http://jmscr.igmpublication.org/home/
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v8i3.40

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Research Article

Tympanometric Findings among Children with Enlarged Adenoids in a Tertiary Health Care Establishment

Authors
Navin Agrawal[1], Saket Bansal[2*], Chhavi Agrawal[3], Anand Sharma[4], Saurabh Vijay[5]
[1,2,3,4,5]Department of ENT, IMCHRC, Indore (M.P.), India
*Corresponding Author
Saket Bansal

Abstract
Aim: *To critically appraise the tympanometric findings among children with adenoid hypertrophy in a Tertiary Health Care Centre.*
Materials and Methods: *A prospective case-control study was carried out among newly diagnosed cases of adenoid enlargement in a Tertiary Health Care Centre between June 2018 and November 2018. Tympanometry was done on every study subject and each ear was studied as a single entity. Types B and C tympanograms were taken as indicators of OME. Data was collected and analysed using SPSS version 20.*
Results: *59 ears were studied of the thirty patients having adenoid hypertrophy within the study period. 13 (22.03%) ears had type C tympanogram, while 16 (27.12%) ears had type B. The total incidence of OME was 49.15%; there were 5 (16.67%) unilateral OME, while bilateral OME was 12 (40%). The study showed that adenoid hypertrophy was statistically significant with the OME.*
Conclusion: *This study showed that enlarged adenoids is a significant risk factor for OME in children. There were more cases of bilateral OME than unilateral OME. This establishes the need for prompt hearing evaluation and management.*
Keywords: *Tympanometry, Adenoids, Otitis media with effusion, hearing evaluation.*

Introduction

Adenoid hypertrophy is a common childhood disorder.[1] Santorini first described the nasopharyngeal lymphoid aggregate or '**Lushka's tonsil**' in 1724.Wilhelm Meyer coined the term 'adenoid' to apply to what he described as 'nasopharyngeal vegetations' in 1870.The adenoid forms the uppermost part of the Waldeyer's ring of lymphoid tissue. Historically, the adenoid has been associated with upper airway obstruction, as a focus of sepsisand more recently with the persistence of otitis media with effusion (OME) which is the commonest cause of hearing impairment in children. Thus, it predisposes the child to delayed speech, poor academics and delayed language development[2,3]. ET dysfunction is one of the most important factors in the pathogenesis of otitis media with effusion.[4] Common symptoms of patients having enlarged adenoids –

1. Nasal symptoms- nasal obstruction, mouth breathing, snoring, anterior nasal discharge, postnasal discharge, obstructive

sleep apnea, hyponasal speech (Rhinolalia clausa), epistaxis.

2. Aural symptoms– Recurrent otalgia, deafness, ear discharge.
3. Throat symptoms– Recurrent sore throat, dysphagia, change in voice, poor eaters, malnutrition.
4. General symptoms– mental dullness, nocturnal enuresis, night terrors.

Common signs in patients having adenoid hypertrophy –

i. Nasal– discharge in the nasal cavity, mucosal congestion and edema, enlarged adenoids seen on posterior rhinoscopy
ii. Aural– retracted or bulging drum, fluid levels may be seen, conductive hearing loss on doing tuning fork tests
iii. Throat– mucosal congestion of the pharynx, granular posterior pharyngeal wall, postnasal drip
iv. Neck– cervical lymphadenopathy– usually posterior triangle and upper deep cervical nodes involvement

Adenoid facie – Pinched nose, mouth breathing, dribbling of saliva, flat nasal arch, malar hypoplasia, elongated face, dull 'idiotic' appearance, loss of nasolabial fold, short protruding upper lip, crowding of teeth especially of the upper jaw, high arched palate, deafness - inattentive child.

General features – Growth retardation, recurrent LRTI, frequent diarrhoea, low nutritional status, pigeon shaped chest, protuberant abdomen, enuresis +/-.

Aims and Objectives

1. To critically appraise the tympanometric findings among children having adenoid enlargement presenting to a tertiary health care establishment.
2. To establish the correlation between enlarged adenoids and development of otitis media with effusion in children.

