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RESEARCH ARTICLE
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PREVALENCE OF OTITIS MEDIA WITH EFFUSION AND EFFECT ON HEARING THRESHOLD IN CHILDREN WITH ADENOID HYPERTROPHY

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Abstract
Background: Adenoid is a lymphoid tissue at the roof and posterior wall of the nasopharynx. Otitis media with effusion (OME) is fluid in the middle ear that can affect hearing, speech, and learning in children. **Aim:** To determine the prevalence of middle ear effusion in children with adenoid hypertrophy and compare the grade of adenoid hypertrophy with the severity of hearing loss.
Material and method: The study was performed in the Department of ENT, Regional Institute of Medical sciences, Imphal, Manipur. 61 Children aged 3–15 years diagnosed to have adenoid hypertrophy were included in the study. Nasal endoscopy, X ray nasopharynx were performed to assess the grades of adenoids. All of them were subjected to routine otoscopic examination and hearing assessment by standard pure tone audiometry (PTA) and impedance testing.
Results: Majority of children between the ages of 3-15 years were males. 46% had adenoidal symptoms between the age group of 3-5 years. Nasal obstruction (41%), mouth breathing (35%) and snoring (39%) were the common symptoms. Majority of the children had grade 3 (45.9%) . Most children (58%) had B type curve on tympanometry. The greatest hearing loss (32–48 dB) occurred in patients with fourth grade adenoids.
Conclusion: The study shows that adenoid enlargement predisposes children to OME via mechanical obstruction, inflammation, and pathogenic reservoirs, emphasising the need for early identification and management to prevent hearing loss.

Key Word: Adenoid hypertrophy, tympanometry, pure tone audiometry, otitis media with effusion.

INTRODUCTION

Diseases of the adenoid and tonsils are among the most common problems in children. Recurrent upper respiratory tract infections (URTI) affect the adenoid, resulting in hyperplasia, mouth breathing, nasal obstruction, snoring and hyponasal speech.[1]. Mechanism of eustachian tube obstruction is by

the direct blocking the opening of the eustachian tube by an enlarged adenoid, and more commonly, the obstruction of lymphatics draining the middle ear, which are the two mechanisms postulated. Another is that the chronic infection of adenoids acts as a focus of infection adjacent to eustachian tube orifice causing retrograde infection and tubal dysfunction.[2] These ultimately leads to Otitis Media with Effusion (OME) which is defined as accumulation of sterile mucus secretion in the middle ear cleft.[3] In a developing country like India, the number of children seeking medical treatment for nasal symptoms are much less, as most of them resort to home remedies.[4] This in turn leads to unrecognised OME. Hence, in this study, we aim to determine the prevalence of middle ear effusion in children with adenoid hypertrophy and compare the grade of adenoid hypertrophy with the severity of hearing loss.

MATERIAL AND METHOD

A cross-sectional study was conducted in the Department of Otorhinolaryngology, Regional Institute of Medical Sciences (RIMS), Imphal, from April 2023 to October 2024. Sixty-one children aged 3–15 years with clinical features of adenoid hypertrophy, including ear problems, were included in the study. Children with clinical features of adenoid hypertrophy, children with definitive indications for adenoidectomy, and children with otitis media with effusion were included in the study. Children with acute suppurative otitis media, chronic suppurative ear disease and other associated syndromic conditions, underwent adenoidectomy were excluded. Adenoid size assessed with nasal endoscopy using Clemens et al grading system. X-ray nasopharynx lateral view adenoid nasopharyngeal ratio (ANR) was measured as proposed by Fujioka et al. Middle ear effusion confirmed by otoendoscopy. Pure tone audiometry was used for assessing the degree of hearing impairment. Ethical approval for this study was obtained from the Research Ethics Board of the institute (No. A/206/REB Comm(SP)/RIMS/2015/1113/144/2023).

RESULTS

The age of the respondents ranged from 3 to 15 years, with a mean age of 9 years, and the majority of the patients were males, 46 in number, as compared to 15 female patients.

Table no. 1: Distribution of patients according to symptoms

Symptoms	Present	Absent
1. Nasal obstruction	56	5
2. Throat pain	51	10
3. Recurrent upper respiratory tract infection	48	13
4. Mouth breathing	43	18
5. Snoring	40	21
6. Decrease Hearing	27	34

(* Multiple responses)

Distribution of patients according to symptoms: the nasal obstruction (92%), throat pain (84%), recurrent upper respiratory tract infection (79%), mouth breathing (70%) and snoring (66%) were the common symptoms, followed by decrease Hearing (44%) (Table 1).

Table no. 2: Distribution of participants according to tympanic membrane status N= 61

TM status	Frequency (n)	Percentage (%)
1. Fluid	37	61
2. Dull & Retracted	7	11
3. Intact	17	28

In this study, 61% had fluid with air bubbles, and 11% had a dull and retracted tympanic membrane on otoscopic examination (Table 2).

