

Study of Bacteriology in ASOM**Arvindkumar B. Sangavi¹, R. Rajani Ranganath², Ravi Kumar³, Suhas Y Chudhari⁴**¹Associate Professor, Department of ENT, RIMS, Raichur, Karnataka, India²Associate Professor, Department of Microbiology, Ballari Medical College & Research Centre, Ballari, Karnataka, India³Assistant Professor, Department of ENT, RIMS, Raichur, Karnataka, India⁴Assistant Professor, Department of ENT, RIMS, Raichur, Karnataka, India

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Conflict of interest: Nil

Abstract:

Acute Suppurative Otitis Media (ASOM) is a primary reason for prescribing antibiotics in children. The near closeness of the middle ear to the brain, coupled with the growing resistance of pathogenic organisms associated with otitis media, renders this condition highly concerning in youngsters. The present study was done “to study the bacteriology of the disease in detail followed by Antibiotic Sensitivity patterns of the most common etiological organisms”.

Material & Methods: The current prospective research was conducted at Ear, Nose & Throat Department of RIMS Hospital, Raichur from April 2017 to June 2017, among all the selected 50 patients of ear discharge. Clinical details of patients presenting with ear discharge of less than 3 weeks duration diagnosed as ASOM at first presentation were collected for age, gender, bacteriology, clinical presentation & management taken. Results were analyzed using SPSS version 25.0

Results: In the present study the maximum numbers of patients were in the age group of 0 to 5 years (10). Female patients (27) were more in number as compared to male (23). The symptom & signs of ASOM present in patients were otorrhea (48) & perforation of tympanic membrane (49). In 11 patients ASOM was present on one side while in 39 patients ASOM was present bilaterally. The most common micro-organism was *Staphylococcus aureus* (21) & least common was *Streptococcus viridians* (3).

Conclusion: A systemic antibiotic that is effective against bacteria that produce beta-lactamase, along with anti-histamine treatment & local ear treatment, is recommended to achieve better results in stopping ear discharge & reducing the likelihood of developing a chronically discharging ear (CSOM) with its associated issues.

Keywords: Acute, Antibiotic, Chronic, Ear, Suppurative, Otitis Media.

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Introduction

Acute Suppurative Otitis Media (ASOM) refers to a bacterial infection in the middle ear cavities. This infection causes a build-up of pus in the middle ear, which then is released as ear discharge.[1,2] It is typically the primary bacterial infection in children below the age of two but can be seen in adults also & is one of the main reasons for prescribing antibiotics. Nevertheless, the close proximity of the middle ear to the brain & the growing resistance of bacteria to antibiotics make otitis media a significant issue in young infants [3, 4].

Middle ear infection can result from viral, bacterial, or co-infection. The predominant bacterial pathogens responsible for otitis media are *Streptococcus pneumoniae*, followed by Non-Typeable *Haemophilus influenzae* (NTHi) & *Moraxella catarrhalis*. After the conjugate pneumococcal vaccinations were introduced, the pneumococcal organisms have adapted to serotypes that are not covered by the vaccine. The

predominant viral pathogens causing otitis media are Respiratory Syncytial Virus (RSV), Adenoviruses, Influenza viruses, Coronaviruses, Human metapneumovirus, & Picornaviruses [5-7].

Otitis media is diagnosed through a clinical evaluation that includes objective observations during a physical examination (otoscopy), as well as consideration of the patient's medical history & the signs & symptoms they are experiencing. Various diagnostic instruments, including a tympanometry, pneumatic otoscope, & acoustic reflectometry, can be used to assist in the diagnosis of otitis media. Pneumatic otoscopy is more dependable & exhibits greater sensitivity & specificity in comparison to plain otoscopy. However, if pneumatic otoscopy is not accessible, tympanometry & other methods can aid in the diagnosis [8].

