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Original Research Article

Recent trends in bacteriological and antibiogram profile of isolates from ear, nose and throat in a tertiary care hospital in coastal Karnataka

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ABSTRACT

Background: The objectives were to study the bacterial pathogens of ear, nose and throat (ENT), to determine the culture and sensitivity pattern of ENT infections in coastal Karnataka.
Methods: A retrospective culture and sensitivity profiling study of 109 samples from September 2018 to September 2019 was done in Department of ENT in KVG Medical College and Hospital.
Results: Among the pure growth, *Pseudomonas aeruginosa* was isolated in majority of samples (27.77%) followed by *Staphylococcus aureus* (22.9%). *Klebsiella* sp., *Acinetobacter* sp., *Citrobacter*, *Non enterococcus*, *Escherichia coli*, *Proteus* sp. and *Streptococcus pneumoniae* were responsible for remaining samples. Among *S. aureus* majority was MRSA accounting for 18.51%. *P. aeruginosa* was most sensitive to amikacin, ceftazidime, meropenem and piperacillin- tazobactam and least sensitive to cotrimoxazole and colistin and most resistant to sparfloxacin, cefaperazone-sulbactam, ceftriaxone-tazobactam and clindamycin. MRSA was most sensitive to gentamicin, amikacin and clindamycin and most resistant to cephalexin, ampicillin and ciprofloxacin. *Klebsiella* sp. was most sensitive to amikacin and cotrimoxazole and most resistant to sparfloxacin and ceftriaxone. *E. coli* was most sensitive to gentamicin and cotrimoxazole and most resistant to sparfloxacin.
Conclusions: *P. aeruginosa, S. aureus* and *Klebsiella* sp. represent majority of culture samples. With ever changing culture & sensitivity pattern and rising antibiotic resistance, a simple step of sending pus samples for the same will help in personalizing the treatment, thereby reducing the disease burden.

Keywords: ENT, Culture sensitivity, Changing pattern

INTRODUCTION

The ear, nose and throat (ENT) are closely related and are interconnected and are colonized by a wide range of microorganisms, some of which are more or less harmless under normal conditions.[1]

The ear, nose and throat come in contact with the physical environment directly and are exposed constantly to air borne microorganisms and therefore are frequent source of infection. These infections are one of the leading causes of significant morbidity and mortality in critically ill patients.[2]

The etiologies of ENT infections are varied and it may be bacterial, viral or fungal. The signs and symptoms may often mislead about the etiology of the disease. At times it becomes very difficult for the physician to relate the bacteria with the disease. Hence the physician may advocate antibiotic therapy irrespective of the etiology of the disease. This may lead to unwanted economic loss and stress to the patient if the ENT infection is due to the virus or fungi.[3]

Otitis externa, malignant otitis externa, chronic otitis media, nasal vestibulitis, chronic rhinosinusitis, URTI, neck abscess, septal abscess, tonsillitis represent few of the conditions seen on a daily basis in an ENT outpatient department by Otorhinolaryngologists. These conditions amongst others require an empirical antimicrobial treatment so as to provide relief and to prevent further complications.

Bacterial species such as *Staphylococcus aureus, Streptococcus* sp., *Proteus spp*., *Haemophilus* and *Escherichia Coli* forms were found to be responsible for most cases of ENT infections.[6]

Antibiotic resistance seems to be progressively increasing for these common conditions. This increasing resistance appears to be largely related to the inadvertent use of antibiotics. The antibiogram of common organisms also changes from location to location.

The recent changes in the infectious etiology and the antibiotic resistance is a problem medical fraternity is facing worldwide, so it is necessary to do a study that could reveal the actual bacterial spectrum of infectious conditions in otorhinolaryngology and also the correct antibiotic treatment.

Objectives

The objectives of the study were to evaluate the bacteriological profile of patients attending ENT OPD or IPD in a tertiary care hospital and to study the antibiogram of the isolated organisms.

METHODS

Source of data

Microbiology records of all pus exudates from inpatients or patients attending the outpatient Department of Otorhinolaryngology, Head and Neck Surgery (ENT HNS) of KVG Medical College and Hospital from September 2018 to September 2019.

