

## Original Research Article

# A study on the effect of adenoidectomy with tonsillectomy in otitis media with effusion in children

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## ABSTRACT

**Background:** The aural symptoms attributed to adenoid hypertrophy are Eustachian tube block (ET) and otitis media with effusion (OME). It is thought that adenoid hypertrophy causes a block in air flow through the ET, thus creating a negative pressure in the middle ear leading to effusion which acts as a focus of infection. The role of hypertrophied tonsils in the aetiology of OME is controversial. Adenoid and tonsillar hypertrophy and associated inflammation continue to be a major problem in paediatric age group despite the advances in medicine. Otitis media with effusion is a treatable cause of deafness which may hamper the learning ability of a child. This study was undertaken to study the effect of adenoidectomy with tonsillectomy on established otitis media with effusion in children.

**Methods:** 35 children presenting to the department of ENT, Government Medical College, Thrissur, Kerala, India over one and a half years with features suggestive of secretory otitis media, tonsillar and adenoid hypertrophy who underwent adenoidectomy with tonsillectomy in Government Medical College, Thrissur, Kerala, India were included in the study. A predesigned questionnaire was prepared which included details on clinical symptoms, relevant investigations and preoperative and postoperative evaluation of hearing after 6 weeks and 3 months. Data collected was analyzed using paired t-test and chi square test to determine the improvement in hearing after 6 weeks and 3 months following surgery.

**Results:** Out of the 35 children included in the study, it was seen that 56% of cases, after 6 weeks showed complete resolution of OME which improved to 67% after 3 months. This was assessed by PTA and tympanometry. 33% showed partial improvement with Type C curve in tympanometry and improvement in PTA values.

**Conclusions:** All cases of OME associated with adenoid and tonsillar hypertrophy responded to our treatment with 67% showing complete cure of the condition. It can be assumed that, in the 33% partial responders there may be other factors like allergy, anatomical deformities, immunological which prevented the complete resolution of symptoms in OME.

**Keywords:** Adenoidectomy, Otitis media with effusion, Tonsillectomy

## INTRODUCTION

Disease of adenoids and tonsils are among the most common problems in children. Recurrent upper respiratory tract infections (URTI) affect the adenoids resulting in hyperplasia, nasal obstruction, snoring, mouth breathing and hyponasal speech.<sup>1</sup> The effect of

both obstruction and infection from tonsil and adenoid are seen to cause major ill effect nose and paranasal sinus, eustachian tube and middle ear cleft.<sup>2</sup> It has been postulated that the enlargement of adenoids or repeated infections of adenoids result in Otitis media with effusion (OME).<sup>2</sup> Synonyms of OME include glue ear, serous otitis media, secretory otitis media and chronic

nonpurulent otitis media.<sup>3</sup> OME is the chronic accumulation of mucus within the middle ear and sometimes the mastoid air cell system. The time for the fluid present for this condition to be termed “chronic” is usually at least 12 weeks. OME results from alteration in the mucociliary system within the middle ear cleft which is frequently caused by malfunctioning of Eustachian tube. This is especially prevalent in children with cleft palate, recurrent upper respiratory tract infection, allergic rhinitis, ciliary abnormalities and other nasopharyngeal pathologies.<sup>4</sup>

OME is a common condition in the paediatric age group. This usually presents as inattentiveness, decreased scholastic performance, slow learning and occasionally with recurrent otalgia when this condition is complicated with infection.<sup>5</sup> Typical findings in otoscopy like retracted and dull tympanic membrane with restricted mobility on siegalisation, presence of air fluid level and/or air bubbles behind the drum are indicators of OME. Tympanometry shows a typical type B tympanogram. Type A is the normal curve and type C falls in between. So audiometric assessment is mandatory in all children referred with a suspected hearing impairment to rule out OME. Enlarged adenoids can produce Eustachian tube obstruction in two ways. The direct closure of Eustachian tube by enlarged adenoids and more commonly the obstruction of lymphatics draining the middle ear and ET are the two mechanisms postulated. Chronic infection of adenoids acts as a focus of infection adjacent to ET orifice causing retrograde infection and tubal dysfunction.<sup>5</sup> Tonsil as a potential source of infection is also implicated.<sup>3</sup> This study is a prospective study with the specific objective to evaluate the effect of adenoidectomy with tonsillectomy in treatment of established bilateral secretory otitis media in children.

