

MICROBIOLOGICAL STUDY OF ACUTE OTITIS MEDIA IN CHILDREN AGED 2 MONTHS TO 18 YEARSRamakrishna Pai Jakribettu¹, Fysal N², Sushanth P.S³, Syed Mustaq Ahmed⁴, Shamseer Ali P.T⁵**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: Acute Suppurative Otitis media (ASOM) is one of the diseases that caused death in children below the age of 5 years. The pathogens causing otitis media (OM) vary from region to region. Both Gram positive and Gram negative bacteria are responsible for OM. So this study was conducted to know the aerobic bacterial pathogens causing OM and their susceptibility pattern in children below 18 years attending a rural tertiary health care center in north Kerala. **MATERIALS AND METHODS:** A total of 75 patients in pediatric age group 2 months to 18 years clinically having ASOM, were included in the study. Ear discharge was collected using sterile cotton swabs and processed accordingly. **RESULTS:** A total of 75 patients aged 2 months to 18 years with discharging ears were included in the study. Among them, forty one (54.7%) were males and thirty four (45.3%) were females. Forty five children were below years. Sixty five (86.6%) had unilateral ear discharge. Among the 75 ear swabs cultured, 66 (88%) had aerobic bacteria isolated. S.aureus was the most common isolate accounting to 32(47%) followed by P.aeruginosa 19(27.9%). It was observed that most of the Staphylococcus aureus isolates were resistant to penicillins and first generation cephalosporins while Pseudomonas aeruginosa to fluoroquinolones. **CONCLUSION:** Since there is reduced susceptibility of the pathogens isolated to first and second line antibacterials it is necessary to use these antibacterials judiciously and in the right dosage.

INTRODUCTION: Otitis media (OM) is defined as inflammation of middle ear that may present with recurrent ear discharge or otorrhoea through tympanic membrane perforation. The three criteria for Acute Otitis Media (AOM) include: acute onset of symptoms (fever, irritability, and earache), signs of inflammation of the tympanic membrane (TM), and presence of Middle ear effusion.¹ In developing countries like India, the main predisposing factor for Otitis media is lower Socio-economic status. Overcrowding, poor hygiene and sanitation, inadequate health care and education and malnutrition lead to upper respiratory tract infection including otitis media. In children and young adults, OM is the commonest cause of persistent mild to moderate hearing impairment.² Infection can spread from middle ear to vital structures such as mastoid, facial nerve, labyrinth, lateral sinus, meninges and brain leading to mastoid abscess, facial nerve paralysis, deafness, lateral sinus thrombosis, meningitis and intracranial abscess^{3, 4}. The introduction of antibiotics gave clinicians a tool to be used even without a precise etiological diagnosis and the irrational use of antibiotics led to the emergence of multi-drug resistant bacterial strains and disease complications in turn.

The World Health Organization estimates that each year 51000 children aged below 5 years die from complications of otitis media in developing countries⁵. The prevalence and antibiogram of these organisms have been reported to vary with time and geographical area, probably due to indiscriminate use of antibiotics. Globally, the major bacterial pathogens responsible for AOM are

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Streptococcus pneumoniae, *Haemophilus influenzae* and to a lesser extent, *Moraxella catarrhalis*, *S. pyogenes* and *Staphylococcus aureus*.⁶ Little is known about microbial epidemiology of AOM in India. Hence, the periodic update of prevalence and antibiogram of the etiological agents would be helpful in therapy and management of patients with otitis media.

The objective of this cross sectional prospective study was to determine the microbial diversity and the antibiogram of aerobic bacterial isolates among children suffering from OM in the age group 2 months to 18 years who attended our hospital.

MATERIALS AND METHODS: This prospective study was conducted from January 2012 to June 2013 after obtaining ethical clearance from Institutional Ethical Committee for a period of 18 months in patients attending pediatric OPD, MES Medical College Hospital, Perinthalmanna, Malappuram District, Kerala.

