

Audiological profile in children with chronic adenotonsillitis

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Abstract

Background

Adenotonsillitis is the hypertrophy of the Tonsil and adenoid tissues in the oropharynx and nasopharynx respectively which results in obstruction of the eustachian tube (ET) due to edema by mechanical obstruction leading to otitis media with effusion (OME) which can result in hearing impairment in the child and interferes with the child's social development, language and behaviour which can remain unnoticed for a long time. Hence screening of the children should be done routinely to detect it earlier.

Method

It is a prospective study done in department of ENT, Saveetha medical College and hospital between February 2022 to september 2022. 30 cases of children with chronic adenotonsillitis were included in the study after meeting the inclusion criteria their demographic details, examination findings including pure tone audiometry(PTA) and tympanogram were noted for analysis.

Results

Of the total 30 patients taken, 50% showed bilateral normal hearing , 40% showed bilateral mild hearing loss and a minority 10% showed bilateral moderate hearing loss. The tympanogram results showed the right ear with majority of 70% with B type curve on both right and left ear.

Conclusion

Audiological screening for all children diagnosed with chronic adenotonsillitis should be made mandatory to detect the hearing impairment at an early stage and try to treat accordingly.

Key words: adenoids, adenoid hypertrophy, hearing loss, conductive hearing loss, tonsils, tympanogram, pure tone audiometry, screening.

INTRODUCTION

The adenoids are a mass of lymphoid tissue behind the nasal cavity in the nasopharynx that is at the junction of roof and posterior wall of nasopharynx. These adenoids along with other lymphoid tissues like faecal, lingual and tubal tonsils forms the waldeyer's ring and results in priming the immunity in infancy. Adenoiditis is the result of inflammation of adenoids tissue resulting from various factors like chronic infections, laryngopharyngeal reflux and allergies. (1,2)

The grading of the adenoids on x ray neck lateral view or x ray nasopharynx, the adenoid nasopharyngeal ratio range from 0 to 4 grades being according to Clemens and McMurray grading of adenoid hypertrophy(11)

Grade 1 - adenoid tissue filling one third of the vertical portion of choana

Grade 2- adenoid tissue filling from one third to two third of the choana

Grade 3- adenoid tissue filling from two third to nearly complete obstruction of the choana

Grade 4- complete obstruction of choana

The X ray was done in lateral view with the child in head fixed and erect position. The adenoid size is obtained by drawing a perpendicular line from anterior margin of basiocciput to the maximum concavity of adenoid tissue. The nasopharynx size was calculated by drawing a line between posterosuperior edge of hard palate and anteroinferior edge of sphenobasioccipital region.(4) Adenoid hypertrophy itself can be a predisposing factor for various conditions like obstructive sleep apnoea by causing significant reeducation in upper airway, otitis media with effusion caused by obstruction of the Eustachian tube opening leading to middle ear diseases and conductive hearing loss. Long term adenoid hypertrophy in children can lead to adenoid facies like retrognathic mandible and high arched palate.(5)

Otitis media with effusion is known as one of the most common causes of hearing loss in children. OME which occurs as a result of ET obstruction or damage can resolve spontaneously within 2-3 days or may result in hearing impairment that can last for about a year. Pathologically otitis media with effusion occurs from alteration in mucociliary clearance within the middle ear which is characterised by fluid in the middle ear behind an intact tympanic membrane.(6)

In most of the cases the hearing impaired ENT in the children goes unnoticed and goes undetected as the child is mostly too young and unable to convey or express the hearing impairment and the parents can also not be attentive in detecting this due to unawareness about it.(7) Therefore this condition has to be detected as early as possible and appropriate management must be provided to the child to ensure a better quality of life.

Clinical examination, radiological and audiological assessment should be used as a screening tool for diagnosis to detect the presence of hearing impairment in the children with chronic adenoid hypertrophy. The gold standard investigation. Is tympanometry. The treatment can be medical or surgical management. Medical management includes steroid nasal sprays and surgical management includes adenoidectomy by various techniques using adenoid curette, endoscopic adenoidectomy , microdebrider assisted adenoidectomy(8,9,10)

This study is aimed at evaluating the audiological Profile of the children with chronic adenotonsillitis and study the hearing in these children.

OBJECTIVES

To evaluate the audiological profile in children with chronic adenotonsillitis using pure tone audiometry and impedance audiometry.

