



# Association of asymptomatic otitis media with effusion in patients with adenoid hypertrophy

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## ABSTRACT

Objective Clinical symptoms of otitis media with effusion are rarely brought forward to the guardians of young children who the disease is most prevalent in. This often leads to poor scholastic performances and difficult social interactions. The objective of this study was to identify asymptomatic cases of otitis media with effusion present in individuals with adenoid hypertrophy. Material and Methods In a cross sectional study advocated in Justice K.S.Hegde Hospital, Karnataka India we evaluated one hundred patients above the age of three from August 2016 to December 2017. Candidates who presented with an adenoid nasopharyngeal ratio of more than 0.5 were selected for the study. Individuals who complained of otological symptoms were not considered for the study. Patients cleared of other pathological otological conditions were underwent audiological evaluation with pure tone audiometry and tympanometry for evaluating the middle ear status and hearing loss. Results The study showed a total of 36% of patients evaluated presented with asymptomatic otitis media with effusion. In candidates who presented with a bilateral B tympanogram, 40% had significant conductive hearing loss of more than 25dB. Conclusion An objective test such as impedance audiometry in all patients with adenoid hypertrophy would aid in the diagnosis of fluid in the middle ear, so that timely intervention can be done and possible complications be averted.

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## 1. Introduction

Otitis media with effusion (OME) is defined as a clinical condition of the middle ear in which effusion is present behind intact tympanic membrane without signs of acute inflammation (Sade et al., 1989). Patients commonly present with a fluctuating hearing loss or the condition remains largely undetected or asymptomatic (Broning et al., 2008; Austin et al., 1989).

Otitis media with effusion could manifest due to the mechanical obstruction of the Eustachian tube opening resulting in poor ventilation of the middle ear. Adenoid hypertrophy which is a

condition predominantly seen in a younger age group is identified as a cause of OME due to the proximity to the nasopharyngeal end of the Eustachian tube to the enlarged lymphoid tissue (Austin et al., 1989; George et al., 2008; Gleeson et al., 2008). Approximately 95% of preschool children are said to experience at least one episode of otitis media with effusion (Tos et al., 1984). The classical symptoms are rarely brought forward by the affected individual. Poor performance in school and parental concerns about loss of hearing loss, language development, and behaviour eventually lead to a clinical evaluation (National Institute for Health and Clinical Excellence, 2008a; Williamson, 2011; Rosenfeld et al., 2003).

Diagnosis of otitis media with effusion can be made by clinical examination of the tympanic membrane and objectively with pure tone audiometry and impedance audiometry. The presence of a “B” type tympanogram remains the most reliable non-invasive investigation for otitis media with effusion (Yellon et al., 1995a; Gunel et al., 2014).

Myringotomy acts as both a diagnostic and therapeutic tool for the management of otitis media with effusion with surgical

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intervention only being advised if there is significant hearing loss identified during evaluation (Cummings - Andrew et al., 2005).

The purpose of this study was to identify asymptomatic cases of otitis media with effusion in patients with adenoid hypertrophy.

**2. Materials and method**

This was a cross sectional study carried out in KS Hegde Medical Academy involving one hundred patients selected on the basis of symptoms of adenoid hypertrophy without any previous otological complaints between the period of August 2016 and December 2017.

An Adenoid nasopharyngeal ratio of more than 0.5 considered as significant adenoid hypertrophy. The posterosuperior edge of sphenobasioccipital synchondrosis and the basion identified on the lateral x ray of the nasopharynx was used as a base line to measure the nasopharyngeal depth. This was used in comparison to a point of adenoid tissue with the closest proximity to the posterior nasal spine to determine the adenoid nasopharyngeal ratio (Mygind et al., 1981). A range between 0.5 and 0.75 was categorised as grade 3 adenoid hypertrophy and 0.75 or more was regarded as grade 4 adenoid hypertrophy. Every candidate who presented with symptoms of adenoid hypertrophy were subjected to an X ray of the nasopharynx.

The majority of the study sample being children resulted in many being uncooperative for nasal endoscopy.

All the candidates also underwent pure tone audiometry along with impedance audiometry (Grason-Statler, TymStar Pro™ v2, United States) to evaluate the level and the type of hearing loss. Individuals who had sensorineural hearing loss were excluded from the study.

Routine otorhinolaryngological examinations were done to rule out the possibility of acute otitis media, tympanic membrane perforations and to ensure the external auditory canal was clean prior to audiological examination.

*2.1. Inclusion criteria*

- An adenoid nasopharyngeal ratio of more than 0.5
- An intact tympanic membrane.