A total of 75 patients in pediatric age group 2 months to 18 years with a clinical diagnosis of ASOM, were included in the study. Ear discharge was obtained using pre-sterilized cotton swab. The swabs were streaked on 5% sheep blood agar (BA), MacConkey's agar and chocolate agar (CA). The plates were incubated at 37°C for 48 h.

Organisms were identified using standard procedures. Antimicrobial sensitivity testing for aerobic isolates was carried out by Kirby Bauer disc diffusion method on Muller Hinton agar. Results were interpreted in accordance with Central Laboratory Standards Institute guidelines⁷.

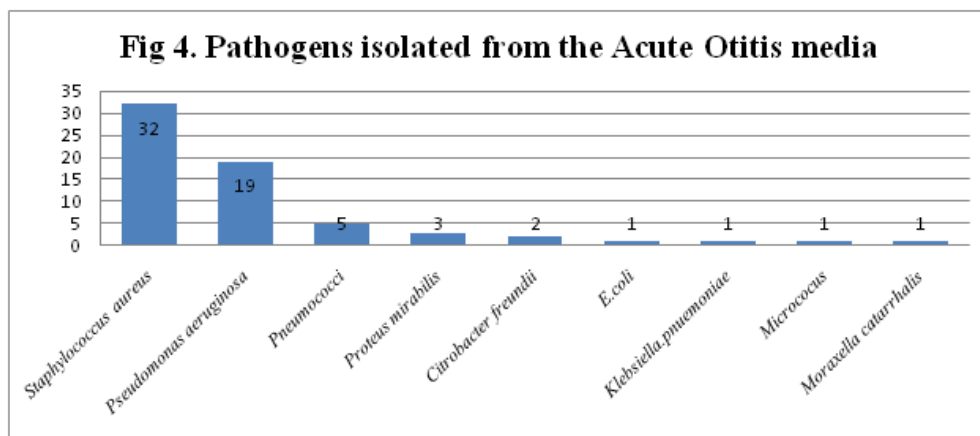
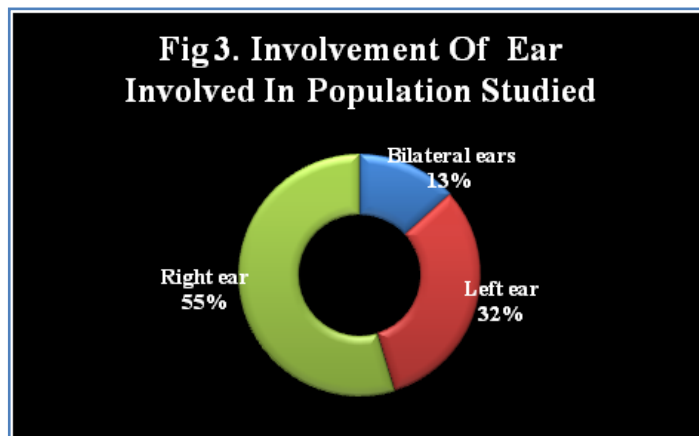
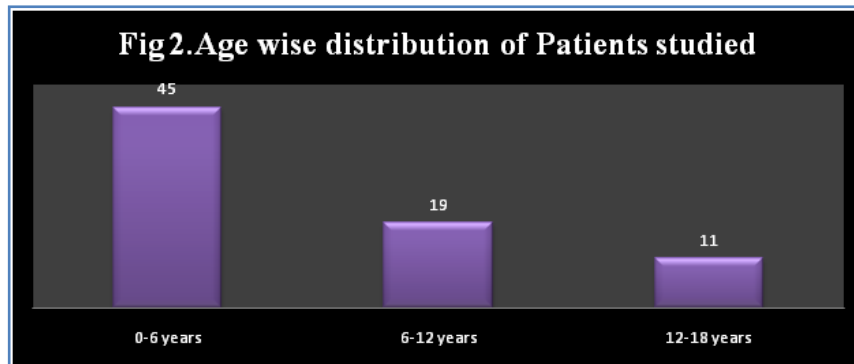
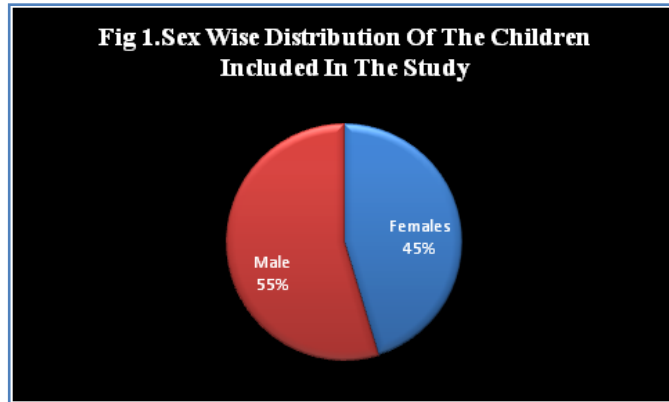
Statistical analysis: The data was analyzed by using Statistical Package for Social Sciences (SPSS) and the prevalence of organisms was determined and expressed in percentage.