## METHODS

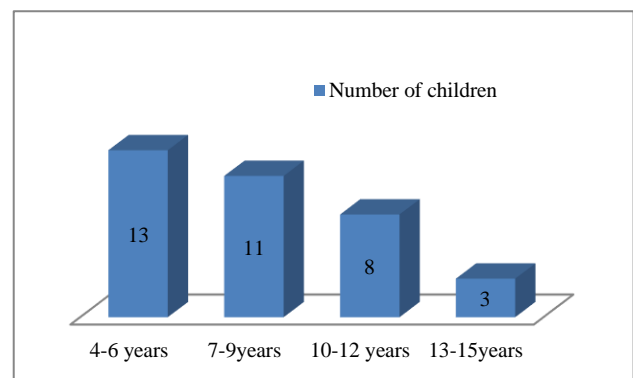
This was a prospective study conducted on 35 children between the age group 4-15 years, in Government Medical College, Thrissur, Kerala, India for a period of one and a half years. These children presented in with features suggestive of OME and tonsillar and adenoid hypertrophy such as difficulty in hearing, snoring, mouth breathing, recurrent nasal discharge. Clinical examination was done. Tonsillar hypertrophy was graded using Suen’s classification into 5 grades ranging from grade 0 to 4, where grade 0 was categorized as tonsil not visible to grade 4 which was the presence of “kissing” tonsils in the midline. Otoscopy was done to view the condition of the tympanic membrane digital X-ray nasopharynx lateral view in erect position was done to confirm adenoid hypertrophy. Audiological investigations like pure tone audiometry (PTA) and tympanometry were done to establish OME. All the patients underwent adenotonsillectomy under general anaesthesia. After surgery the patients were followed up at 6 weeks and 3 months with PTA and tympanometry to assess the

improvement in hearing and the data thus collected were analyzed. Patients with discharging ear or perforation in tympanic membrane, patients with congenital deformities like cleft palate or other craniofacial anomalies, patient with previous ear or palatal surgery were excluded from the study.

## RESULTS

### Age distribution

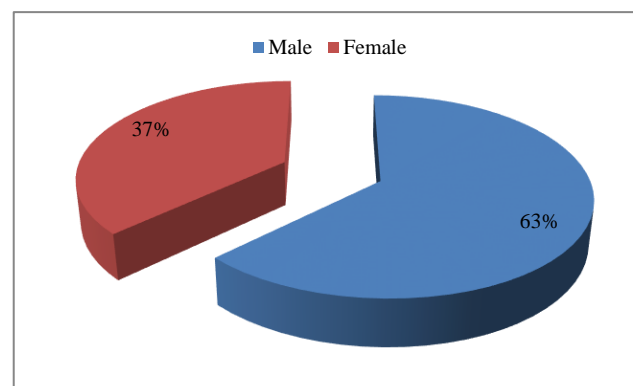
Age of the patients ranged from 4-15 years with the mean age of the patients being 8 years. The most prevalent age group was 4-6 years (37.2%) followed by 7-9 years (31.4%) (Figure 1).



**Figure 1: Age distribution of children.**

### Sex distribution

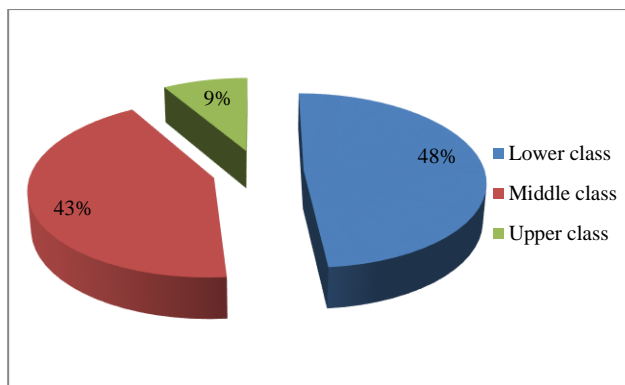
There were 13 females and 22 male children in this study (Figure 2).