Study design

Study design was retrospective study.

Sample collection

Exudate from ear or nasal cavity or middle meatus or throat or neck etc. was taken with a swab and transported to microbiology lab within an hour of collection.

Culture technique

The exudate was streak inoculated on blood agar, Mc Conkey's agar, chocolate agar and incubated at 37 degree C for 18 to 24 hr.[9] Hemolysis was studied on chocolate agar. Identification and characterization of isolates were performed on the basis of gram staining, microscopic characteristics, colony characteristic, and biochemical tests using standard microbiological methods.[9]

Sensitivity profile

Antimicrobial susceptibility profile was determined by modified Kirby Bauer disc diffusion method.[10]

Statistical analysis

The laboratory samples were statistically analysed by Microsoft office excel 2007, IBM SPSS version 21.

RESULTS

The following figure represents distribution of patients according to age group.

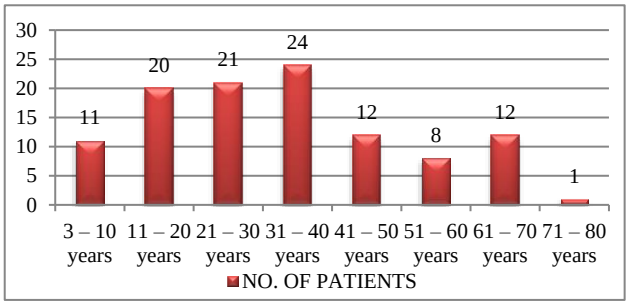

Figure 1: Age distribution of the study population.

Majority of patients belonged to age range 31 to 40 yrs, least number of cases were in 71 to 80 yrs. age group.

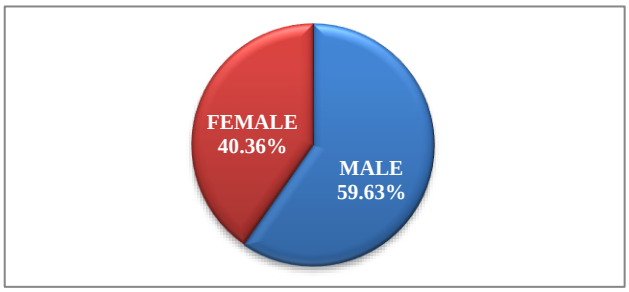

Figure 2: Gender distribution of the study population.

Males were majority with male to female ratio of 1.4:1.

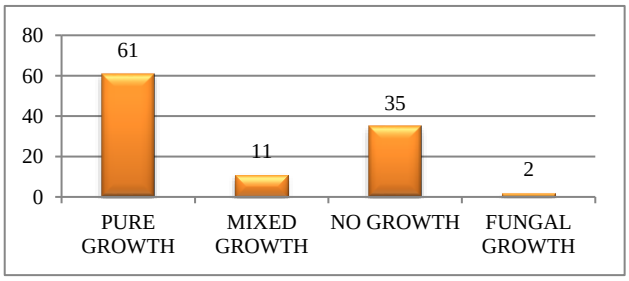

Figure 3: Type of growth obtained from discharge.

Pure growth was seen in majority of samples (55.96%). Minimum number of samples had fungal growth (1.83%).

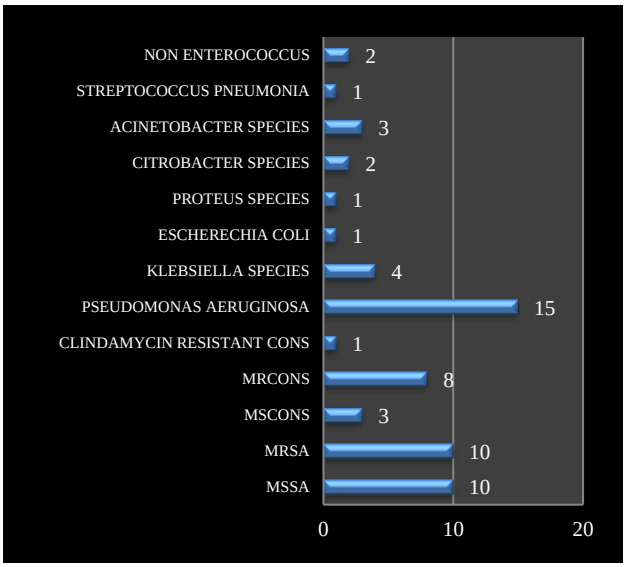

Figure 4: Organisms grown in pure growth culture.