RESULTS: 75 patients with discharging ears were included in the study. Among them, forty one (54.7%) were males and thirty four (45.3%) were females giving a M: F ratio 1.2: 1 (Fig 1). Forty five children were below 6 year of age (fig 2). Sixty five (86.6%) had unilateral ear discharge. In 41 (54.6%) children, the right ear was affected. (Fig 3)

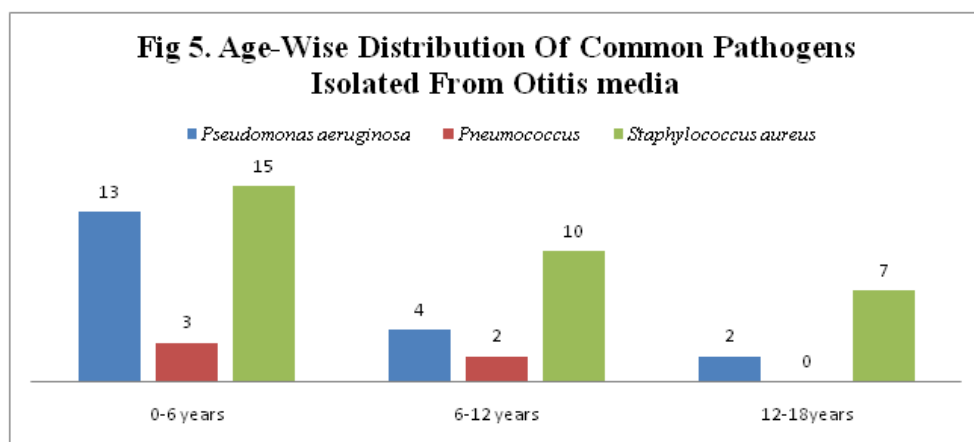
Among the 75 ear swab cultured, 66 (88%) had aerobic bacteria isolated, while 9 (12%) did not have any aerobic bacteria grown. 64 (85.4%) swab yielded single isolates and 2 (2.6%) had 2 isolates each. *S.aureus* was the most common isolate accounting to 32 (47%) followed by *P.aeruginosa* 19 (27.9%) (Fig4). *S.aureus* is the commonest pathogen causing infection in the toddlers; *Pneumococcus* is seen mainly in children below 12 years while *P.aeruginosa* is seen in all age groups (Fig. 5).

Antibiotic susceptibility testing was done and the sensitivity pattern of the four common isolates is shown in Table.1.

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Isolate tested	Total no of isolates	Antibacterial Susceptibility Pattern															
		Penicillin	Ampicillin	Amoxyclav	Cephalexin	Cefuroxime	Cefotaxime	Co-trimoxazole	Piperacillin	Ceftazidime	Gentamicin	Amikacin	Ofloxacin	Ciprofloxacin	Levofloxacin	Erythromycin	Clindamycin
S.aureus	32	14	14	19	18	21	23	18	-	-	21	24	28	19	24	15	23
P.aeruginosa	19	-	-	-	-	-	-	3	19	19	18	19	6	6	7	-	-
Pneumococci	5	5	5	-	-	-	-	-	-	-	-	-	5	-	-	5	4
Proteus	3	-	1	-	-	-	-	-	2	3	3	-	3	-	-	-	-

Table 1: Antibacterial Susceptibility Pattern of Pathogens isolated in the study population.