**Figure 2: Sex distribution.**

### Socioeconomic status

Socioeconomic status was measured using modified Kuppaswamy scale. The patients were stratified into 3 classes- lower, middle and upper classes. Lower class comprised of 48.57%, middle class 42.86% and upper class 8.57% (Figure 3).



**Figure 3: Socioeconomic status.**

**Symptom wise distribution of cases**

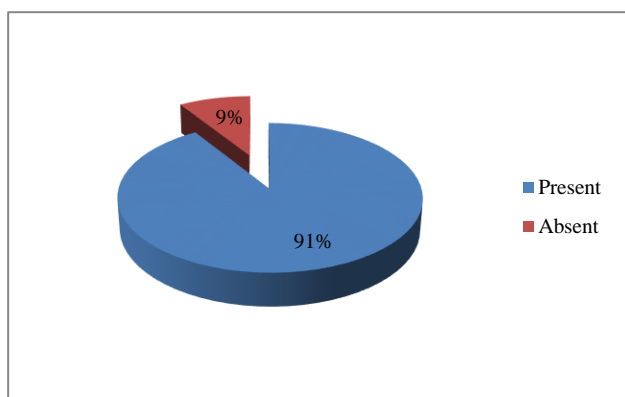
Most children presented with more than one symptom. It was observed that 97.1% presented with mouth breathing and 91.4% presented with nasal obstruction, which were the commonest symptoms. Other symptoms were nasal discharge, snoring, ear pain, difficulty in hearing and recurrent sore throat (Table 1).

**Table 1: Symptom wise distribution of cases.**

| Symptoms              | Frequency (number of patients) | Percentage (%) |
|-----------------------|--------------------------------|----------------|
| Nasal obstruction     | 32                             | 91.4           |
| Nasal discharge       | 29                             | 82.9           |
| Mouth breathing       | 34                             | 97.1           |
| Snoring               | 29                             | 82.9           |
| Hard of hearing       | 24                             | 68.6           |
| Ear pain              | 25                             | 71.4           |
| Recurrent sore throat | 21                             | 60             |

**Clinical examination findings**

Adenoid facies were present in 91% of cases (Figure 4).



**Figure 4: Occurrence of adenoid facies.**

Tonsillar hypertrophy of 2nd and 3rd grades were most common (Table 2).

**Table 2: Incidence of tonsillar hypertrophy.**

| Tonsillar hypertrophy | Frequency (number of patients) | Percentage (%) |
|-----------------------|--------------------------------|----------------|
| Grade 1               | 0                              | 0              |
| Grade 2               | 15                             | 42.9           |
| Grade 3               | 16                             | 45.7           |
| Grade 4               | 4                              | 11.4           |
| Total                 | 35                             | 100            |

Plain x-ray soft tissue nasopharynx lateral view showed marked adenoid hypertrophy in all cases.

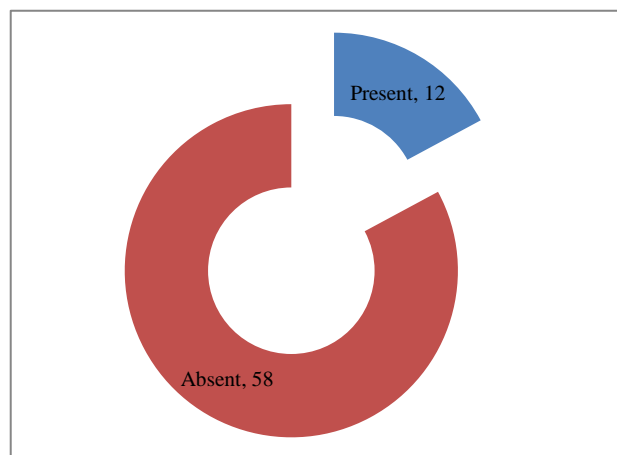
Otoscopic findings showed 78.5% having dull and retracted tympanic membrane. Change in colour of the tympanic membrane and air fluid level, each showed around 10% incidence in the study (Table 3).