The use of antibiotics for treating otitis media is a subject of debate & is specifically dependent on the specific form of otitis media being considered. If not treated correctly, purulent fluid from the middle ear can spread to nearby anatomical areas & lead to complications such as perforation of the tympanic membrane, labyrinthitis, mastoiditis, meningitis, petrositis, hearing loss, brain abscess, lateral & cavernous sinus thrombosis, & other conditions. Consequently, particular recommendations have been established to address the therapy of OM [9].

Gaining knowledge about the patterns & causes of Acute Suppurative Otitis Media (ASOM) will help in creating effective methods to prevent the condition & improve its treatment. The isolation of organisms differs across different locations worldwide, & the responsiveness of these isolated organisms to antibiotics likewise varies across different locales. Thus we felt a need “to study the bacteriology of the disease in detail followed by antibiotic sensitivity/resistance patterns of the most common etiological organisms”.

Material & Methods

The current prospective research was conducted at Ear, Nose & Throat Department of RIMS Hospital, Raichur from April 2017 to June 2017 among all the selected patients of clinical discharge. Patients were asked to sign an informed consent form after explaining them the complete procedure. Ethical clearance was taken from institutional ethics committee before commencement of the study.

Through convenience sampling, total 50 cases of pus discharge from ear diagnosed as Acute Suppurative otitis media were considered for the study on the basis of following inclusion & exclusion criteria.

Inclusion criteria included patients of all ages; newly diagnosed ASOM cases who haven't taken any antibiotic treatment.

Exclusion criteria included ASOM cases already taking treatment, CSOM cases, ASOM with Otitis externa & those not willing to participate in the study.

Clinical information on sex, age, bacteriology, clinical presentation & management was gathered for patients with ear discharge lasting less than three weeks who were initially diagnosed with ASOM. The same hospital's microbiology department did testing for bacteria & antibiotic sensitivity.

Ear discharge was obtained using sterile swabs following thorough cleaning of the outer ear. Each patient provided two samples, which were promptly transferred to the Laboratory in thermally stable containers for processing. The initial sample was utilised for direct scrutiny by Gram stain microscopy, while the subsequent sample was employed for aerobic cultivation & the separation of microorganisms. The culture media that were inoculated based on the Gram reaction were Blood Agar, Chocolate Agar, Mac Conkey Agar and Mueller Hinton Agar (MHA). Bacterial identification to the species level was accomplished through the utilisation of traditional biochemical identification assays.

Antibiotic Sensitivity Testing: The modified Kirby Bauer disc diffusion test was conducted to determine the antibiotic sensitivity of the isolates. The test was performed on plain MH agar and Blood agar for fastidious bacteria.

Data for analysis entered into Microsoft Excel spreadsheet & Data were analyzed with using SPSS software version 25.0. Chi square test was used to measure results, with $p < 0.05$ taken as significant.

Results

In the present study the maximum number of patients was in the age group of 0 to 5 years (10). Female patients (27) were more in number as compared to male (23). When classified according to socioeconomic status mostly was from the lower class (20). Maximum patients were suffering from malnutrition (21) & were lean built also. Most common comorbidity found was Diabetes mellitus (8) & Hypertension (6) shown in table 1.

Table 1: Demographic data of patients

Variable		Frequency/ Mean
Age (years)	0-5	10
	6-10	8
	11-15	7
	16-20	2
	21-25	5
	26-30	9
	31-35	2
	36-40	5
	41-45	2
Gender	Male	23
	Female	27

Socioeconomic status	Lower class	20
	Middle class	16
	Higher class	14
Nutritional status	Malnutrition	21
	Average built	14
	Good built	15
Comorbidity	Hypertension	6
	Diabetes mellitus	8
	Others	10
	Absent	26

The symptom & signs of ASOM present in patients were otorrhea (48), perforation of tympanic membrane (49), nasal discharge (22), otalgia (30), ear itching (4) & hearing loss (2) as shown in table 2.

Table 2: Symptoms & signs of ASOM

Signs & Symptoms	Frequency
Otorrhea	48
Perforation of tympanic membrane	49
Nasal discharge	22
Otalgia	30
Ear itching	4
Hearing loss	2

In 11 patients, ASOM was present on one side while in 39 patients ASOM was present bilaterally as shown in figure 1.

