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"ASSESSMENT OF THE TYMPANOMETRIC PATTERNS IN PATIENTS RECOVERING FROM ACUTE SUPPURATIVE"

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ABSTRACT **Background:** An acute, suppurative infectious condition known as acute otitis media (AOM) is characterized by inflammation of the mucosa lining the middle ear cavity and the presence of infected middle ear fluid. The majority of comparative studies of antimicrobial treatment in AOM have been unable to establish a difference in the efficacy of amoxicillin against any other drug. Type B curve with normal canal volume was consider as conclusive evidence of fluid in the middle ear space according to Jerger's classification. With this background current study was done to determine changes in tympanometry pattern among acute suppurative otitis media patients at pre-treatment and post-treatment after 7 days of antibiotic therapy. **Methodology:** Present cross-sectional survey was done among 76 patients with acute otitis media. All patients undergo tympanometry prior to antibiotic therapy. Further tympanometry repeated post 7 days of antibiotic therapy. Chi-square test was performed to determine whether tympanometry pattern change after antibiotic treatment. **Result:** Out of 76 AOM patients, 88.2% of patients had B curve on tympanometry on their first visit. After antibiotic treatment tympanometry was done on 7th day again. Only 6 patients had abnormal curve on 7th day follow up. **Conclusion:** Amoxicillin with Potassium Clavulanate had significant effect to treat patients with AOM within 7 day duration and shifting tympanometry curve from type B to Normal. Symptoms of patients resolved within 7 days of treatment.

KEYWORDS : Antibiotic, Otitis Media , Tympanometry

BACKGROUND:

An acute, suppurative infectious condition known as acute otitis media (AOM) is characterized by inflammation of the mucosa lining the middle ear cavity and the presence of infected middle ear fluid.[1] The infection is most usually brought on by the Eustachian tube's diminished function, which causes the retention and suppuration of residual secretions. If there is a perforated tympanic membrane, AOM may also be related to purulent otorrhea. AOM often responds quickly to antibiotic treatment.[2]

The majority of cases of AOM are caused by bacteria, and the most common etiological agents are group A streptococcus, Moraxella catarrhalis, nontypeable Haemophilus influenzae, and Staphylococcus aureus.[3,4] A considerable number of cases are still brought on by viruses , and antibiotic treatment is not anticipated to have any impact on the outcome. [5]

Alarms have been raised concerning the appropriateness of using aminopenicillins (like amoxicillin) as the usual first-line antibiotic for uncomplicated AOM due to the rising incidence of beta-lactamase-producing (penicillin-resistant) strains of H influenzae and M catarrhalis. Amoxicillin remains to be as effective as any other oral antibiotic medication for treating children AOM, despite theoretical worries about its declining value. For otitis media brought on by bacteria that are either penicillin-susceptible or -resistant to penicillin, it really works just as well as extended range, penicillinase-resistant oral medications. [6]

The majority of comparative studies of antimicrobial treatment in AOM have been unable to establish a difference in the efficacy of amoxicillin against any other drug. The cost of the newer, broader spectrum, penicillinase-stable antimicrobial agents is significantly higher than that of amoxicillin, and their use may be linked to comparatively high rates of side effects as well as increase the pressure for the selection of bacteria strains that are multi-antibiotic-resistant. Amoxicillin is still the treatment of choice for simple AOM owing to its outstanding "track record" (for infections caused by penicillin-susceptible and -resistant bacteria), cheap cost, safety, and patient acceptance.[7,8]

Tympanometry used to detect middle ear pathology which help to detect abnormality during otitis media also. Tympanogram tracings were classified as type A (normal), type B (flat, clearly abnormal), and type C (indicating a significantly negative pressure in the middle ear, possibly indicative of pathology). [9] Type B curve with normal canal volume was consider as conclusive evidence of fluid in the middle ear space according to Jerger's classification. [9]

With this background current study was done to determine changes in tympanometry pattern among acute suppurative otitis media patients at pre-treatment and post-treatment after 7 days of antibiotic therapy.

METHODOLOGY

Present cross-sectional survey was done among patients of Came to Outpatient department of Otorhinolaryngology at SAMC & PG Institute, Indore, from April 2021 to September 2022 with complaint of ear pain with or without fever.

In our study we included patients of age group between 5 years to 50 years. Patients with antibiotic use 30 days prior to Outpatient Department visit, patients with perforated otitis media and previous complications secondary to Otitis Media were excluded.