**Table 3: Otoscopic findings (both tympanic membranes findings noted separately i.e. n=70).**

| Otoscopic findings | Frequency (number of patients) | Percentage (%) |
|--------------------|--------------------------------|----------------|
| Dull and retracted | 55                             | 78.57          |
| Colour change      | 7                              | 10             |
| Air fluid level    | 8                              | 11.42          |
| Total              | 70                             | 100            |

**Pneumatic otoscopic findings**

Using pneumatic otoscopy the movement could be detected only in 17.14% cases and the in rest (82.85%) movement could not be appreciated (Figure 5).



**Figure 5: Pneumatic otoscopic findings.**

Prior to surgery PTA and tympanometry were done in all subjects. Only those with bilateral B type tympanogram were selected for this study. Most of the subject had hearing loss in the range of 31-40dB with a mean hearing loss of 36.5dB. The maximum hearing loss was 50dB while the minimum was 25dB when both ears were considered together.

**Table 4: Pre and postoperative comparison of PTA.**

| Paired t-test | Mean                  | Standard deviation | t-value |         |
|---------------|-----------------------|--------------------|---------|---------|
| Pair 1        | Preop PTA-Right       | 37.0454            | 6.15763 | 13.29** |
|               | PTA at 6 weeks- Right | 28.9983            | 6.81440 |         |
| Pair 2        | Preop PTA-Left        | 36.6163            | 5.72339 | 13.90** |
|               | PTA at 6 weeks- Left  | 28.7106            | 7.38770 |         |
| Pair 3        | PTA at 6 weeks- Right | 28.9983            | 6.81440 | 12.92** |
|               | PTA at 3 months-Right | 22.0846            | 8.17481 |         |
| Pair 4        | PTA at 6 weeks- Left  | 28.7106            | 7.38770 | 14.26** |
|               | PTA at 3 months- Left | 21.9991            | 8.68687 |         |

\*\*significant at 1% level.

All the subjects underwent adenotonsillectomy. Postoperatively they were followed up. The resolution of

OME was assessed by PTA and tympanometry at 6 weeks and 3 months interval. Paired t-test was used to compare the resolution of OME after 6 weeks as also after 3 months of surgery in both the ears separately. It was observed that there was consecutive steady decrease in both the ears signifying a positive prognosis well justified by the highly significant t-static in all the stages (Table 4).

Tympanogram was used to verify the significant changes towards a positive prognosis at 6 weeks and 3 months postoperatively. Chi square statistics revealed a good prognosis at all stages of observation with a p-value<0.01 which was significant (Table 5).

6 weeks following surgery 55.71% of type B tympanogram changed to type A and 15.7% to type C, while in 28.57% type B persisted. After 3 months 65.71% of tympanogram were type A and 8.57% were type C. In 25.71% of subjects type B tympanogram persisted. It was also observed that in all those subjects with persistent type B tympanogram, the preoperative hearing loss was higher, that is, between 40-50dB.

**Table 5: Pre and post-operative comparison of tympanogram.**

| Number of cases | Preoperative tympanogram | Postoperative tympanogram |             |              |               | Percentage (%) |
|-----------------|--------------------------|---------------------------|-------------|--------------|---------------|----------------|
|                 |                          | Rt (6weeks)               | Lt (6weeks) | Rt (3months) | Lt (3 months) |                |
| 17              | Type B                   | Type A                    | Type A      | Type A       | Type A        | 48.57          |
| 1               | Type B                   | Type C                    | Type A      | Type A       | Type A        | 2.86           |
| 1               | Type B                   | Type C                    | Type C      | Type A       | Type A        | 2.86           |
| 3               | Type B                   | Type A                    | Type C      | Type A       | Type A        | 8.57           |
| 1               | Type B                   | Type C                    | Type A      | Type C       | Type A        | 2.86           |
| 1               | Type B                   | Type B                    | Type B      | Type A       | Type B        | 2.86           |
| 6               | Type B                   | Type B                    | Type B      | Type B       | Type B        | 17.14          |
| 4               | Type B                   | Type C                    | Type B      | Type C       | Type B        | 11.43          |
| 1               | Type B                   | Type B                    | Type B      | Type C       | Type B        | 2.86           |