Among the pure growth, *P. aeruginosa* was isolated in majority of samples (27.77%) followed by *S. aureus* (22.9%). *Klebsiella* sp. accounted for 7.40%, *Acinetobacter* sp. for 5.55%, *Citrobacter* and *Non enterococcus* accounted for 3.70% each, and *E. coli*, *Proteus* sp. and *S. pneumoniae* were responsible for 1.85% of samples each.

Among *S. aureus* majority was MRSA accounting for 18.51%, followed by MRCONS 14.81%, MSSA 5.55%, MSCONS 5.55% and Clindamycin resistant CONS accounted for 1.85%.

Among mixed growth samples, *S. aureus*, *Klebsiella* sp. and *E. coli* were responsible for 21.73% of samples each. *P. aeruginosa* accounted for 13.04%, *Proteus* sp. for 8.69%, and *Enterococcus* and *Acinetobacter* sp. accounted for 4.34% of samples each.

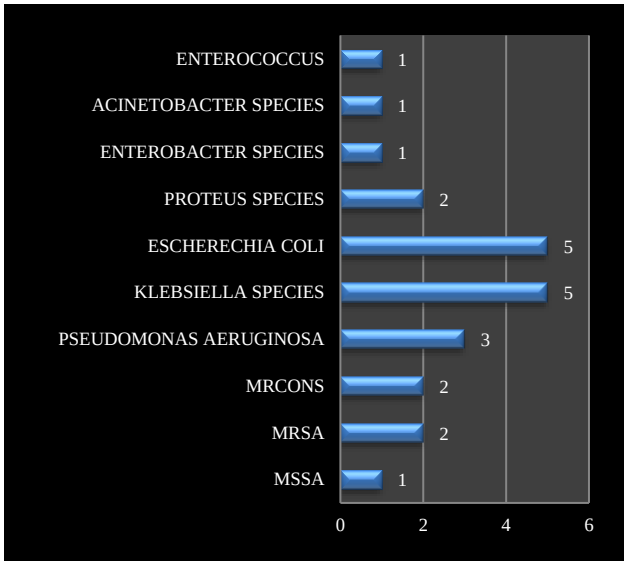

Figure 5: Organisms grown in mixed culture.

P. aeruginosa was most sensitive to amikacin, ceftazidime, meropenem and piperacillin-tazobactam and least sensitive to cotrimoxazole and colistin. It was most resistant to sparfloxacin, cefaperazone-sulbactam, ceftriaxone-tazobactam and clindamycin.

MRSA was most sensitive to gentamicin, amikacin, clindamycin and most resistant to cephalexin, ampicillin and ciprofloxacin.

Klebsiella sp. was most sensitive to amikacin and cotrimoxazole and most resistant to sparfloxacin and ceftriaxone. *E. coli* was most sensitive to gentamicin and cotrimoxazole and most resistant to sparfloxacin.