*2.2. Exclusion criteria*

- Sensory neural hearing loss
- History of suppurative otitis media/tympanic membrane perforations.
- Below 3 years of age
- Complaints of hearing loss

*2.3. Ethical clearance*

Ethical clearance was obtained on 09/10/15 following approval from members of the institutional committee of NITTE University, KS Hegde Medical College.

*2.4. Statistical analysis*

To calculate the sample size the technique of estimation of proportion was used. The incidence of otitis media with effusion was anticipated to be 5.3% among children. The statistical analysis was based on the law of averages and percentages.

**3. Results**

This study evaluated one hundred candidates with adenoid hypertrophy. Among the evaluated, 56 individuals presented with grade 3 adenoid hypertrophy in comparison to 44 with grade 4 adenoid hypertrophy. Males (54%) were marginally more affected than females (46%).

The majority (56%) of adenoid hypertrophy was present between the ages of 6 and 10 years of age and was less common in those aged 16 and above (4%), with the oldest in our study subjects being 34 years old.

*3.1. Symptoms and clinical findings*

The majority of the candidates presented with a history of mouth breathing (37%) which followed by nasal obstruction (21%) and snoring (15%). Nasal discharge was the primary complaint among the younger candidates which accounted for 8% of the total study group.

*3.2. Tympanic membrane*

The evaluation of the tympanic membranes showed that, 61% of the study group presented with a normal tympanic membrane. Middle ear pathology was identified in the remaining candidates, with 18% demonstrating a distorted cone of light, 11% showing retraction of the pars tensa (Sades 1) and remaining 10% an air fluid level.

*3.3. Audiometric evaluation*

Impedance audiometry showed that 55% of the candidates presented with 'A' type tympanogram. In patients with an 'A' tympanogram 75% had bilateral 'A' type tympanogram, the remaining 25% had either unilateral 'B' type or 'C' type.

Unilateral 'B' tympanogram was identified in 12% of the cases and the remaining 6% identified with having a unilateral 'C' tympanogram. The distribution of this data represented in Fig. 1 above.

A total of 24% of the study subjects presented with bilateral 'B' tympanogram only 3% of the study group presented with a bilateral 'C' type tympanogram. This suggested that a total of 36% of the study population had fluid in the middle ear which was clinically not identifiable, but diagnosed by impedance audiometry.

*3.4. Hearing levels*

Hearing loss with respect to impedance is illustrated in Table 1. There was significant hearing loss seen in patients with bilateral 'B'

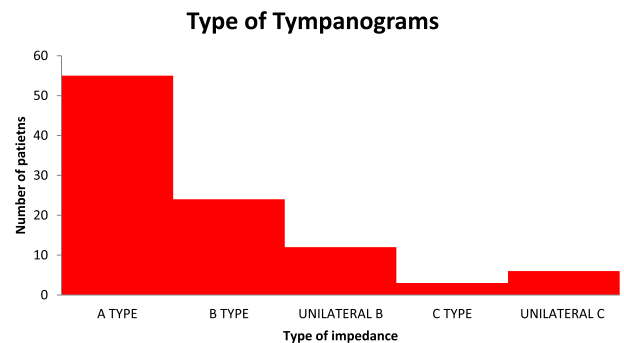


Fig. 1. Types of tympanogram.

**Table 1**  
Average hearing loss in different tympanograms.

Average hearing loss in different tympanograms		
Tympanogram	Right	Left
Bilateral A	12.7	12.8
Bilateral B	23.8	24.0
Bilateral C	13.1	13.9

tympanogram, with an average of more than 20 dB hearing loss.

**3.5. Bilateral type 'B' tympanogram**

This group accounted for 24% of the total number of candidates selected for the study. Within this group 12 patients exhibited significant conductive hearing loss of more than 25 dB.

The average hearing loss in this group evaluated was 23.8 dB in the right ear as compared to 24.0 dB in the left ear. The highest level hearing loss in this group was recorded at 50 dB.

The scatter graph below (Fig. 2) illustrates the distribution of hearing loss among patients with bilateral B tympanograms. The data compares both the right and left ears of each of the candidates and level of hearing loss they presented with. A mark of the 25 dB threshold illustrates the number of candidates who had significant hearing loss. Two of the candidates identified as 5 and 24 presented with similar levels of hearing resulting in overlapping of their data.

