginosa	3	0.9 %
Acinobacter	3	0.9 %
Citrobacter	3	0.9 %
Escherichia colli	3	0.9 %
Klebsiella pneumoniae	2	0.6 %
Staphylococcus epidermidis	1	0.3%
Providentia vetgeri	1	0.3 %
Giardia lamblia	1	0.3 %
Total	**346**	**100 %**

Table V. The range of pathogens isolated from of the throat specimens

Type of pathogen	Nr.	%
Staphylococcus aureus	231	49.6 %
Enterococcus faecalis	63	13.5 %
Streptococcus β-haemolyticus gr. A	56	12 %
Streptococcus β-haemolyticus gr. B	40	8.6 %
Giardia lamblia	27	5.8 %
Escherichia colli	13	2.8 %
Enterobacter	9	1.9 %
Streptococcus pneumoniae	7	1.5 %
Citrobacter	4	0.8 %
Pseudomonas aeuroginosa	3	0.6 %
Proteus mirabilis	2	0.4 %
Klebsiella pneumoniae	2	0.4 %
Branhamella catarrhalis	2	0.4 %
Morganella	2	0.4 %
Streptococcus viridans	1	0.2 %
Providentia vetgeri	1	0.2 %
Salmonella	1	0.2 %
Proteus vulgaris	1	0.2 %
Acinobacter	1	0.2 %
Total	**466**	**100 %**

Table VI. The range of the isolated pathogens from ear, nose and throat specimens

Type of pathogen	Nr.	%
Staphylococcus aureus	644	37.2 %
Pseudomonas aeuroginosa	167	9.6 %
Escherichia colli	122	7 %
Streptococcus β-haemolyticus pyogenes	115	6.6 %
Enterococcus faecalis	94	5.4 %
Enterobacter	82	4.7 %
Proteus mirabilis	79	4.6 %
Streptococcus β-haemolyticus	73	4.2 %
Citrobacter	64	3.7 %
Branhamella catarrhalis	51	2.9 %
Streptococcus pneumoniae	51	2.9 %
Acinobacter	48	2.8 %
Proteus vulgaris	42	2.4 %
Klebsiella pneumoniae	34	2 %
Giardia lamblia	28	1.6 %
Candida albicans	11	0.6 %
Salmonella	5	0.3 %
Morganella	5	0.3 %
Alcaligenes faecalis	4	0.2 %
Streptococcus faecalis	3	0.2 %
Aspergillus flava	2	0.1 %
Aspergillus niger	2	0.1 %
Providentia vetgeri	2	0.1%
Staphylococcus epidermidis	1	0.06 %
Streptococcus viridans	1	0.06 %
Total	**1730**	**100 %**

Table VII. Distribution of isolated bacteria by category and type

Group and organism	Nr.
Gram positive cocci	
Staphylococcus aureus	644
Staphylococcus epidermidis	1
Streptococcus β-haemolyticus, group A	115
Streptococcus β-haemolyticus, group B	73
Streptococcus pneumoniae	51
Streptococcus faecalis	3
Streptococcus viridans	1
Enterococcus faecalis	94
Total	**982 (56.8%)**
Gram negative cocci	
Branhamella catarrhalis	51
Total	**51 (2.9%)**
Gram negative rods	
Pseudomonas auriginosa	167
Escherichia colli	122
Enterobacter	82
Proteus mirabilis	79
Proteus vulgaris	42
Citrobacter	64
Acinobacter	48
Klebsiella pneumoniae	34
Salmonella	5
Morganella morgani	5
Alcaligenes faecalis	4
Providentia vetgeri	2
Total	**654 (37.8%)**
Fungal forms	
Candida albicans	11
Aspergillus niger	2
Aspergillus flava	2
Total	**15 (0.9%)**
Parasite	
Giardia lambllia	28
Total	**28 (1.6%)**
Grand total	**1730 100%**

Discussion

Bacterial resistance appears to be an ever-increasing problem and is threatening to spiral out of control. The scare caused by the rapid spread of methicillin-resistant *Staphylococcus aureus* (MRSA) among hospitals is the most recent and it is causing growing concern. Otorhinolaryngology is deeply involved in this problem, as one of the reasons often cited for increasing bacterial resistance is the use of antibiotics in suspected bacterial infections in ear, nose and throat by primary care physicians. This speciality is also involved in the development of guidelines for antimicrobial use by primary and secondary care.[3,4] Antimicrobial resistance is a growing problem worldwide, requiring international approaches. The World Health Organization (WHO) and the European Commission have recognized the importance of studying the emergence and determinants of resistance and the need for strategies for its control. In European countries, antimicrobial resistance has been monitored in selected bacteria from humans since 1998 through the European Antimicrobial Resistance Surveillance System (EARSS). Funded by the European Commission, EARSS is an international network of national surveillance systems intended to collect comparable and reliable resistance data. The purpose of EARSS is to document variations in antimicrobial resistance over time and place and to provide the basis for and assess the effectiveness of prevention programs and policy decisions. Results of EARSS show that in Europe antimicrobial resistence of *Streptococcus pneumoniae* to penicillin is correlated with use of beta-lactam antibiotics and macrolides.[5] The mechanisms that produce bacterial resistance to antimicrobial agents include enzymatic inhibition, membrane impermeability, alteration of target enzymes, active pumping out of antibiotic and alteration of the ribosomal target.[6] Results of our study show that *Staphylococcus aureus* is most often isolated from ear, nose and throat specimens, but his resistence to meticillin and other antibiotics is not investigate, so further studies have yet to be done. *Streptococcus pneumoniae* is the fourth in the range and this may concern in further studies on bacterial resistence in Kosovo. In general, Gram positive cocci are the largest pathogen microbial population in this series, accounting for 64.7%, Gram negative bacilli presents 29.3%, Gram negative cocci 2.4%, parasites 1.3% and fungal forms 0.7%.

Even the most common problems in antibiotic treatment do not have simple solutions. Choosing an antibiotic drug from among several candidates (including no treatment) entails analysing the benefits and the detriments associated with each drug and balancing each one against the others. In this context, matching the in vitro susceptibility of the pathogen was associated with substantial advantagean advantage so great that the cost of the drug and side effects were rendered secondary considerations. However, the development of future resistance remained the major concern.[7]

Microbiology results from specific populations e.g. specimens taken during surgery from ears of children with acute mastoiditis , specimens from incision of peritonsillar abscess, neck deep infections or speciemens obtained during functional endoscopic sinus surgery (FESS) differs totally from results of specimens taken in out-patient based primary or secondary health care. Diferent authors found that *Streptococcus pneumoniae, Haemophilus influenzae* and beta-hemolytic *Streptococcus* are leading isolated

pathogens from patients with acute otitis media (AOM) and acute mastoiditis.[8,9] Results of specimens taken with FESS during endoscopic sinus surgery recovered *Streptococcus pneumoniae, Haemophilus influenzae* and *Moraxella catarrhalis* frequently.[10] In a retrospective study in 117 children that undergoes incision for peritonsillar and other deep neck abscesses, Staphylococcus aureus, beta-hemolytic Streptococcus as aerobes and Bacteroides melaninogenicus and Veillonella as anaerobes were most often recovered.[11]

The specimens for microbiology exam from ear, nose and throat presents the main method for choose of the appropriate antibiotic in cases when clinical evidence of bacterial infection exists. Althought in 88% of cases the normal microbiological flora is isolated, the use of antibiotics without previous microbiology exam presents the great risk for antimicrobial resistence development.

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