Materials and Methods

This is a prospective case control study done among newly diagnosed cases of enlarged adenoids at the Department of ENT of a tertiary health care establishment. The study was done between June 2018 and November 2019.

Inclusion Criteria

- All newly diagnosed cases having clinical and radiological features of enlarged adenoids.
- Those who gave consent for being part of the study and were affording to undergo the required investigations.

Exclusion Criteria

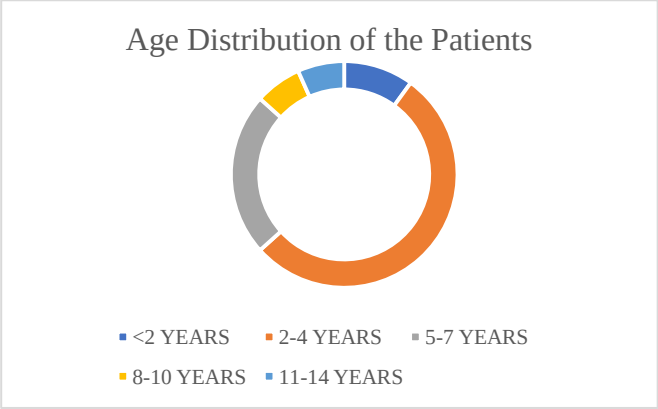
- Children having previous history of adenoidectomy,
- Cerebral Palsy,
- Ear Discharge,
- Cleft palate and congenital ear deformities.

Informed consent was taken from the parents/guardians of all the recruited cases and controls in English and Hindi. A complete ENT and physical examination was carried out for all the cases and controls. Plain radiographs of the lateral view of the nasopharynx with open mouth taken only of those patients having features of adenoid hypertrophy. The control group was recruited among patients presenting to Department of ENT and Paediatrics of a tertiary health care establishment having no ear and nose complaints and were matched for age and sex. All had same exclusion criteria with case group and also excluded those having symptoms suggestive of adenoid hypertrophy. Plain radiograph of the nasopharynx was not done for this group. Tympanometry was done using MAICO MA 42 audiometer for both cases and controls and each ear was studied as a single entity. Types B and C tympanograms were used as indicator of OME. The data was collected in a Proforma and analysed using SPSS version 20. $p< 0.05$ was considered significant and confidence interval was set at 95%.

Observations and Results

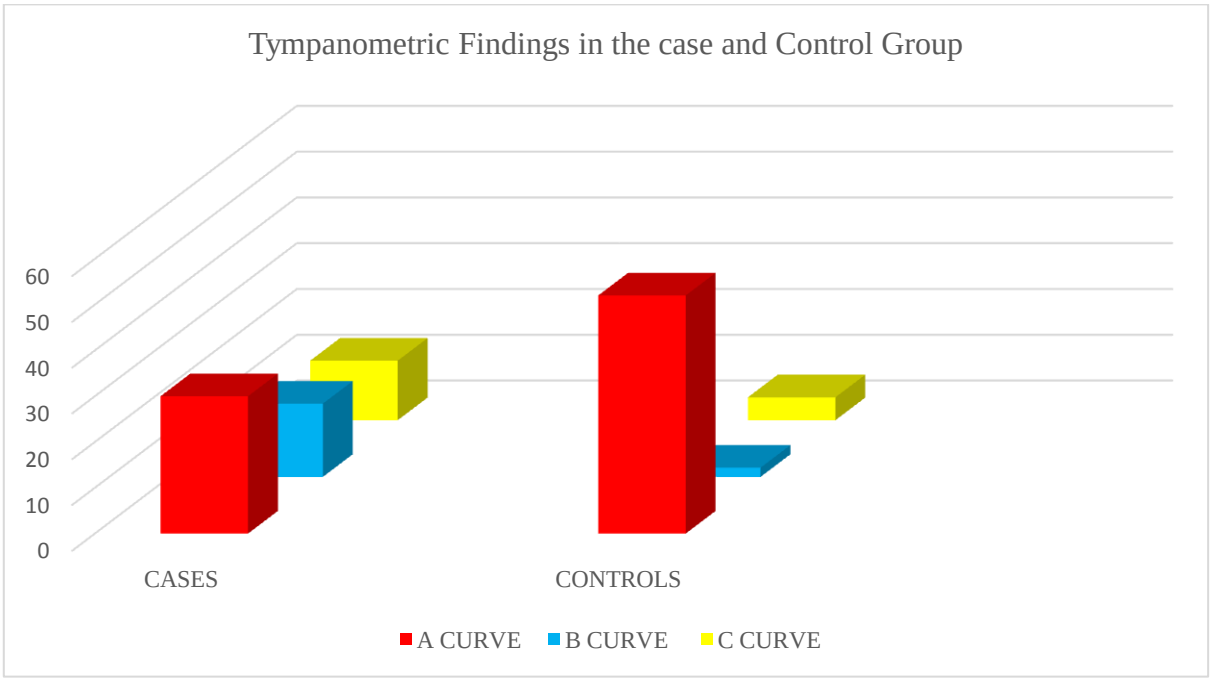
Fifty nine ears were selected during this study period. They all were within the ages of 0-14 years. The mean age was 4.3 and modal age was 3 years.