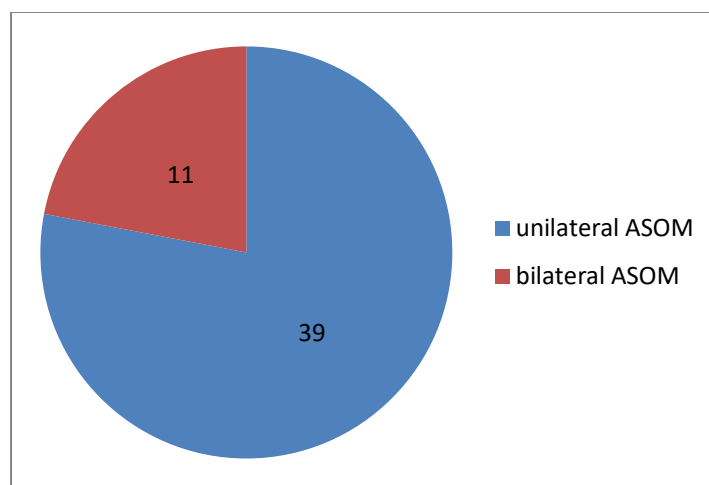


Figure 1: Type of ASOM

The predisposing factors related to ASOM were tonsillitis (30), rhinitis (27), UTRI (20), adenoids (10) & common cold (10) as shown in table 3.

Table 3: Predisposing factors related to ASOM

Predisposing factors	Frequency
Tonsillitis	30
Rhinitis	27
UTRI	20
Adenoids	10
Common cold	12

The most common organism was *Staphylococcus aureus* (21) & least common was *Streptococcus viridians* (3), other organisms found are shown in figure 2.

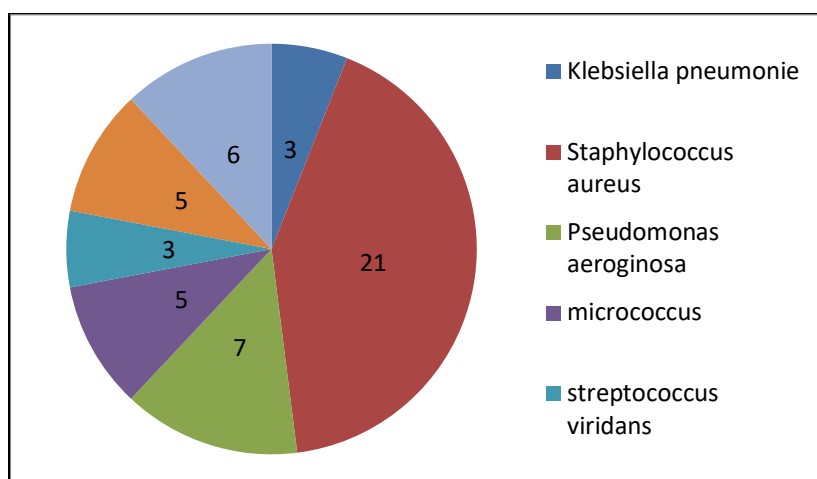


Figure 2: Type of microorganisms

The type of micro-organism there sensitive pattern & resistance to antibiotics is shown in table 4.

Table 4: Sensitive & resistance pattern of Bacterial isolates

Micro-organisms	Sensitive	Resistance
Klebsiella pneumonie	Amoxiclav Amikacin Cefotaxime Ceftazidine+ Tazobactam Levofloxacin Cefuroxime Gentamycin Ciprofloxacin Clotrimoxazole	Nil
Staphylococcus Aureus	Amoxiclav Cefipime Cefaperazone Ceftriaxone Ciprofloxacin Cotrimoxazole Linezolid	Ampicillin Amoxicillin Erythromycin Penicillin Piperacillin Ticarcillin
Psuedomonasaeruginosa	Amikacin Cefipime Cefperazone+salbactam Ceftazidime+tazobactam Ciprofloxacin Gentamycin Imipenem Levofloxacin Tobramycin Aztreonam	Ticarcillin
Streptococcus viridans	Ampicillin Clindamycin Doxycycline Penicillin Piperacillin+tazobactam Tetracycline	Azithromycin Cotrimoxazole Erythromycin Levofloxacin Ofloxacin
Enterococcus	Ampicillin Amoxicillin Amoxiclav Erythromycin Gentamycin Imipenem Levofloxacin	Nil

