



Association Between the Grade of Adenoid Hypertrophy and Otitis Media with Effusion.

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Received: 01-06-2026

Revised: 15-06-2026

Accepted: 29-06-2026

Published: 18-07-2026

Abstract

Background: **Aim:** To evaluate the association between the grade of adenoid hypertrophy and otitis media with effusion (OME) in children aged 3–12 years. **Methods:** This prospective observational study included 107 children with adenoid hypertrophy at SGRDIMSAR, Amritsar. Adenoid hypertrophy was graded using the adenoid/nasopharyngeal (A/N) ratio on lateral nasopharyngeal X-ray. OME was diagnosed using otoscopy and confirmed by tympanometry. Statistical analysis was performed using chi-square test. **Results:** The majority of patients were aged 6–9 years (44.9%) with male predominance (67.3%). Grade 4 adenoid hypertrophy was most common (42.1%). Type B tympanogram was observed in 62.6% of ears. OME incidence increased with adenoid hypertrophy grade: 16.7% (Grade 1), 27.8% (Grade 2), 68.4% (Grade 3), and 88.9% (Grade 4). A statistically significant association was found between adenoid hypertrophy grade and OME ($p < 0.0001$) on Chi-square test. **Conclusion:** Higher grades of adenoid hypertrophy are strongly associated with increased prevalence of OME. Radiographic grading combined with tympanometry is an effective screening approach.

Keywords: Adenoid hypertrophy, Otitis media with effusion, Tympanometry, A/N ratio.



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INTRODUCTION

Adenoids are lymphoid tissue located in the nasopharynx and form part of Waldeyer's ring¹. They undergo rapid growth during childhood and may hypertrophy due to recurrent infections or allergies. Enlarged adenoids can obstruct the Eustachian tube, which can lead to otitis media with effusion (OME), a common cause of hearing loss in children.

OME is characterized by the presence of fluid in the middle ear without signs of acute infection and may result in hearing impairment and delayed speech development⁴. The adenoid/nasopharyngeal (A/N) ratio measured on lateral X-ray is a simple and reliable method to assess adenoid hypertrophy.^{2,3}

This study aims to evaluate the association between the grade of adenoid hypertrophy and otitis media with effusion (OME) in children aged 3–12 years.

MATERIALS AND METHODS

This is a prospective observational study conducted in Department of Otorhinolaryngology, SGRDIMSAR, Amritsar from July 2024 to December 2025 on 107 children aged 3–12 years with adenoid hypertrophy.

Inclusion Criteria:

1. Children with radiologically confirmed adenoid hypertrophy
2. Children with OME confirmed by tympanometry

Exclusion Criteria:

1. Craniofacial anomalies
2. Chronic suppurative otitis media

3. Acute ear infections

Methods:

History was taken and clinical assessment was done. Otoscopy and otoendoscopy was done to assess tympanic membrane. Lateral nasopharyngeal X-ray was obtained for A/N ratio(Fujioka et al). Grading of adenoid hypertrophy (Grade 1+ to 4+) was done.6 Tympanometry was done to confirm the diagnosis of OME.5

Statistical analysis was done using Chi-square test; $p < 0.05$ was considered significant.

RESULTS

The majority of the patients (44.9%) were aged between 6-9 years followed by 9-12 years (28.0%) followed by 3-6 years (27.1%). Adenoid hypertrophy was seen more commonly in male patients (67.3%) than female patients (32.7%). The most frequent symptom was mouth breathing (100%), followed by snoring (85.9%), recurrent URTIs (67.3%), loss of hearing (41.1%) and nasal discharge (26.2%). The majority (35.5%) of the patients had symptoms lasting between 1 to 2 years. The majority of children had Grade 4+ Adenoid hypertrophy (42.1 percent) on x-ray nasopharynx lateral view.

Table 1: Grading of Adenoid Hypertrophy on X-Ray Nasopharynx (Lateral View)

Adenoid Grade	Frequency (N)	Percentage (%)
Grade 1+	6	5.6%
Grade 2+	18	16.8%
Grade 3+	38	35.5%
Grade 4+	45	42.1%
Total	107	100.0%

Mean A/N ratio for Grade 4+ was 0.86, 0.60 for Grade 3+, 0.37 for Grade 2+ and 0.17 for Grade 1+. Most common otoscopic finding was dull tympanic membrane (33.2%). Most common curve on tympanometry was Type B curve (62.6%). All patients with Type A Curve on tympanometry had normal tympanic membrane on otoscopy. Patients with Type B curve had either dull tympanic membrane (most common) or fluid in the middle ear or retracted tympanic membrane. Patients with Type C curve had either dull or retracted tympanic membrane.

Table 2: Association between Adenoid Hypertrophy Grade and OME

A/N Ratio Range	OME Present (N)	OME Absent (N)	% OME per Grade
<0.25 (Grade 1+)	1	5	16.7%
0.26–0.50 (Grade 2+)	5	13	27.8%
0.51–0.75 (Grade 3+)	26	12	68.4%
>0.75 (Grade 4+)	40	5	88.9%
Total	72	35	67.3%

OME was present in 88.9% patients with Grade 4+ Adenoid hypertrophy whereas only 16.7% with Grade 1+ Adenoid hypertrophy had OME. Majority of the patients with OME in Grade 4+ adenoid hypertrophy (95%) had bilateral OME. Grade of Adenoid hypertrophy had a statistically significant association with OME presence. (p value < 0.0001)

Table 3: Laterality of OME (Unilateral vs Bilateral) in Relation to Adenoid Grade

Adenoid Grade	Unilateral OME (N)	Bilateral OME (N)	Total (N)	% Bilateral OME
Grade 1+	1	0	1	0%
Grade 2+	2	3	5	60.0%
Grade 3+	5	21	26	80.8%
Grade 4+	2	38	40	95.0%
Total	10	62	72	86.1%

DISCUSSION

The study demonstrates association between increasing adenoid grade and OME. Findings are consistent with previous literature showing that mechanical obstruction and infection from hypertrophied adenoids contribute to Eustachian tube dysfunction. The grade of adenoid hypertrophy showed statistically significant association with OME (exceptionally high p -values < 0.0001). Khayat et al.6 also observed in their study that proportion of OME increases with the severity of nasopharyngeal obstruction by adenoid hypertrophy.

The outcome of Sharma et al.7 in 2023, who discovered that the measure of radiological severity, A/N ratio, had a significant correlation with the prevalence of OME. Unilateral OME was seen in 13.9 percent of the participants in the

current study and bilateral in 86.1 percent. Bilateral OME was absent in Grade 1+, present in 60% children with Grade 2 +, 80.8% children with Grade 3+ and 95% children with Grade 4+ adenoid hypertrophy.

The fact that was found by Gunel et al.⁸ in 2014 adenoid hypertrophy is correlated with more negative middle ear pressure in both ears agrees with the prevalence of bilateral OME in our group population. Islam et al.⁹ in 2020 also noted that in children with severe adenoid hypertrophy, the bilateral effusion is highly prevalent; hence, the sensitivity of radiology that predicts laterality.

CONCLUSION

Adenoid hypertrophy is significantly associated with OME in children. Early diagnosis using radiography and tympanometry can prevent complications such as hearing loss and speech delay.

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