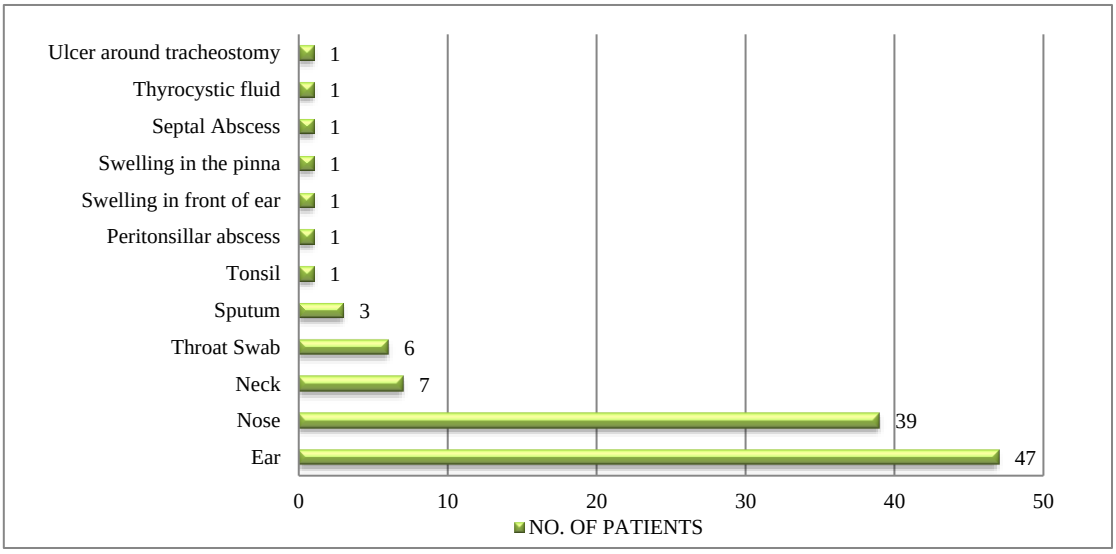

Figure 6: Locations from where specimen was collected.

Table 6: Antibiotic sensitivity pattern of certain organisms.

Antibiotics	*P. aeuroginosa*		*MRSA*		*MSSA*		*MRCONS*		*Klebsiella sp.*		*E. coli*	
	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant
CAZ	11	5	-	-	-	-	-	-	2	1	--	-
SPX	5	10	-	-	-	-	-	-	5	3	3	1
CIP	9	8	2	8	1	1	4	4	2	0	-	-
CTR	7	6	-	-	-	-	-	-	5	3	4	0
AK	12	5	8	1	3	0	8	2	7	1	4	0
GEN	8	5	11	1	3	0	8	1	5	3	6	0
PIT	10	2	-	-	-	-	-	-	3	1	-	-
CFS	6	10	-	-	-	-	-	-	1	2	-	-
MRP	10	3	-	-	-	-	-	-	3	1	-	-
CL	4	0	-	-	-	-	-	-	-	-	-	-
COT	2	3	-	-	-	-	-	-	7	2	6	0
TOB	9	6	-	-	-	-	-	-	-	-	-	-
IMP	8	8	-	-	-	-	-	-	1	3	-	-
CIT	5	9	-	-	-	-	-	-	-	-	-	-
CD	-	-	9	1	3	0	9	2	-	-	-	-
E	-	-	2	4	1	0	4	5	-	-	-	-
CN	-	-	2	10	2	1	2	6	-	-	-	-
AMP	-	-	1	10	1	2	0	10	-	-	-	-
LZ	-	1	1	-	-	-	1	0	-	-	-	-
DO	-	-	1	-	-	-	-	-	-	-	-	-
CX	-	-	0	2	1	1	0	3	-	-	-	-
VA	-	-	-	-	-	-	0	1	-	-	-	-
TZ	-	-	-	-	-	-	0	1	-	-	-	-
AMC	-	2	-	-	-	-	1	0	5	3	5	0
CTX	-	-	-	-	-	-	1	0	4	4	2	1

Majority of samples were from ear 47%, followed by nose 39%. Samples from neck were responsible for 6.42%, throat swabs for 5.50%, and sputum for 2.75%. Pus from tonsil, peritonsillar abscess, swelling in front of ear, swelling in pinna, septal abscess, thyrocystic fluid and ulcer around tracheostomy site were responsible for 0.91% of samples each.

DISCUSSION

In a study done by Kumar et al, a total of 115 cases were randomly selected in which males were 71 and females were 44.[7] Male to female ratio was 1.61:1, this is similar to our study where male to female ratio is 1.4:1.