METHODOLOGY

This is a prospective study done after obtaining ethical clearance from the institutional ethical committee during the period of February 2022 to September 2022 in the ENT department of Saveetha medical college and hospital. This study includes 30 patients with symptoms and findings suggestive of adenoid hypertrophy by convenience sampling. This study was conducted in children coming to the ENT OP meeting the following inclusion criteria.

Inclusion criteria

- Children aged between 3-18 years with chronic adenostonsillitis.
- The parents/guardians of the children willing to give informed consent were included in this study.

Exclusion criteria

- Children age <3 and >18years.
- Children with congenital ear deformities

- Children with congenital anomalies
- Children with septal deviation
- H/O previous ear surgeries and adenoidectomy
- H/O allergic rhinitis were excluded from the study
- H/O of previous documented hearing loss,

After obtaining approval from the ethics committee and getting the written informed consent from the parents/guardians of the children, the ones who fulfilled the inclusion criteria were enrolled in the study.

From the enrolled cases their complete history including demographic details, previous history , examination findings of ear, nose ,throat and nasopharynx were noted. Along with that the radiological investigation X- ray nasopharynx and audiometry (including PTA and tympanogram) results were noted. The adenoid nasopharyngeal ratio (ANR) was noted based on the x ray. Though x ray is a convenient procedure it is found to be less accurate and hence endoscopy is found to be more accurate.

RESULTS

A total of 30 patients diagnosed with chronic adenotonsillitis by clinical and radiological methods in saveetha medical college, department of ENT were considered for the study after obtaining consent from the parent or the guardian. In this study 19 (63.3%) were male and 11 (36.7%) were female. Male gender were more in the study compared to the females. With the male female ratio of 1.7:1.

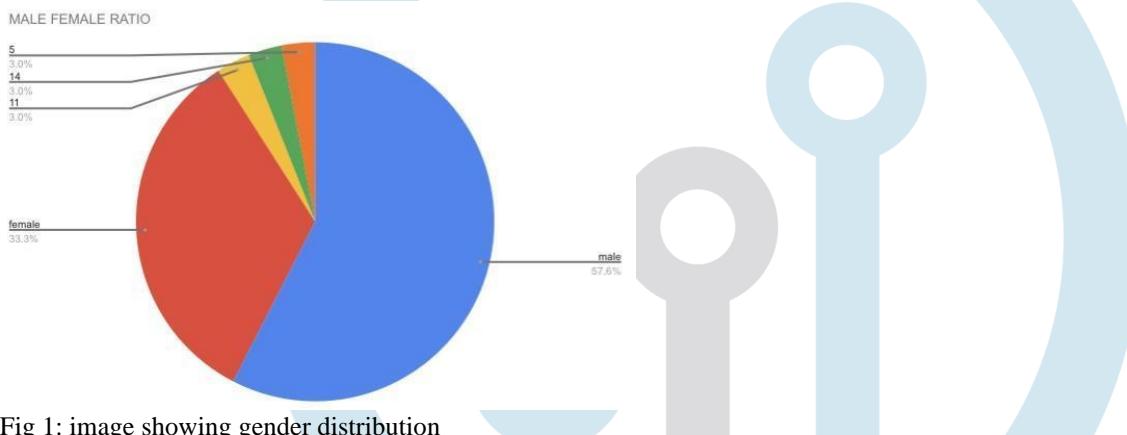


Fig 1: image showing gender distribution

When distribution among the age were analysed the average age was around 9 years. 36.7% of the children fell under the age group of 3 to 7 years, 46.7% of the children fell under the age group of 8 to 12 years and 16.7% of the children fell under the age group of 13 to 18 years. The maximum number of children fell under the age group of 8 to 12 years. 11 children under the age group of 3 to 7 years. 14 children under 8 to 12 years and 5 children under the age group of 13 to 18 years.