Systematic review by Monasta L. et al on the burden of OM worldwide projected that 10.8 new AOM episodes occur per 100 persons per year. Children under the age of five are thought to experience roughly 51% of the overall yearly number of new AOM cases.[10] Considering this fact, we took prevalence of AOM in younger age approx. 5% half of total prevalence after excluding children below 5 years of age. So, calculated sample size was $4pq/l^2 = (4*5*95)/(5)^2 = \mathbf{76}$, where we have considered 95% confidence interval with absolute error 5% and significance level 0.05.

Portable tympanometer with 226 Hz tone was used for tympanometry. The probe was placed snugly in the external ear canal. A sound stimulus generator transmits acoustic energy into the canal while a vacuum pump introduces positive and negative pressures into the ear canal. A microphone in the instrument detects returning sound energy. After obtaining tympanogram each Adult patient was provided with Tab. Amoxicillin (500mg) + Potassium Clavulanate (125mg) + Tab. Phenylephrine (4.0 Mg) + Chlorpheniramine / Chlorphenamine (10.0 Mg). Per oral 12 hourly for 7 days and Oxymetazoline nasal solution IP (0.05%) nasal drop 2 drop 8 hourly, with Steam inhalation intranasal drop 8 hourly for 7 days.

For paediatric patients Amoxicillin 40 mg per kg in 2 divided doses use for children up to 25 kg then after we started adult dose. Chlorphenamine given according to age group as 1 to 6 years: 1mg, 6-12 years: 2mg and for children more than 12 years 4mg considering 0.35mg/kg/day every 6 hourly and if child is more than 25 kg, we started adult dose. For children below 12 years we gave 2-3 spray of 0.25% Phenylephrine in each nostril twice a day for 7 days.

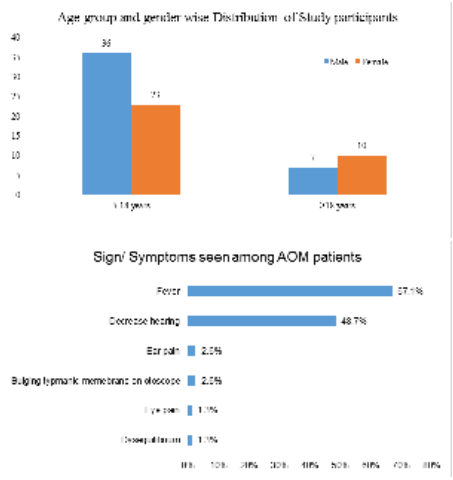
Patients' tympanometry curve was compared after 7 days of antibiotic treatment. Chi-square test was performed with 95% confidence

interval and significance level of p value less than 0.05 to determine whether tympanometry pattern change before and after antibiotic treatment for 7 days.

RESULT:

Current study included 76 patients with acute otitis media, among them majority (59,78%) were between 5 to 18 years of age.

Overall, male (57%) was more affected than female (43%). Out of total 59 patient below 18 years, 61% were male and 39% were female. Whereas, among adult patient 41% were male and 59% were female showing higher prevalence among female in older age group.



Out of total 76, 51 patients gave history of fever, 37 had decrease hearing, ear pain and bulging tympanic membrane was seen among two patients. Disequilibrium and eye pain which is rarely seen among adult patients was present in only one patient.

Comparison of tympanometry before and after treatment

Tympanometry	Before treatment	After treatment
A / C	14 (18.4%)	70(92.1%)
B	67(88.2%)	6(7.9%)
Chi-square value: 88.23	df= 1	p value: <0.0001*

Out of 76 AOM patients, 88.2% of patients had B curve on tympanometry on their first visit. After antibiotic treatment tympanometry was done on 7th day again. On 7th day follow up only 6 patients had abnormal curve. There was a significant difference found in tympanometry curve type which shift significantly from abnormal type B flat curve to Normal type A curve after 7 days of given selected treatment with antibiotics and analgesics along with inhalation therapy.

None of the study participants had developed anu complication on 7th day follow up examination. None of the patient had ear pain or fever on follow up visit. Only one patient had disequilibrium which was later diagnosed with Meniere's disease.