Table no. 3: Adenoid grades. N=61

Grades of adenoid	Number of children	Percentage
1	3	4.9
2	17	27.9
3	28	45.9
4	13	21.3

Table no.3 shows adenoid grades, most of the children (45.9%) belongs to grade 3.

Table no. 4: Distribution of tympanometry curve. N=61

Tympanometric curve	Frequency (n)	Percentage (%)
A	17	28
B	37	61
C	7	11

Tympanometry showed a 'B' type curve in 61% of the patients while 28% had an 'A' type curve.

Table no. 5: Adenoid grading compared with middle ear fluid N=61

Grade of Adenoid	Middle ear fluid absent (n)	Middle ear fluid present (n)
1	19	5
2	3	9
3	2	23

Table No. 4 shows adenoid grading with middle ear fluid.

Table no. 6: Size of Adenoid hypertrophy and severity of hearing loss. N= 61

Grades of adenoid	Degree of conductive hearing loss (in dB)
1	23-35
2	26-39
3	26-41
4	30-46

Table 5 Degree of conductive hearing loss directly proportional to grade of the adenoid. The greatest hearing loss (32–48 dB) occurred in patients with grade four adenoids.

DISCUSSION

Adenoid hypertrophy may result in either partial or complete obstruction of the upper airway, leading to a reduction in airway lumen diameter and the development of eustachian tube dysfunction secondary to negative nasopharyngeal pressure. Furthermore, the pharyngeal orifice of the auditory tube may be directly impeded by the hypertrophied adenoidal tissue, thereby predisposing the patient to otitis media with effusion (OME). In our study, 46 children were taken the age ranged from 3 to 15 years, with mean age of 9 years. 46 chlildren were male and 15 children were female. Waheed A. Adegbiji et al[5] observed a male predominance. The reason for the male predominance remains unclear, as no definitive studies link gender to the pathology of adenoid-related conditions. However, male children may have increased exposure to allergens and infectious agents due to higher physical activity levels, which could predispose them to recurrent upper respiratory tract infections, as noted by Ajayan P. V. et al.[6] The most common symptom in our study was nasal obstruction (92%), followed by throat pain (84%), recurrent upper respiratory tract infections (79%), mouth breathing (70%), and snoring (66%), followed by decrease hearing (44%) (Table no. 1) this results were comparable with

the study by Nishanth Savery et al.[7] However, the study conducted by Ashish Khadgi et al[12] found out that the most common symptoms of the patients with adenoid hypertrophy was hearing impairment (79.6%), mouth breathing (63.3%), and nasal obstruction and discharge (69.4%).In our study 11% had dull and retracted tympanic membrane and 61% had fluid with air bubbles on otoscopic examination (Table no. 2), thereby clearly establishing that the presence of adenoid hypertrophy has a direct influence on the ventilation and drainage of the middle ear cleft and the consequent development of otitis media with effusion, though the size of the adenoid did not have a statistical association with the otoscopy findings. Our tympanometry findings showed, 61% children had type 'B' curve and 28% had type 'A' curve, which indicative of middle ear effusion and normal middle ear status respectively (Table no. 3). This was consistent with findings by Chibuike Nwosu et al[8] and Nishanth Savery et al.[7] Our analysis showed that 21% of children with grade 1 adenoid hypertrophy, 75% with grade 2, and 92% with grade 3 had middle ear effusion, which matched the findings of S. M. Sarwar et al.[9] However, Timothy Els et al[10], in their study in South Africa found no statistically significant relationship between adenoid size, as determined by lateral soft tissue neck radiography, and the type of tympanogram suggesting that it would not be reasonable to predict the presence of OME based solely on ANR. They concluded that adenoid pathology may play an aetio-pathological role in the development of OME which however, may be due to the presence of biofilms due to the periodic shedding of inflammatory cytokines and planktonic bacteria rather than obstructive adenoid hypertrophy, given the lack of a significant ($p > 0.05$) correlation between adenoid hypertrophy and OME. Patients were further categorized based on hearing thresholds. Conductive hearing loss (CHL) increased as adenoid obstruction worsened. Children with grade third or grade four adenoids were five times more likely to have CHL was similar with a study by Ashish Khadgi et al[12] found out that the degree of CHL increased with the grade of the adenoid increases. This suggests that while adenoid hypertrophy contributes conductive hearing loss due to Eustachian tube dysfuction leads to OME.

CONCLUSION

Overall, the study establishes that adenoid pathology predisposes children to OME through mechanical obstruction, inflammatory responses, and pathogenic reservoirs, highlighting the importance of early identification and management of these conditions to prevent complications such as hearing loss.

LIMITATIONS OF THE STUDY

The study's small, cross-sectional cohort limits generalizability and long-term insights, and while it highlights mechanical obstruction in OME, factors like biofilms and subtle middle ear pathology may require further investigation.

DISCLOSURE

- Conflict of interest: none
- Compliance with ethical standards
- Sponsorship: none
- Funding source: none

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