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Original Research Article

Comparative study between throat swab and ear discharge swabs culture and sensitivity findings in pediatric patients with bilateral chronic otitis media

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ABSTRACT

Background: Chronic otitis media is one of the common infections seen in pediatric age group. The most widely recognized route of infection is via the eustachian tube. The inflammation of the pharyngeal end of the eustachian tube may prevent gas exchange, leading to lowering of the middle ear pressure and predisposes to aspiration of nasopharyngeal microbes into the middle ear cleft.
Methods: Eighty (80) cases of clinically diagnosed chronic otitis media among pediatric age group of both sexes selected on simple random basis were included in this study. Swabs from both ears and throat were taken and the samples were sent under strict aseptic conditions for culture and sensitivity testing.
Results: The mean age of patients was 6.1years and the frequency of chronic otitis media was maximum in 1-5 years age group. Male to female ratio was 1.6:1.The most frequent organism isolated was *S. Aureus* followed by *Psuedomonas*. The ear swab and throat swab findings showed positive relationship ($p<0.05$) for the common organisms i.e., *S. Aureus*, *pseudomonas* and *Streptococcus pyogenes* respectively, thus suggesting a common etiological agent. Psuedomonal infection was found to be associated with large perforation in tympanic membrane.
Conclusions: The pathology in bilateral ear disease is central i.e., throat. Treatment in these cases is focused on selected drug with optimum dose and calculated regimen of treatment completely, thus reducing the morbidity of loss of physiological function of the ear and the grave complications involved.

Keywords: Bilateral chronic otitis media, Culture and sensitivity, Throat swab, Ear swab

INTRODUCTION

The diagnosis of chronic otitis media is most likely to result from an earlier unresolved or partially resolved acute otitis media or otitis media with effusion. In short it is the state of inflammation of middle ear cleft.[1]

On WHO standards, it is otorrhea through permanent perforation of tympanic membrane which exists for at least 2 weeks.[2]

The chronic otitis media gets the attention for its management at the earliest because of its sequelae of impairment in acquiring linguistic and paralinguistic features, development of cognition, during the development of a child.

WHO estimates the prevalence of this menace across south east Asia ranging from 1-6% across this part of the globe.[3]

The chronic otitis media among the children are studied to be multifactorial in origin. Most of them are host factors and the pathogens of infection and environmental geographic predisposition.[4]

Among the host factors, the anatomic features of pediatric eustachian tube and the immunity factors are important in both native and acquired type.[5]

The damage of mucosal lining of the nasopharynx and middle ear by the biofilms of the local commensals is also an additive factor of etiopathogenesis of otitis media.[6]

It is observed that bilateral middle ear diseases arise from the central pathology, most of the times from the nasopharynx and oropharynx in the form of ascending infection through eustachian tube.[7]

In this study we emphasise on the bacterial flora of throat and middle ear using culture and sensitivity test results of both throat and ears discharge swabs to derive the etiological bacteria.

METHODS

This study is carried out at a Medical College Hospital, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, India, which spanned over the period of 1 year from March 2017 to February 2018. Approval from the ethical committee was obtained before starting the study.

Eighty (n=80) cases of clinically diagnosed and untreated bilateral chronic otitis media cases among pediatric age group of both sexes selected on simple random basis were included in this study. Patients whose parents didn't give consent and patients who were lost to follow up were excluded from the study.

Following informed parental consent, 3 swabs were taken from each patient, one each from both ears and throat and the samples were sent under strict aseptic conditions for culture and sensitivity testing and the results were analysed.

RESULTS

The tests were performed on a total of 80 patients (n=80) comprising 49 (61.3%) males and 31 (38.8%) females. The male: female ratio was 1.6:1.

The mean age was 6.10 years with the minimum being 10 months and maximum 15 years. The frequency of chronic otitis media was maximum in 1-5 years age group (45%) followed by 6-10 age group (30%) (Table 1).

Table 1: Age distribution.

Age (in years)	Frequency	Percentage (%)
<1	6	7.5
1-5	36	45.0
6-10	24	30.0
10-15	14	17.5
Total	80	100.0

Table 2: Organism isolated from swabs.

Organism isolated from swabs	Total	Percentage (%)
All 3 same	15	18.75
Right ear and throat same	16	20
Left ear and throat same	7	8.75
Right ear and left ear same	16	20
All different	9	11.25
No growth	17	21.25

Table 3: Statistical analysis of organisms isolated and site of swab (Kappa agreement of culture in right ear, left ear and throat).

Culture	Right vs left ear	Right ear vs throat	Left ear vs throat
Streptococcus	P<0.02	P<0.000	P<0.03
Staphylococcus aureus	P<0.000	P<0.000	P<0.000
CONS	P<0.01	P<0.774	P<0.678
Klebsiella	-	P<0.795	-
Pseudomonas	P<0.000	P<0.01	P<0.000
Acinetobacter	P<0.817	-	-
Citrobacter	P<0.000	P<0.777	P<0.649
E.Coli	P<0.872	P<0.872	P<0.000
Enterobacter	-	-	P<0.000
Serratia	P<0.000	P<0.000	P<0.000

Table 4: Organism vs perforation.