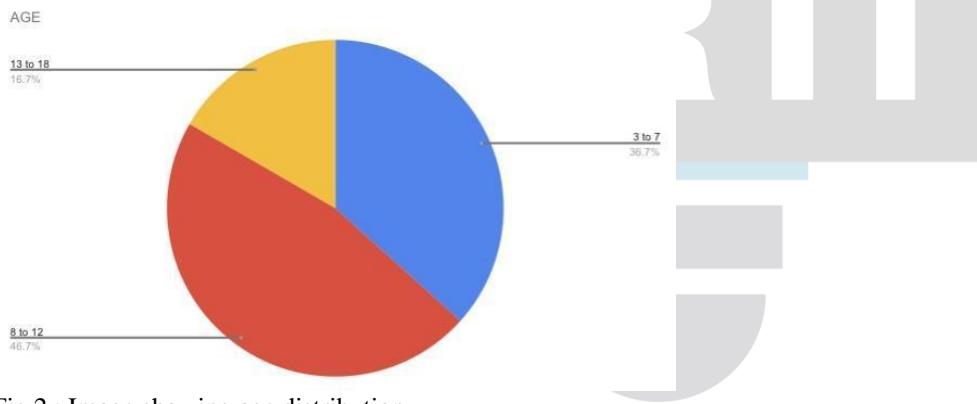


Fig 2 : Image showing age distribution

Most of the children Were observed to have adenoid facies. Examination showed features including, majorly open mouth breathing, high arched palate and crowded teeth.

On radiological examination the AN ratio grading was done and was found that most of the children had grade 2 adenoid hypertrophy that is adenoid tissue filling from one third to two third of the choana (33.3%) followed by grade 1 that is adenoid tissue filling one third of the vertical portion of choana(26.7%) followed by grade 3 and 4 (20%) that is adenoid tissue filling from two third to nearly complete obstruction of the choana And complete obstruction of choana respectively.

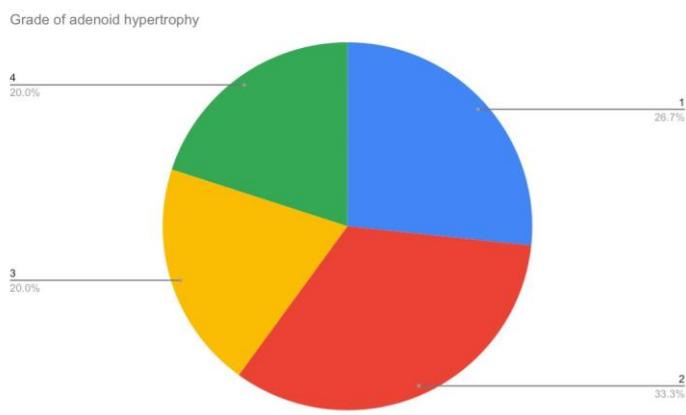


Fig 3 : image showing x ray grading of adenoid hypertrophy

The pure tone audiometry was done to identify any hearing loss in these children, average of 25.49dB in right ear and 25.12dB in left ear ,collectively 15 children (50%) of the children had normal hearing , 12 children (40%) showed mild hearing loss and 3 children (10%) showed moderate hearing loss according to the WHO hearing loss criteria. Further 11 children (36.7%) had air bone gap of 11 to 20 dB, 12 childrens (40%) had ABG of 21 to 30 dB being the highest count of children, 3 children (10%) showed 30 to 40dB of ABG and 4 children (13.3%) had an ABG of > 40dB.