DISCUSSION:

Acute otitis media equally prevalent in both genders.[11] In current research overall, male study participants were more compared to female. However, in older age group females were more affected than males which might be due to tolerance capacity of pain among female is low compared to male and female is more likely take care of children and they are more in close contact with patients that may leads to get more chances of respiratory infection from children which is common risk factor to develop otitis media. Such environmental fact which influences development of Acute otitis media is studied by Ellen K. et al.[12]

A "Type B" tympanogram with a normal canal volume accurately diagnose this issue.[9] We have done tympanogram before giving any antibiotics to the patients and found 67 (88.2%) patients with type B curve. Our study finding is in parallel with the conclusion documented by Anwar et al. where the diagnostic value of tympanometry was; Sensitivity 85.85%, Specificity 72.22%, PPV 94.44%, NPV 48.14% and Accuracy of 83.76%. [9]

As per Recent advances in otitis media literature by Pelton S. et al. [13] symptoms involve in initial stage is hearing loss or aural fullness but typically do not involve pain or fever which is partially contradictory to our study findings where majority of patients had fever followed by decrease in hearing capacity and only two had ear pain. However, In children Ear pain is the most consistent symptom of AOM, where 50–60% of children with AOM complain of ear pain. [14]

After doing initial tympanometry all patients were prescribed with antibiotics and analgesics. Our choice for amoxicillin-clavulanate is justified by the drug's broad spectrum activity, which will cover the majority of otopathogens. The patient with AOM should take a recommended antibacterial medication that is effective against S. pneumoniae, nontypeable H. influenzae, and M. catarrhalis.

Based on the few research that have been done, S. aureus may possibly be a significant pathogen in adults. S. aureus- and beta-lactamase-producing H. influenzae or M. catarrhalis- and AOM caused by H. influenzae cannot be treated with even large doses of amoxicillin. Beta-lactamase inhibitors are ineffective against penicillin-resistant S. pneumoniae because the mechanism of resistance is different, and the addition of clavulanate does not increase the coverage for these organisms.[15,16]

However, this resistance can typically be overcome by the increased dose of amoxicillin mentioned above. Although the majority of penicillin-resistant S. pneumoniae isolates in AOM often exhibit only partial, not complete penicillin resistance, high doses of amoxicillin are effective against these strains.[17]

While there are guidelines for teenagers, there are none for adults on the selection of an antibiotic for the treatment of AOM. In addition, there are guidelines from society for the selection of an antibiotic in the management of acute bacterial sinusitis in adults, an illness with a microbiology comparable to AOM.[18] We provide antibiotics for seven days as high-quality data about the ideal length of therapy are unavailable.[19]

On 7th day follow up tympanometry, only 6 patients had flat curve (Type B) else had normal curve. Tympanometry changes in patients from on OPD visit to 7th day post treatment was statistically significant as given treatment proven to work best for the Acute otitis media patients.

Untreated AOM may threat to development of intratemporal and cerebral infections. These illnesses have a high morbidity rate. Adults are significantly less likely to have serious problems (1 in 100,000 children compared to 1 in 300,000 adults per year).[20] Almost 80% of serious complications are intra-temporal in nature (mainly mastoiditis).[20] The other serious intracranial complications are intracranial abscess and meningitis. In contrast to chronic OM, acute OM causes the majority of serious consequences. Hearing loss is a persistent consequence in around 1 in 4 cases.[20] In current study none of the study participants had develop any complication.

CONCLUSION:

Tympanometry provides useful quantitative information about the presence of fluid in the middle ear, mobility of the middle ear system, and ear canal volume. Amoxicillin with Potassium Clavulanate had significant effect to treat patients with AOM within 7 day duration and shifting tympanometry curve from type B to Normal. Symptoms of patients resolved within 7 days of treatment.

REFERENCES:

1. Diagnosis and management of acute otitis media. Pediatrics [Internet]. 2004 May [cited 2023 Feb 13];113(5):1451–65. Available from: https://pubmed.ncbi.nlm.nih.gov/15121972/
2. ONUSKO E. Tympanometry. Am Fam Physician [Internet]. 2004 Nov 1 [cited 2023 Feb 13];70(9):1713–20. Available from: https://www.aafp.org/pubs/afp/issues/2004/1101/p1713.html
3. Antibiotic management of acute otitis media. Paediatr Child Health [Internet]. 1998 Jul 1 [cited 2023 Mar 1];3(4):265. Available from: /pmc/articles/PMC2851349/
4. Ngo CC, Massa HM, Thornton RB, Cripps AW. Predominant Bacteria Detected from the Middle Ear Fluid of Children Experiencing Otitis Media: A Systematic Review. PLoS One [Internet]. 2016 Mar 1 [cited 2023 Mar 2];11(3). Available from: https://pubmed.ncbi.nlm.nih.gov/26953891/
5. Carroll K, Reimer L. Microbiology and laboratory diagnosis of upper respiratory tract infections. Clin Infect Dis [Internet]. 1996 [cited 2023 Mar 1];23(3):442–8. Available from: https://pubmed.ncbi.nlm.nih.gov/8879762/
6. Rosenfeld RM, Vertrees JE, Carr J, Cipolle RJ, Uden DL, Giebink GS, et al. Clinical efficacy of antimicrobial drugs for acute otitis media: metaanalysis of 5400 children from thirty-three randomized trials. J Pediatr [Internet]. 1994 [cited 2023 Mar 1];124(3):355–67. Available from: https://pubmed.ncbi.nlm.nih.gov/8120703/
7. Spoială EL, Stanciu GD, Bild V, Ababei DC, Gavrilovici C. From Evidence to Clinical Guidelines in Antibiotic Treatment in Acute Otitis Media in Children. Antibiotics [Internet]. 2021 Jan 1 [cited 2023 Mar 1];10(1):1–15. Available from:

/pmc/articles/PMC7825459/
8. Sakulchit T, Goldman RD. Antibiotic therapy for children with acute otitis media. Canadian Family Physician [Internet]. 2017 Sep 1 [cited 2023 Mar 1];63(9):685. Available from: /pmc/articles/PMC5597011/
9. Anwar K, Khan S, Habib-ur-Rehman, Javaid M, Shahabi I. Otitis media with effusion: Accuracy of tympanometry in detecting fluid in the middle ears of children at myringotomies. Pak J Med Sci [Internet]. 2016 [cited 2023 Mar 3];32(2):466. Available from: /pmc/articles/PMC4859046/
10. Monasta L, Ronfani L, Marchetti F, Montico M, Brumatti L, Bavcar A, et al. Burden of disease caused by otitis media: Systematic review and global estimates. PLoS One. 2012 Apr 30;7(4).
11. Mcfadden DM, Berwick DM, Feldstein ML, Marter SS. Age-specific patterns of diagnosis of acute otitis media. Clin Pediatr (Phila) [Internet]. 1985 [cited 2023 Mar 3];24(10):571–5. Available from: https://pubmed.ncbi.nlm.nih.gov/4028615/
12. Kvestad E, Kværner KJ, Røysamb E, Tambs K, Harris JR, Magnus P. Otitis media: genetic factors and sex differences. Twin Res [Internet]. 2004 Jun [cited 2023 Mar 3];7(3):239–44. Available from: https://pubmed.ncbi.nlm.nih.gov/15193168/
13. Pelton S, journal ELTP infectious disease, 2009 undefined. Recent advances in otitis media. journals.lww.com [Internet]. [cited 2023 Mar 3]; Available from: https://journals.lww.com/pidj/Fulltext/2009/10001/Recent_Advances_in_Otitis_Media.00004.aspx
14. Shaikh N, Hoberman A, Paradise JL, Rockette HE, Kurs-Lasky M, Colborn DK, et al. Responsiveness and construct validity of a symptom scale for acute otitis media. Pediatr Infect Dis J [Internet]. 2009 [cited 2023 Mar 3];28(1):9–12. Available from: https://pubmed.ncbi.nlm.nih.gov/19077916/
15. The emergence of resistant pneumococcus as a pathogen in childhood upper respiratory tract infections [Internet]. [cited 2023 Mar 3]. Available from: https://pubmed.ncbi.nlm.nih.gov/7761712/
16. Jacobs MR, Dagan R, Appelbaum PC, Burch DJ. Prevalence of antimicrobial-resistant pathogens in middle ear fluid: multinational study of 917 children with acute otitis media. Antimicrob Agents Chemother [Internet]. 1998 [cited 2023 Mar 3];42(3):589–95. Available from: https://pubmed.ncbi.nlm.nih.gov/9517937/
17. Thanaviratananich S, Laopaiboon M, Vatanasapt P. Once or twice daily versus three times daily amoxicillin with or without clavulanate for the treatment of acute otitis media. Cochrane Database Syst Rev [Internet]. 2008 [cited 2023 Mar 3];(4). Available from: https://pubmed.ncbi.nlm.nih.gov/18843673/
18. Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, Brook I, Ashok Kumar K, Kramper M, et al. Clinical practice guideline (update): adult sinusitis. Otolaryngol Head Neck Surg [Internet]. 2015 Apr 6 [cited 2023 Mar 3];152(2 Suppl):S1–39. Available from: https://pubmed.ncbi.nlm.nih.gov/25832968/
19. Acute otitis media in adults [Internet]. [cited 2023 Mar 3]. Available from: https://www.uptodate.com/contents/acute-otitis-media-in-adults
20. Acute Otitis Media in Adults (Causes, Symptoms and Treatment) | Patient [Internet]. [cited 2023 Mar 3]. Available from: https://patient.info/doctor/acute-otitis-media-in-adults