## DISCUSSION

Otitis media with effusion continues to be a problem in the paediatric age group. In present study majority of children belonged to the age group 4-6 years which was followed by the 7-9 year group. This observation was in concurrence with a study of Fujioka M et al which showed that the size of the adenoid, though varies from child to child, the adenoids attain their maximum size between 4-8 years of age after which it regresses gradually till the age of 12 years.<sup>7</sup>

Male children have more incidence of childhood infection as they are more exposed to allergic and infectious agents compared to female children.<sup>8</sup> In present study also we encountered 22 cases of male

children as against 13 cases of female children. Adenotonsillar disease is seen more commonly in low socioeconomic strata.<sup>9</sup> Present study also revealed that majority of cases (17 cases) belonged to the lower class. We found that children from middle class accounted for 15 cases. This almost equal incidence in middle class children may indicate exposure of children to infectious agents and allergens secondary to change in the food habits and urbanization.

The classical presentation of adenoid hypertrophy is mouth breathing, snoring, nasal obstruction and nasal discharge.<sup>10</sup> In present study also these symptoms-mouth breathing (97.1%), nasal obstruction (91.4%), nasal discharge (82.9%) and snoring (82.9%) were the predominant symptoms. Nasal symptoms predominate

over aural symptoms maybe because the parents identify nasal symptoms more easily compared to aural symptoms secondary to adenoids.

Adenoid facies were seen in 91.4% of children which correlates with the symptoms of adenoid hypertrophy. Our study showed varied appearance of tympanic membrane in the children. Also in pneumatic otoscopy, majority showed absent movement of tympanic membrane which is a reliable sign of OME. The varied findings in otoscopy may be due to different pathological stages of OME. Also according to Agency for health care research and quality, otoscopic appearance is reliable in two-third cases of OME.<sup>11</sup> It has been shown in many studies that the hearing loss in OME shows a wide range with air conduction thresholds averaging 27.5dB.<sup>12</sup> This wide variation is probably related to the amount and type of fluid, its physical character (serous or mucous) and its exact location within the middle ear.<sup>13</sup> In present study 61.42% subjects had hearing loss in the range of 31-40dB with a mean hearing loss of 36.5dB.

In the present study there was significant improvement in OME suggested by PTA values and tympanometry. Postoperatively the mean hearing loss was 29dB at 6 weeks which again dropped to 22dB at 3 months. Complete resolution of OME (suggested by type A tympanogram) was seen in 56% of cases after 6weeks which improved to 66% after 3 months, which almost correlates with the similar study by Richard Maw where rate of resolution is 59% at 6 weeks and 62% at one year which he compared with no surgery group the effects of adenotonsillectomy were significant.<sup>4</sup> In a study by Sandooja D et al about the effect of adenotonsillectomy on hearing threshold and middle ear pressure concluded that it improves Eustachian tube function which was consistent with present study.<sup>14</sup>

Other causes of ET dysfunction with OME are allergy, craniofacial anomalies, ciliary dysfunction in the present study we had excluded children with obvious craniofacial anomalies. In spite of this there were 25.71% cases with persistent Type B curve in tympanometry even after 3 months. This may be a sequelae of long standing OME and other causes of OME should also be considered. Due to this reason, in spite of the fact that spontaneous resolution of OME may occur in some cases with time, it is better to do an early surgical intervention to prevent unwanted sequelae.<sup>15</sup> It would benefit the child if the OME were identified in the early stages itself. Development of OME hampers language learning in the early years of life.<sup>16,17</sup> Language learning is important in the formative years as language is required to a certain extend in the normal functioning of a child in his community.<sup>18</sup>

## CONCLUSION

Adenoidectomy with tonsillectomy improves the outcome of OME by improving Eustachian tube function

and by removing the focus of infection. It can be regarded as a useful management option in children with adenotonsillar hypertrophy and established otitis media with effusion. The disease process can be identified in its early stages by simple investigations like tympanometry at the earliest. Early diagnosis will help minimize the sequelae of OME. This can be achieved by sensitizing primary school teachers to identify the at risk group.