**3.6. Unilateral 'B' tympanogram**

This group accounted for 12% of the total sample size, with only three individuals showing significant hearing impairment. The average hearing threshold recorded totalled to 13.8 dB in the right

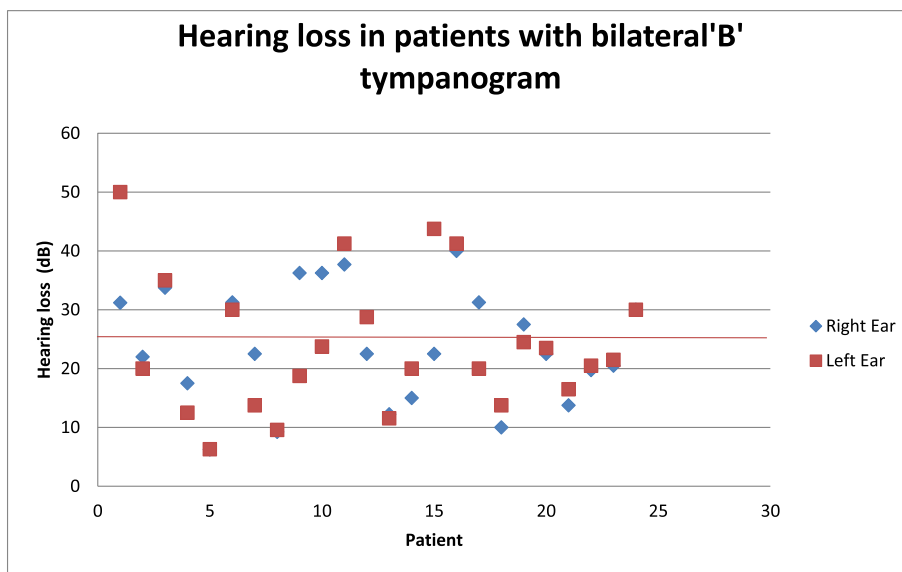


Fig. 2. Hearing loss in patients with bilateral 'B' tympanogram.

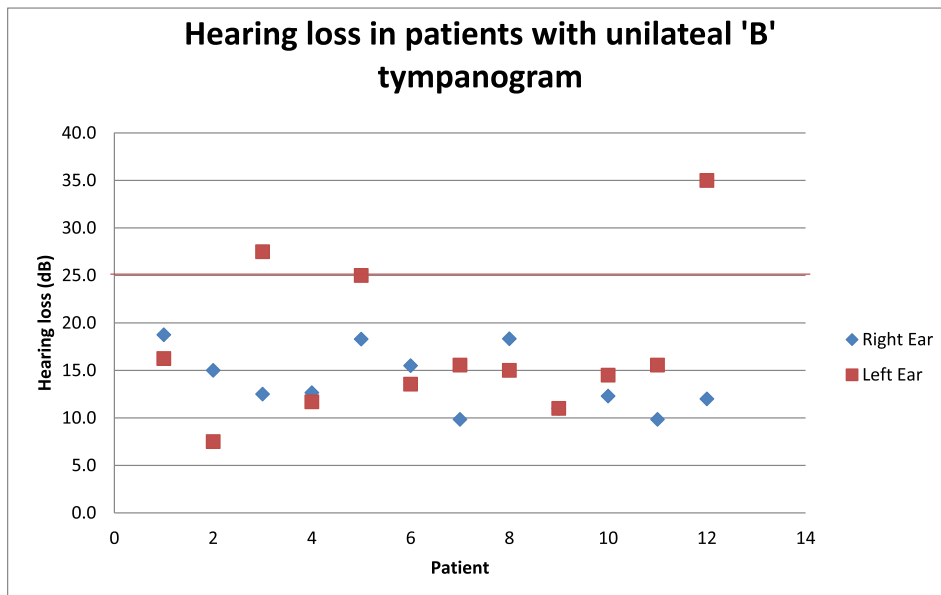


Fig. 3. Hearing loss in patients with unilateral 'B' tympanogram.

ear and 17.3 dB in the left ear.

A similar graph below (Fig. 3) illustrates the hearing loss in unilateral B tympanogram. The red line demarcates the 25 dB hearing level.

#### 4. Discussion

Nearly 90% of preschool children experience at least one episode of otitis media with effusion according to Tos M. et al. (Tos et al., 1984) who studied the epidemiology and natural history of secretory otitis media. The predominant symptom associated with effusion in the middle ear is mild and fluctuant hearing loss; this however almost always remains unidentified as per the report of the National Institute for Health and Clinical Excellence in a study conducted for the evaluation of surgical management of otitis media with effusion in 2008 (National Institute for Health and Clinical Excellence, 2008b). Williamson et al. (Williamson, 2011) and Rosenfeld RM et al. (Rosenfeld et al., 2003) stated that hearing loss is only identified once parental concerns about hearing, language development, behaviour, or school performance are raised.

The majority of the candidates we evaluated between 6 and 10 years of age, accounted for 56% of the study group, the youngest was 3 year old boy. Tos M et al. (Tos et al., 1984) and Casselbrant ML et al. (Casselbrant et al., 1985) observed that otitis media with effusion is most prevalent in children aged between 4 years and 8 years.