Age range (in years)	Frequency	Percentage
<2	3	10%
2-4	16	53.33%
5-7	7	23.33%
8-10	2	6.67%
11-14	2	6.67%



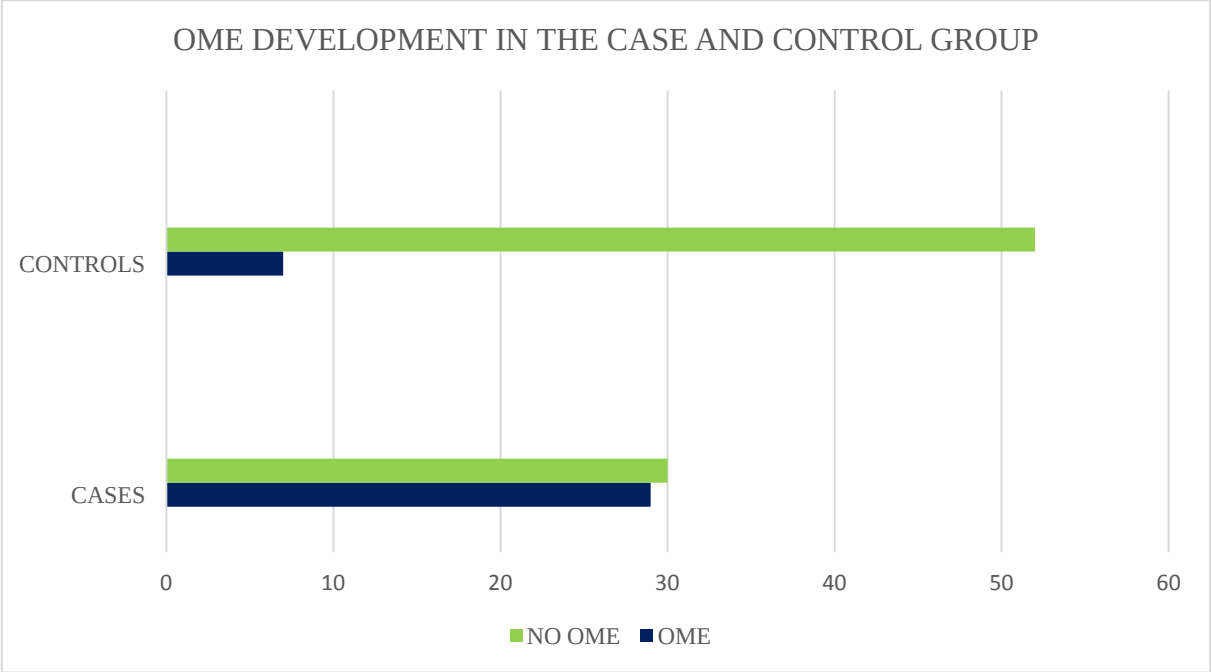
The incidence of type B tympanogram was 27.12 %, while of type C was 22.03% in the case group. In the control group, type B was 3.39% while type C was 8.47%.