Organism	Medium	Large	Chi square test
S. aureus	21	32	P<0.945
Pseudomonas	14	35	P<0.05
Streptococcus	4	10	P<0.269
CONS	7	4	P<0.338
Serratia	0	4	P<0.126
Acinetobacter	0	4	P<0.126

3 swabs were taken from each patient. Culture was positive for 78.33% of the total swabs and negative for 21.6% of swabs. Gram positive organisms were isolated from 60.5% and gram negative from 39.5% of culture positive swabs. *Staphalococcus aureus* was the commonest organism isolated followed by *Pseudomonas* and *Streptococcus pyogenes*.

Of the total 80 cases, there were 26 cases (32.5%) of perfect correlation between the two sites, where pathogens were common in all 3 samples, or else culture was negative in all. There were 23 cases (28.75 %) of partial correlation, i.e. common pathogen in one of the ear swabs and the throat swab and 15 cases (18.75 %) with no correlation at all, either because the pathogens concerned were different or culture showed no growth in the case of the middle ear but not the throat. 16 cases (20%) showed same organism in both ear swabs which was different from the one in throat (Table 2).

Analysing individual organisms, there was statistically significant correlation ($p<0.05$) between the ear and throat swabs for the three most commonly isolated organisms i.e., *S. aureus*, *Pseudomonas* and *Streptococcus pyogenes* (Table 3).

Our study also examined the relation between the etiological bacteria and the type of perforation i.e., whether small or large and found that patients who had Pseudomonas isolated from their ear discharge swab were prone to have large perforations ($p<0.05$) (Table 4).

The sensitivity pattern showed that the most sensitive drug was amikacin followed by doxycycline. Most of the organisms were found to be resistant to amoxicillin and clavulanic acid combination.

DISCUSSION

In our study, the mean age of patients was found to be 6.10 years and the highest incidence of chronic otitis media was seen in 1-5 years age group accounting for 45% of case and this finding is in accordance with the studies published earlier by Shyamala et al. and Gulati et al.[8,9]

Our study shows a male preponderance to this disease, with male:female ratio being 1.6:1. Prior studies by Teele et al showed similar results but few studies as the one by Casselbrant et al had more number of female patients.[10,11]

In a study by Rao and Reddy to ascertain the bacteriology of chronic otitis media, found that *Staphylococcus aureus* was the predominant pathogen (42.5%) followed by *Pseudomonas aeruginosa* (21.67%) with pathogens being isolated from 68.52% of the ear swabs .[12]

In this study we have similar results with positive culture results in 78.3% of the ear swabs. The most frequent bacteria were *Staphylococcus aureus* (27.5%) and *Pseudomonas aeruginosa* (16.25%). *Streptococcus pyogenes* was isolated from 12.5% of swabs.

Studies done by Loy et al, Shreshtha et al, Lakshmi et al and Kumar et al showed similar findings.[13-16]

In contrast to our present study, studies done by Poorey et al and Varshney et al showed *Pseudomonas* species as the most common isolate.[17,18]

Our study had 21.6% of negative ear swab culture results like Fatma et al (16.9%) and Chakraborty et al (12.6%) studies.[19,20]

The drug sensitivity testing showed amikacin to be most sensitive in eradicating the bacteria. Study by Lakshmi et al also pointed out the same.[15]

The study by Rao and Reddy, on the contrary had gentamycin as the sensitive drug for treating cases due to either gram positive or gram negative organisms followed by cefotoxime and amikacin.[12]

Our study showed most of the bacteria to be resistant to amoxicillin and clavulanic acid combination. This is supported by similar studies done by Chakraborty et al.[20]

61.25% of the cases showed correlation between throat swab and ear swab, i.e., similar organisms seen in both swabs and no relation was seen in 18.75% with statistically significant results for the common organisms. Thus our study points towards a common pathology.

Our study also looked into the relationship between the etiological bacteria and the type of perforation in tympanic membrane i.e., whether small or large. Our studies found that patients who had Pseudomonas isolated from their ear discharge swab were prone to have large perforations ($p<0.05$). No similar studies were found to illustrate or compare our above two findings.

Bacterial pathogens which colonize throat are able to infect the middle ear usually affecting eustachian tube and predisposing to bacterial aspiration and proliferation. This study shows good correlation between the bacteriology of throat and middle ear in bilateral disease. Hence treatment of COM should be focused on source of infection, mainly the central pathologies such as pharyngeal conditions and adenoids.

CONCLUSION

The pathology in bilateral ear disease is a central i.e., throat. Treatment in these cases is focused on selected drug with optimum dose and calculated regimen of treatment completely, thus reducing the morbidity of bilateral chronic otitis media and preventing the damage to the physiological function of the ear and the grave complications involved as the pediatric age group is most vulnerable.

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