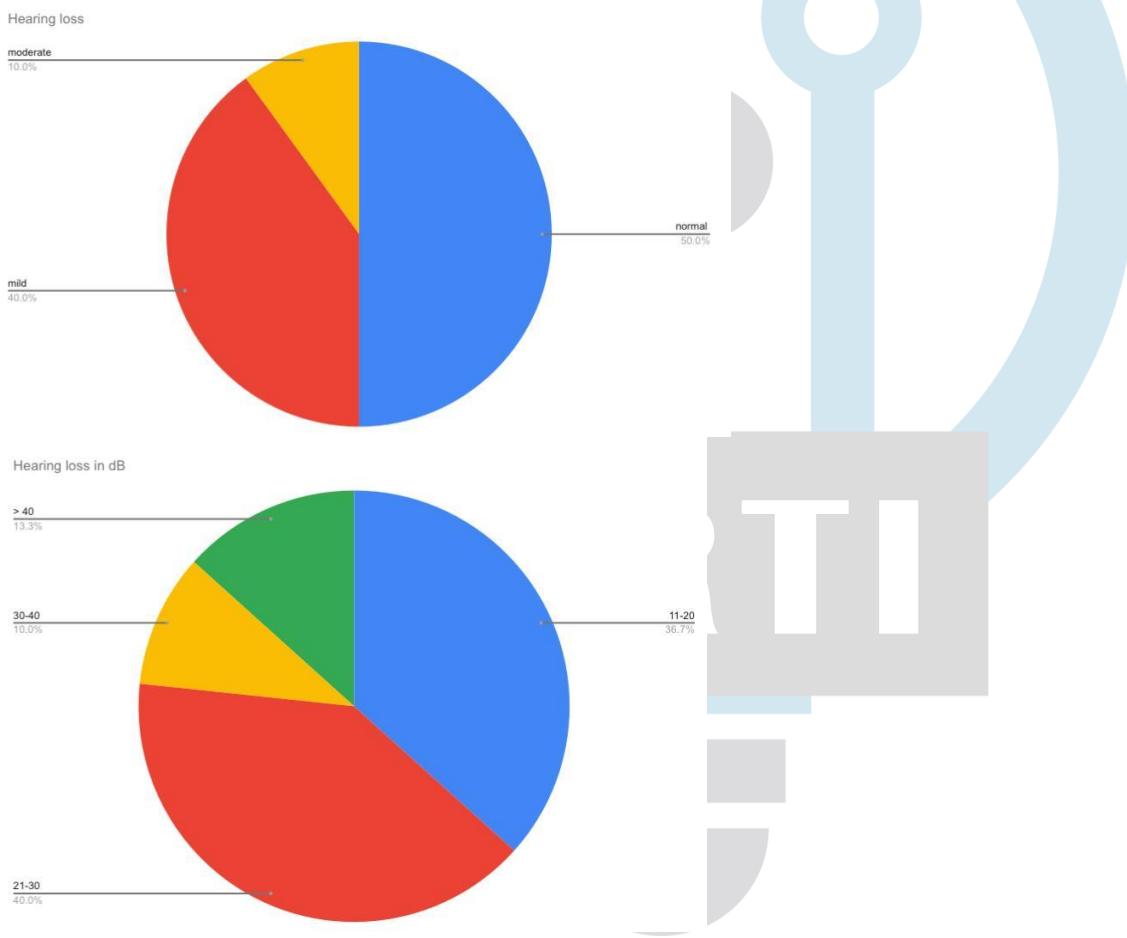


Fig 4 and 5 : image showing hearing loss and Air bone gap on pure tone audiometry

The mean hearing loss in these children in the right ear was 24.91 ± 3.627 (+/- 14.56%) with standard deviation of 10.134 and a margin of error of 1.8 highest dB loss being 46 and lowest being 11.6dB.
The mean hearing loss in the left ear of these children was 25.12 ± 3.541 (+/- 14.10%) and standard deviation of 9.896 with a margin of error being 1.80 and a highest being 43 dB and lowers being 11 dB hearing loss in the left ear.

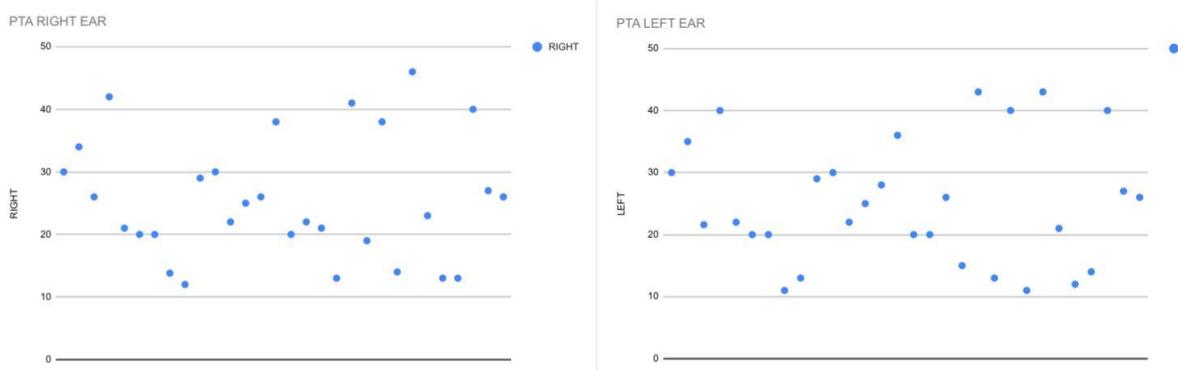


Fig 6: images showing hearing loss on PTA

Tympanogram was done separately for both the ears and the results of the right ear were 70% of the children had B type curve, 13.3% had Ad type curve, 10% had C type curve followed by 6.7% with A type. Results of left ear are as follows 70% had B type, 23.3% had A type and 6.7% showed Ad type.