A study by Anitha et al had 55 swabs, among which 35 (63.6%) samples were found to be growth and remaining 20 (36.3%) samples showed no growth.[1] This is similar to our study where 74 (67.8%) samples showed growth and 35 (32.1%) had no growth.

Study done by Ahmad et al showed that among 100 samples majority comprised of 55 ear swabs, while remaining were 30 and 15 throat and nose swabs respectively.[6] This is similar to our study with majority of samples from ear 47%, followed by nose 39%.

In a study done by Bhaumik et al the most common isolated of gram negative organism was *Pseudomonas* sp. 58 (23.38%), followed by *Acinetobacter spp*. 46 (18.55%).[4]

According to a study done on ENT infection, by Osozuwa[8] et al. the following bacteria were found in the study; *P. aeruginosa*, *S. aureus*, *Klebsiella* sp., *Streptococcus pneumoniae*, *E. coli* and *Citrobacter frenndi*. Based on their study, Pseudomonas aeruginosa was the most prevalent etiologic agent of ENT infections in Benin City.[8] These studies have results similar to our study where *Pseudomonas* sp. was isolated in majority of samples 27.77%.

However unlike our study, Estifanos et al found *Proteus mirabilis* (30%) to be the most isolated organism followed by *Klebsiella pneumoniae* (20%) in ENT swabs, while the least were recorded on *Citrobacter sp.*, *Pseudomonas fulorescens, Proteus vulgaris, Acinetobacter baumanii, E. coli, Klebsiella pneumonia* (3.3%).[2]

Ahmad et al did a similar study and found that *Staphylococcus aureus* recorded the highest rates (24.17%) amongst isolates in ENT swabs, while *P. aeruginosa* (19.78%) was isolated in only ear swabs.[6]

Kumar et al. reported that *Pseudomonas*, *S. aureus*, *Proteus* and *Klebsiella* are the common bacteria that cause ENT infection in Jaipur India.[7]

Selvaraj et al in a similar study found *Pseudomonas* in 43 (30.71%), *S. aureus* in 32 (22.85%), *Proteus* sp. in 18 (12.85%), *Klebsiella* sp. in 17 (12.14%) samples. These studies illustrate the tendency of bacterial profile to change from population to population.[5]

According to Estifanos et al Ampicillin had the highest overall resistance rate (80.8%) followed by cephalothin (58.6.6%), cefazolin (57.14%), cefuroxime and cefuroxime axetil (53.6%) and cefpodoxime (48.27%).[2] On the other hand, majority of bacterial isolates were susceptible to levofloxacin, tobramycin, ciprofloxacin and gentamycin with overall resistance rates of 0%, 0%, 6.6%, and 11.11% respectively.[2]

Study by Selvaraj et al showed that gram positive bacteria were most sensitive to vancomycin (100%) followed by amikacin (97.14%), and gram negative bacteria were sensitive to sulbactam or cefoperazone (97.14%), piperacillin or tazobactam (95.23%) and meropenem (94.28%) were the most effective drugs.[5]

However according to our study gram negative organisms were most sensitive to amikacin, ceftazidime, meropenem and piperacillin-tazobactam and least sensitive to cotrimoxazole and colistin and were resistant to sparfloxacin, cefaperazone-sulbactam, ceftriaxone-tazobactam and clindamycin.

Gram positive organisms were most sensitive to gentamicin, amikacin and clindamycin and resistant to cephalexin, ampicillin and ciprofloxacin.

This change in antibiogram pattern necessitates the need for such a study.

CONCLUSION

ENT infection is a frequent treatable health care problem worldwide but if left untreated it can cause a number of serious complications affecting the quality of life for patients and their relatives and lead to significant financial burden on them. Also, it leads to increased disease and economic burden on health care systems. The prevalence of ENT infections is more in developing countries due to lower living standards, poor hygiene conditions, lack of proper nutrition, over population and scarcity of health care systems.

Therefore, taking simple steps such as sending pus samples for culture and sensitivity will helps us significantly in reducing this burden and in identifying trends in antibiogram secondary to increasing antibiotic resistance.

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Ethical approval: Not required

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