	Penicillin Piperacillin+tazobactam Tetracycline Vancomycin Linezolid	
Proteus mirabilis	Ceftazidime Cefepime Amikacin Cefixime Tobramycin	Cotrimoxazole Ampicillin Cefotaxime Cefuroxime

Discussion

ASOM is a prevalent condition in children. In this study, children between the ages of 0-5 accounted for 10 of 50 cases, which is consistent with other research findings. Children in this age group are more susceptible to this condition due to factors such as their increased vulnerability to upper respiratory tract infections, the more horizontal orientation of their Eustachian tubes, & the immaturity of their immune system [10-12].

The most common symptoms observed were ear discharge (otorrhoea) & ear pain (otalgia). Patients typically seek medical attention when they experience ear discharge resulting from a perforated eardrum. Early detection of excessive crying & ear touching, along with confirmation through otoscopic examination, can help prevent eardrum perforation & suppuration. This examination usually reveals a red & inflamed eardrum. Prompt treatment with antibiotics & nasal decongestants can prevent suppuration [13, 14].

The most frequently cultivated microorganism was *Staphylococcus aureus*. It has also been mentioned in other Nigerian reports [15, 16]. This bacterium produces beta-lactamases. It follows that treating ASOM with antibiotics active against beta-lactamase-producing bacteria will be more successful in halting the development of chronic suppurative otitis media (CSOM), which is a more severe form of the illness. But in Ghana, Robby cultured *Streptococcus pyogenes* in patients who experienced suppuration within a week. [17]

Other microorganisms were cultivated from secondary contaminated discharges, & it was hypothesized that penicillin was still effective. However, a sizable portion nevertheless advanced to the chronic stage due to penicillin's inefficiency. Our pattern of bacteriology differs from that described in western literature, where the most common bacteria pathogens are reported to be *Haemophilus influenzae*, *Streptococcus pneumoniae*, & *Moraxella* (*Branhamella*) *catarrhalis* from the US, Colombia, Canada, Sweden, Finland & Japan, followed by *Streptococcus Group A* & *Staphylococcus aureus*. According to several European research, the most prevalent organism is *Haemophilus influenzae*,

which is followed by *Branhamella catarrhalis* & *Streptococcus pneumoniae* [18].

In this investigation, most of the isolated organisms showed resistance towards the amoxicillin-clavulanic acid combination. The significant rate of resistance seen in our study can be attributed to the improper & excessive usage of this combination of antibiotics [19]. Only cephalexin, out of all the beta-lactams examined, shown efficacy against *Enterobacteriaceae*; nevertheless, usage of this antibiotic needs to be carefully controlled. While the *S. pneumoniae* isolates were susceptible to ofloxacin, the *S. aureus* isolates were sensitive to ciprofloxacin.

Despite the positive results of this study on the effectiveness of quinolones, it is important to exercise caution when administering them to children younger than 10 years old due to the possibility of adverse effects on growing cartilages [20, 21]. As per our investigation, *S. pneumoniae* exhibited a high sensitivity to ofloxacin & cephalexin, which contrasts with the findings of other authors.[22] In our investigation, *P.aeruginosa*-which is known to be resistant to a number of antibiotics-was, however, 100% responsive to erythromycin & ciprofloxacin.

Conclusion

ASOM in children is a relatively common condition & an uncommon one in adults. The most common organism related to ASOM in our study was *Staphylococcus aureus*. Therefore, in order to effectively treat ASOM, empirical antibiotic therapy should account for these bacteria. It is underlined that in order to prevent the condition from progressing to CSOM, its consequences & to lower morbidity & mortality, early identification, appropriate antibiotic therapy, & patient education are essential.

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