	Present study	Uttarkhand ²	Bombay ⁸	Pondichery ¹⁰	Nigeria ¹¹	German ¹²	Japan ¹³	USA ¹⁴	Bulgaria ¹⁵	Finnish ¹⁶
Staphylococcus aureus	47%	48.6%	26.6%	19%	4.92%					
Pseudomonas aeruginosa	27.9%	38%	28.3%	32%	57.4%					
Pneumococci	7.3%	1.05%			3.28%	10%	25%		47.6%	26%
Proteus mirabilis	4.4%			20%	11.5%					
Diphtheroids	2.9%	10%								
Klebsiella pneumonia	1.5%	18%			16.4%					
Moraxella catarrhalis	1.5%					1%	20%			23%
Escherichia coli	1.5%	14%			3.28%					
Haemophilus influenza						21%	23%	58%	27.6%	23%
Streptococcus pyogens						13%				

Table 2. Distribution of Pathogens isolated in various other studies in Otitis media.

DISCUSSION: In this prospective study, *Staphylococcus aureus* was the most frequently identified pathogen in children less than 18yr and was also frequently identified in below 6 years. Out of 32, 9 isolates were Methicillin resistant *Staphylococcus aureus* (MRSA). *P.aeruginosa* was the second most

frequently identified pathogen. These results are consistent with the studies conducted in other parts of India^{8,9,10}.

In a large evaluation of AOM etiology conducted in Israel, *S. pyogenes* AOM was observed more frequently in older children than in younger children, and was often associated with acute TM perforation¹⁷. The high rate of *S.aureus* isolation from otorrhea samples in the present study supports the notion that *S. aureus* infection rapidly leads to TM perforation and also likely reflects the severity of disease. Compared to studies conducted in developed countries^{12, 13, 14, 15, 16}, where the most common isolates are *S.pyogenes* and *H influenza*, developing and underdeveloped countries like India^{8, 9, 10} and Nigeria¹¹ show *S.aureus* and *P.aeruginosa* more commonly (Table 2). In India due to over-crowding, poor hygiene, malnutrition and inadequate healthcare the incidence of perforated tympanic membrane caused by otitis media is reported more when compared to developed countries.

In our study, most of the *Staphylococcus aureus* were resistant to Penicillins and first generation cephalosporins, *Pseudomonas aeruginosa* to fluoroquinolones. It may be due to inappropriate use and over use of antibacterial ear drops. As these antibacterial ear drops are easily available over the counter, these are misused in the rural population also. The study reveals reduced susceptibility of the pathogens isolated to first and second line antibacterials in rural settings. Hence it is necessary to use these antibacterials judiciously and in the right dosage.

The study also reveals that there are differences in the pathogens isolated and their antibacterial susceptibility patterns from different regions. Hence it is the need of the hour to have a study at the regional level to know the common pathogens causing otitis media and their susceptibility pattern for easy administration of appropriate antibacterials.

REFERENCES:

1. Subcommittee on Management of Acute Otitis Media. American Academy of Pediatrics and American Academy of Family Physicians. Clinical Practice Guideline: Diagnosis and management of acute otitis media. *Pediatrics*. 2004; 113: 1451–1465. [PubMed: 15121972]
2. Biswas AC, Joarder A H, Siddiquee BH. Prevalence of CSOM among rural school going children. *Mymensingh Med J*. 2005; 14: 152-5.
3. Berman S. Otitis media in developing countries. *Pediatrics*. 1995; 96: 126–31.
4. Wiwanitkit S, Wiwanitkit V. Pyogenic brain abscess in Thailand. *N Am J Med Sci*. 2012; 4: 245–8.
5. O'neil P. Acute Otitis media. *Clin Evid* 2002; 8; 39-40.
6. Leibovitz E, Jacobs MR, Dagan R. *Haemophilus influenzae*: a significant pathogen in acute otitis media. *Pediatr Infect Dis J*; 2004, 23: 1142–1152.
7. Wilker M A, Cockerill F R, Bush K, Dudley M N, Eliopoulos G M, Hardy D J, et al. Performance of Standards for Antimicrobial Disk Susceptibility Tests: Approved Standard- 10th ed. Pennsylvania. Clinical and Laboratory Standards Institute. 2009; 29(1): 11-12.
8. Prakash R, Juyal D, Negi V, Pal S, Adekhandi S, Sharma M, Sharma N. Microbiology of Chronic Suppurative Otitis Media in a Tertiary Care Setup of Uttarakhand State, India. *N Am J Med Sci*. 2013 April; 5(4): 282–287
9. De A, Varaiya A, Tainwala S, Mathur M. Bacteriology of acute otitis media in children. *Indian J Med Microbiol [serial online]* 2002 [cited 2013 Jul 21]; 20: 54-5.

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10. Madana J, Yolmo D, Kalaiarasi R, Gopalakrishnan S, Sujatha S. Microbiological profile with antibiotic sensitivity pattern of cholesteatomatous chronic suppurative otitis media among children. *Int J Pediatr Otorhinolaryngol*. 2011 Sep; 75(9): 1104-8.
11. Nnebe-Agumadu U, Okike O, Orji I, Ibekwe RC. Childhood suppurative otitis media in Abakaliki: Isolated microbes and in vitro antibiotic sensitivity pattern. *Niger J Clin Pract* 2011; 14: 159-62.
12. Gerhard Grevers, Susanne Wiedemann et al. Identification and characterization of the bacterial etiology of clinically problematic acute otitis media after tympanocentesis or spontaneous otorrhea in German children, *BMC Infectious Diseases* 2012; 12: 312
13. Yamanaka N, Hotomi M, DS. Clinical bacteriology and immunology in acute otitis media in children. *J Infect Chemother*. 2008 Jun; 14(3): 180-7.
14. Holder R C, KirseD J, Evans A K, Peters T R, Poehling K A, Swords W, Reid S D. One third of middle ear effusions from children undergoing tympanostomy tube placement had multiple bacterial pathogens. *BMC Pediatrics* 2012, 12: 87
15. Setchanova L P, Kostyanev T, Alexandrova A B, Mitov I G, Nashev D, Kantardjiev T. Microbiological characterization of *Streptococcus pneumoniae* and non-typable *Haemophilus influenzae* isolates as primary causes of acute otitis media in Bulgarian children before the introduction of conjugate vaccines. *Annals of Clinical Microbiology and Antimicrobials* 2013, 12: 6
16. Ruohola A, Meurman O, Nikkari S, Skottman T, Salmi A, Waris M, et al. Microbiology of Acute Otitis Media in Children with Tympanostomy Tubes: Prevalences of Bacteria and Viruses. *Clin Infect Dis*, 2006; 43: 1417-22.
17. Segal N, Givon-Lavi N, Leibovitz E, Yagupsky P, Leiberman A, Dagan R. Acute otitis media caused by *Streptococcus pyogenes* in children. *Clin Infect Dis* 2005, 41: 35-41.

AUTHORS:

1. Ramakrishna PaiJakribettu
2. Fysal N.
3. Sushanth P.S.
4. Syed Mustaq Ahmed
5. Shamseer Ali P.T.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Microbiology, MES Medical College, Perinthalmanna, Kerala.
2. Associate Professor, Department of Paediatrics, MES Medical College, Perinthalmanna, Kerala.
3. PG Student, Department of Paediatrics, MES Medical College, Perinthalmanna, Kerala.

4. Associate Professor, Department of Microbiology, MES Medical College, Perinthalmanna, Kerala.
5. PG Student, Department of Paediatrics, MES Medical College, Perinthalmanna, Kerala.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Fysal N,
Associate Professor of Paediatrics,
MES Medical College,
Perinthalmanna, Kerala.
Email- drfysaln@gmail.com

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