Tympanometry	Case group		Control group	
	Frequency	%	Frequency	%
A	30	50.85	52	88.14
B	16	27.12	2	3.39
C	13	22.03	5	8.47
TOTAL	59	100	59	100



The incidence of OME in the case group was 49.15% while in the control group it was 11.86% showing almost a 4-5 fold increase in OME incidence in patients suffering from adenoid hypertrophy.

	Case group		Control group	
	Frequency	%	Frequency	%
OME	29	49.15	7	11.86
No OME	30	50.85	52	88.14
Total	59	100	59	100



Discussion

The incidence of OME among patients with enlarged adenoids was 49.15% in this study with more type B (27.12%) than type C (22.03%). When compared with control, there was about a 4-5fold increase in incidence of OME. This establishes significance of adenoid hypertrophy as a risk factor in the pathogenesis of OME. This is similar to the findings reported in Enugu [5] by Orji et al. with incidence of 35% using only type B and also a 7-fold increase in incidence when compared with the control which was statistically significant. Also, there was a similar report in Kenyatta National Hospital,[6] among children aged 1 to 4 years with adenoid hypertrophy at the out-patient clinic with prevalence of 67.3% using both type B and type C as indicators. The study also shows an 11-fold increase in the prevalence of OME when compared with the control group. There was higher proportion of type B tympanogram than type C in this study. This means that middle ear effusion occurs more than ET dysfunction in patient with adenoid hypertrophy, which is more associated with severe hearing impairment. [7]This finding was similar to the finding in Kenya with prevalence of type B (67.3%) being about 12-fold higher than type C (5.8%).The adenoid can be identified by magnetic resonance imaging (MRI) from the age of 4 months of age in around 18% of children. [8]Growth continues rapidly during infancy and plateaus between 2 and 14 years of age. Regression of the adenoid occurs by adolescence.[9] The *adenoid* appears to be at its *largest* in the *7 year* old age group. [10] However, clinical symptoms are more common in the comparatively younger age group, due to the smaller size of the nasopharynx and the higher frequency of upper respiratory tract infections. With increasing age, the growth of the nasopharynx increases while the soft tissues remain relatively unchanged and thus the airway increases.[11] Adenoids may become chronically infected and may act as a reservoir in URTIs leading to edema and obstruction of the cartilaginous end of the pharyngotympanic tube. [12,13,14] Enlarged adenoids can also lead to mechanical obstruction of the auditory tube or Eustachian tube leading to absorption of air in the middle ear cavity thereby leading to negative intratympanic pressure.[15,16] Obstruction of the Eustachian tube leads to increased middle ear cavity pressure, while there is also influx of bacteria and viruses from the nasopharynx following infection of the adenoids.[17] Subsequently, there is edema of the middle ear

mucosa, inflammation and increased secretory activity of the middle ear mucosa, leading to formation of effusion in the middle ear cavity [17]. This reveals the need for prompt hearing assessment and management in those with adenoid hypertrophy.[6] There were more bilateral cases of OME than unilateral. Generally, bilateral hearing impairment causes more sequelae than unilateral hearing impairment for obvious reasons [18, 19], hence, establishing that patients with adenoid hypertrophy are more at risk of having sequelae from OME associated with hearing impairment. All the cases in this study had plain radiograph of the nasopharynx lateral view with open mouth. Although different objective modalities have been proposed for the diagnosis of adenoid hypertrophy (including mirror examination, palpation, lateral neck radiography, or nasal endoscopy), the role of each of these diagnostic methods is still controversial, and currently there is no comprehensive guideline for assessing adenoidal enlargement.[20]

Conclusion

This study found that there was a significantly higher incidence of OME among patients with adenoid hypertrophy. Type B tympanogram was found to be the most common. Bilateral OME was more common than unilateral OME. The more severe grade of adenoid hypertrophy was more prevalent and it was shown to be statistically significant with OME, thus being a significant risk factor for OME in children. This establishes the need for prompt hearing evaluation and early and aggressive management of children having enlarged adenoids.

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