Casselbrant ML et al. (Casselbrant et al., 1985) evaluated children attending child care centres routinely, at regular intervals for a period of one year, his results showed that about 50% of children attending child care centres suffered from secretory otitis media. A study by Lous J et al. (Lous and Fiellau-Nikolajsen, 1981) suggests the incidence of OME decreases with age with only 25% of school going children being affected.

There were only four patients above the age of 16 years with adenoid hypertrophy in our study, with the oldest patient being 34 years old. Jeans W.D et al. (Jeans et al., 2014) in a study measuring the progression in the size of the nasopharynx claimed that soft tissue reduces in size to expanding nasopharynx past the age of 13 years. This prevents the obstruction of the eustachian tube unless there is laterally placed adenoid tissue.

The manifestation of otitis media with effusion in younger children is harder to diagnose due to poor communication skills leading to signs and symptoms being lost in translation or a lack of awareness by the patient. In our study the highest level of hearing impairment was 50 dB, in a 7 year old who presented with mouth breathing. Williamson IG et al. (Williamson et al., 1994), Paradise JL et al (Paradise et al., 1997), and Sorenson CH et al. (Sorenson et al., 1981) evaluated healthy children aged between the ages of 1 and 5 years. Their studies showed that 15%–40% of children had undiagnosed middle-ear effusion.

Marchant CD et al. (Marchant et al., 1984) and Rosenfeld RM et al. (Rosenfeld et al., 1997) in their respective studies evaluating the course and outcomes of otitis media in early infancy and quality of life for children with otitis media with effusion mentioned neither the affected individuals nor caregiver complained about hearing loss.

Shekelle Pet al (Shekelle et al., 2003) and Rosenfeld RM et al. (Rosenfeld et al., 1997) claimed 'B' tympanogram had 81% sensitivity and 74% specificity in comparison to the definitive invasive surgical procedure of myringotomy for OME. The majority of our patients had an 'A' tympanogram (55%) followed by bilateral 'B' tympanogram which was seen in (24%) and then by unilateral 'B' tympanogram (12%). Only 9% had a 'C' tympanogram. Patients who presented with a bilateral C type tympanogram accounted for 3% of the study with 6% showing a unilateral 'C' tympanogram. There was

no significant hearing loss identified in unilateral 'C' tympanogram.

The result of our study showed that 36% of the patients had fluid in the middle ear. Among those who presented with a bilateral 'B' tympanogram 40% exhibited conductive hearing loss of more than 25 dB. The average hearing loss in this group was 23.8 dB in the right ear as compared to 24.0 dB in the left ear.

Conductive hearing loss is often accompanied by loss of speech perception in noise as stated by Gravel JS et al. (Gravel and Wallace, 1992), Schilder AG et al. (Schilder et al., 1994), Rosenfeld RM et al. (Rosenfeld et al., 1996), Wallace IF et al. (Wallace et al., 1988) and Roberts JE et al. (Roberts et al., 1995) in otitis media with effusion. This however remains neglected or undiagnosed due to the minimal complaints from the patients and guardians. Hearing loss in children with OME evaluated with pure tone audiometry shows hearing loss ranging from normal hearing to moderate hearing loss.

A total of 12.5% of the 200 hundred ears evaluated showed significant hearing loss of more than 25 dB with none of the patients complaining of any hearing impairment.

Wallace IF et al. (Wallace et al., 1988) and Friel-Patti Set al (Friel-Patti et al., 1990) suggested the presence of fluid in the middle ear can delay early language acquisition. Delayed speech and learning is of a greater concern in children who are affected by Down's syndrome as stated by Whiteman BC et al (Whiteman et al., 1986) or cerebral palsy as mentioned by van der Vyver M et al. (Van der Vyver et al., 1988)

The complications of undiagnosed otitis media with effusion can manifest silently with damage to the tympanic membrane as mentioned by Sano S et al. (Sano et al., 1994) and Yellon RF et al. (Yellon et al., 1995b) due to the effects of leukotrienes, prostaglandins, and arachidonic acid metabolites that invoke a local inflammatory response in the collected middle ear fluid. Negative middle ear pressure could also lead to focal retraction pockets or atelectasis of the tympanic membrane which could progress to become a cholesteatoma. To conclude it is worth evaluating adenoid hypertrophy for the presence of otitis media with effusion.

#### 5. Conclusion

As adenoid hypertrophy is a disease predominantly seen in children, neglected symptoms due to a lack of awareness and delayed communication to the guardians can result in silent progressive hearing loss. Impedance audiometry in all patients with adenoid hypertrophy would aid in the diagnosis of fluid in the middle ear, so that early intervention can avert possible complications.

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There is also no financial disclosure as all cases needed mandatory pure tone audiometric evaluation with impedance.

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