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## REFERENCES

1. Scott-Brown WG. Paediatric Otolaryngology. In: Kerr AG, ed. Scott-Brown's Otolaryngology. 6th ed. London: London. 1997:6.
2. Brodsky L, Robin T, Cotton M, Charles M. Practical Pediatric otolaryngology. 1st ed. New York: Lippincott Raven; 1997.
3. Cengel S, Akyol MU. The role of topical nasal steroids in the treatment of children with otitis media with effusion and/or adenoid hypertrophy. *Int J Pediat Otorhinolaryngol.* 2006;70(4):639-45.
4. Maw AR. Chronic otitis media with effusion (glue ear) and adenotonsillectomy: prospective randomised controlled study. *Br Med J (Clin Res Ed).* 1983;287(6405):1586-8.
5. Sinha V, Patel BH, Sinha S. Incidence of uncomplained secretory otitis media in patients undergoing adenotonsillectomy. *Indian J Otolaryngol Head Neck Surg.* 2005;57(2):110.
6. Marseglia GL, Poddighe D, Caimmi D, Marseglia A, Caimmi S, Ciprandi G, et al. Role of adenoids and adenoiditis in children with allergy and otitis media. *Curr Allergy Asthma Rep.* 2009;9(6):460-4.
7. Fujioka M, Young LW, Girdany BR. Radiographic evaluation of adenoidal size in children: adenoidal-nasopharyngeal ratio. *Am J Roentgenol.* 1979;133(3):401-4.
8. Teele DW, Klein JO, Rosner B, Greater Boston Otitis Media Study Group. Epidemiology of otitis media during the first seven years of life in children in greater Boston: a prospective, cohort study. *J Infect Dis.* 1989;160(1):83-94.
9. Ferreira AM, Clemente V, Gozal D, Gomes A, Pissarra C, César H, et al. Snoring in Portuguese primary school children. *Pediatrics.* 2000;106(5):e64.
10. Tos M, Larsen PL, Stangerup SE, Hvid G, Andreassen UK. Sequelae following secretory otitis

- and their progression. *Acta Oto-Laryngologica.* 1988;105(449):37-8.
11. Onusko ED. Tympanometry. *Am Fam Phys.* 2004;70(9):1713-20.
  12. Fria TJ, Cantekin EI, Eichler JA. Hearing acuity of children with otitis media with effusion. *Arch Otolaryngol.* 1985;111(1):10-6.
  13. Ishii T, Toriyama M, Suzuki JI. Histopathological study of otitis media with effusion. *Ann Otol Rhinol Laryngol.* 1980;89(3):83-6.
  14. Sandooja D, Sachdeva OP, Gulati SP, Kakkar V, Sachdeva A. Effect of adeno-tonsillectomy on hearing threshold and middle ear pressure. *Indian J Pediatr.* 1995;62(5):583-5.
  15. Howie VM, Ploussard JH, Sloyer J. The otitis-prone condition. *Am J Dis Child.* 1975;129(6):676-8.
  16. Friel-Patti S, Finitzo T. Language learning in a prospective study of otitis media with effusion in the first two years of life. *J Speech Language Hearing Res.* 1990;33(1):188-94.
  17. Roberts J, Hunter L, Gravel J, Rosenfeld R, Berman S, Haggard M, et al. Otitis media, hearing loss, and language learning: controversies and current research. *J Develop Behav Pediatr.* 2004;25(2):110-22.
  18. Rubin J. What the good language learner can teach us. *TESOL quarterly.* 1975:41-51.

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