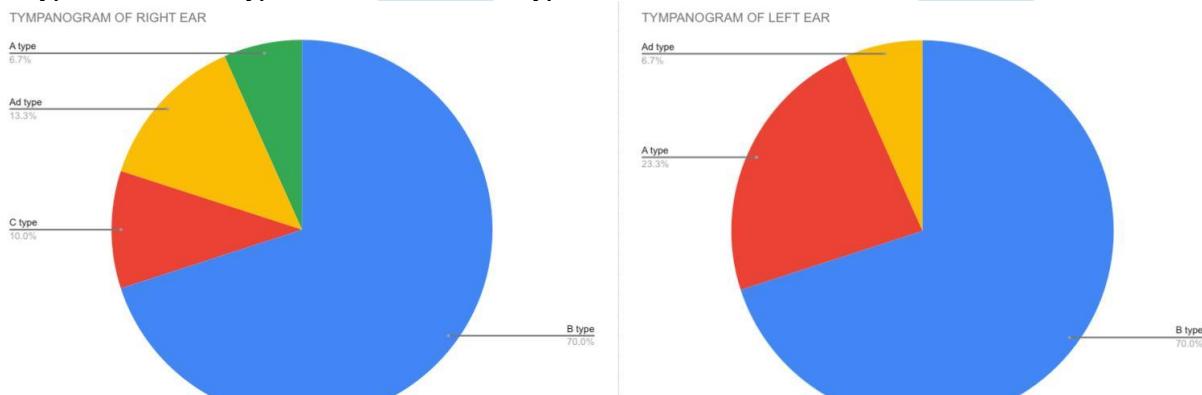


Fig 7: images showing tympanogram of right and left ear

DISCUSSION

Adenoid hypertrophy can present with either isolated adenoid enlargement or as adenotonsillitis. Adenoid hypertrophy can present with varying symptoms ranging from snoring, mouth breathing, nasal obstruction, ear symptoms especially impaired hearing, defective speech (hyponasal speech) and sleep apnoea.(12) In a study by Kindermann et al. found that adenoid hypertrophy as a common cause (53%) of nasal obstruction in children.(13)

Hearing plays an important role in the speech and language development of children. The adenoid hypertrophy causes obstruction of the opening of Eustachian tube in the nasopharyngeal end as it is in close proximity to the adenoid tissue causing Eustachian tube dysfunction leading to otitis media with effusion most commonly in children leading to the hearing impairment.

In a study by Jacob et al results showed 10.9% of the children in the school with conductive hearing loss and 5.3% with chronic otitis media.(14)

And in a study by Sarafoleanu et al showed that adenoid hypertrophy was an important cause of Eustachian tube dysfunction leading to OME.(15) In this study with 30 subjects, on pure tone audiometry with tympanogram evaluation , 40% showed mild hearing loss and 10% showed moderate hearing loss.

In a study by Mori et al. They observed that 50% showed type B tympanogram in children with adenoid hypertrophy (16) In this study Approximately 70% of the children showed B type curve on tympanogram indication fluid in the middle ear, probably indicating otitis media with effusion.

Hearing loss during childhood can affect the speech and language perception ability and development to a variable extent. Maw et al in his study suggested that children with otitis media with effusion there was decrease in the child's hearing and language potentials and it interfered with the skills and development.(17) but in a study by Roberts et al found no statistical significance association between the otitis media with effusion and speech and language development.(18)

Limitation of the study- the hearing could have been assessed in the children the postoperative period also in order to see the improvement in the hearing, that is preoperative and postoperative hearing comparisons and assessment could have been done. nd a larger sample size could have been included as the study population.

CONCLUSION

Thus we can conclude that children with adenoid hypertrophy obstructing the choana or obstructing the Eustachian tube opening are likely to have hearing loss and hence regular screening of the children has to be done to detect hearing impairment as it may lead to speech and language development delay.

REFERENCE

1. Heimroth RD, Casadei E, Salinas I. Molecular Drivers of Lymphocyte Organization in Vertebrate Mucosal Surfaces: Revisiting the TNF Superfamily Hypothesis. *J Immunol.* 2020 May 15;204(10):2697-2711.
2. Lasisi AO, Olaniyan FA, Muibi SA, Azeez IA, Abdulwasiu KG, Lasisi TJ, Imam ZO, Yekinni TO, Olayemi O. Clinical and demographic risk factors associated with chronic suppurative otitis media. *Int J Pediatr Otorhinolaryngol.* 2007 Oct;71(10):1549-54.
3. Pathak K, Ankale NR, Harugop AS. Comparison Between Radiological Versus Endoscopic Assessment of Adenoid Tissue in Patients of Chronic Adenoiditis. *Indian J Otolaryngol Head Neck Surg.* 2019 Oct;71(Suppl 1):981-985.
4. M Fujioka LW Young BR Girdany Radiographic evaluation of adenoidal size in children: adenoidal-nasopharyngeal ratioAm J Roentgenol19791333401410.2214/ajr.133.3.401
5. Koca CF, Erdem T, Bayındır T. The effect of adenoid hypertrophy on maxillofacial development: an objective photographic analysis. *J Otolaryngol Head Neck Surg.* 2016 Sep 20;45(1):48.
6. Caylan R, Bektas D, Atalay C, Korkmaz O. Prevalence and risk factors of otitis media with effusion in Trabzon, a city in northeastern Turkey, with an emphasis on the recommendation of OME screening. *Eur Arch Otorhinolaryngol.* 2006; 263 (5):404-8.
7. International Journal of Otorhinolaryngology and Head and Neck SurgerySatish HS et al. *Int J Otorhinolaryngol Head Neck Surg.* 2020 Jan;6(1):169-176
8. Bross Soriano D, Schimelmitz-Idi J, Arrieta-Gomez JR. Endoscopic adenoidectomy; use or abuse of the technology? Cir. 2004;72(1):15-9.
9. Becker SP, Roberts N, Coglianese D. Endoscopic adenoidectomy for the relief of serous otitis media. *Laryngoscope.*1992;102:1379-84.
10. Rodriguez K, Murray N, Guarisco JL. Power assisted partial adenoidectomy. *Laryngoscope.* 2002; 112:26-8.
11. Clemens J, McMurray JS, Willging JP. Electrocautery versus curette adenoidectomy: comparison of postoperative results. *Int J Pediatr Otorhinolaryngol.*1998;43(2):115-22.
12. Mlynarek A, Tewfik MA, Hagi A, Manoukian JJ, Schloss MD, Tewfik TL et al. Lateral neck radiography versus direct video rhinoscopy in assessing adenoid size. *J Otolaryngol.* 2004; 33(6):360-5.
13. Kindermann CA, Roithmann R, Neto JFL. Sensitivity and specificity of nasal flexible fiberoptic endoscopy in the diagnosis of adenoid hypertrophy in children. *Int J Pediatr Otorhinolaryngol.* 2008;72(1):63-67. doi:10.1016/j.ijporl.2007.09.013.
14. Jacob A, Rupa V, Job A, Joseph A. Hearing impairment and otitis media in a rural primary school in South India. *Int J Pediatr Otorhinolaryngol.* 1997;39(2):133-138. doi: 10.1016/S0165-5876(96)01479-6.
15. Sarafoleanu C, Enache R, Sarafoleanu D. Eustachian Tube Dysfunction of Adenoid Origin. *Therapeutics, Pharmacology and Clinical Toxicology.* 2010;14(1):36-40.
16. Mori H, Kitahara K, Kita M, Takahashi H, Nakai Y. Analysis of tympanograms in relation to the treatment of adenoid vegetation. *Nippon Jibinkoka Gakkai Kaiho.*1980;83(4):415-23.
17. Maw R, Wilks J, Harvey I, Peters TJ, Golding J. Early surgery compared with watchful waiting for glue ear and effect on language development in preschool children: a randomised trial. *Lancet Lond Engl.* 1999;353(9157):960-963. doi: 10.1016/S0140-6736(98)05295-7.
18. Roberts J, Rosenfeld RM, Zeisel SA. Otitis media and speech and language. *Pediatrics.* 2004;113(3):238-248.