

Nasal Obstruction In Children: Adenoid Hypertrophy And Beyond. A Study Done In Katihar

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Abstract:

Background: Adenoid hypertrophy (AH), also known as enlarged adenoid, refers to the unusual growth of the adenoids. AH and its consequences are common in the entire childhood period. The adenoids are small masses of lymphatic tissue located in the upper airway, between the nose and the back of the throat.

Materials and Methods: This cross-sectional study was conducted from November 2023 to November 2024 over a period of 12 months. All the children aged 1-18 years attending the pediatric outpatient department (OPD) who had known risk factors or sign-symptoms of AH underwent a lateral nasopharyngeal x-ray to confirm the presence of an enlarged adenoid. Those children who had enlarged adenoids were analyzed in this study.

Results: A total of 1289 children aged 1-18 years attended the pediatric OPD over 1 year of the study period, out of them, 118 had evidence of enlarged adenoid on lateral nasopharyngeal x-ray, giving a prevalence of 2.3%. Among the 118 radiologically proved AH cases, 112 (95%) were symptomatic and 6 (5%) were asymptomatic having risk factors only. The peak age of diagnosis of AH in this study was between 12-72 months (43.4%). The mean age of presentation was 100.6±58 months. There was a male predominance with male to female ratio of 1.6:1. AH may be presented without symptoms in 5% of cases or may be presented with complications such as OSA (27%), adenoid facies (14%), and otitis media with effusion with or without hearing impairment (13%).

Conclusion: The prevalence of AH among children attending the pediatric outpatient department was 2%, of them 18% had an indication for adenoidectomy. The most common two clinical presentations were mouth breathing and nasal obstruction and the most common complication was obstructive sleep apnea.

Key Word: Adenoid hypertrophy; Sleep apnea; Snoring; Nasal obstruction.

Date of Submission: 24-10-2025

Date of Acceptance: 04-11-2025

I. Introduction

Adenoid hypertrophy (AH) is an obstructive condition related to an increased size of the adenoids. The condition can occur with or without an acute or chronic infection of the adenoids. The adenoids are a collection of lymphoepithelial tissue in the posterior-superior aspect of the nasopharynx medial to the Eustachian tube orifices. The adenoid is a significant part of Waldeyer's ring situated in nasopharyngeal region. Due to its extraordinary location, in adjacent choanae and Eustachian tube, it is regularly the site of beginning of numerous medical issues in youth. Adenoid is small in size at early stages, increases in initial four years of life

because of the improvement of immunity. Whenever left untreated, AH may prompt obstructive sleep apnea (snuffling, uneasiness, mouth breathing), ear issues, pulmonary hypertension, craniofacial peculiarities and inability to thrive.¹ In conjunction with the faucial and lingual tonsils, adenoids make up the structure known as Waldeyer's ring, a collection of mucosal-associated lymphoid tissue situated at the entrance of the upper aerodigestive tract. Blood supply to the adenoids includes the ascending pharyngeal artery, with some contributions from the internal maxillary and facial arteries. The glossopharyngeal and vagus nerves provide sensory innervation to the adenoids. Adenoid size tends to increase during childhood, usually reaching maximal size by age 6 or 7 before regressing by adolescence. These lymphoid tissues are the first line of defense against ingested or inhaled pathogens.² The adenoids becomes evident due to physiological hyperplasia by about six months to one year of life, then gets larger in size during the first 6-10 years of life and generally shrinks by physiological atrophy by the age of 16 and is rare beyond this age.³⁻⁶ Nasal obstruction by hypertrophic adenoid tissue can cause the patient to complain of rhinorrhea, difficulty breathing through the nose, chronic cough, post-nasal drip,

snoring, and/or sleep-disordered breathing in children. If the nasal obstruction is significant, the patient can suffer from sinusitis as a result and may complain of facial pain or pressure. The persistence of enlarged adenoids and even more swelling or reproliferation of regressed tissue which is generally termed as AH is associated with chronic persistent inflammation.^{7,8} Frequent infections in throat, or ears including chronic sinusitis and tonsillitis; allergic conditions such as bronchial asthma (BA), atopic dermatitis (AD), atopic conjunctivitis (AC) and specially atopic rhinitis (AR); allergic sensitivity to house dust, pollen, cockroach and more important cigarette smoke exposure specially at home are known causes (risk factors) for chronic persistent inflammation and symptomatic AH.^{4,9,10}

Obstruction of the Eustachian tube can lead to symptoms consistent with Eustachian tube dysfunction such as muffled hearing, otalgia, crackling or popping sounds in the ear, and or recurrent middle ear infection¹³. An untreated AH may lead to develop craniofacial anomalies (adenoid facies), OSA, ear problems (otitis media with effusion and hearing impairment due to eustachian tube obstruction), failure to thrive, pulmonary hypertension and cor-pulmonale.^{13,15} Defective speech may develop which is effect of articulation error and hearing impairment developed by long term enlarged adenoid.¹⁶ Data regarding the prevalence and clinical profile of adenoid hypertrophy in children is scanty in our country. This study is therefore aimed to estimate the prevalence, to enumerate the presence of risk factors and pattern of presentations and complications of adenoid hypertrophy among children attending at pediatric outpatient department. It is one of the most frequent indications for surgery in the childhood.¹⁹

II. Material And Methods

This cross-sectional study was conducted at the pediatric outpatient department (OPD) in Department of ENT at Katihar Medical College and Hospital, Katihar, Bihar from November 2023 to November 2024 118 diagnosed cases of AH were recruited from patients attending OPD in the hospital. All the children aged 1-18 years attending the OPD were searched for history or presence of any known risk factors for AH. Risk factors considered in this study were frequent infections in the throat, ears including chronic sinusitis and tonsillitis; allergic conditions such as bronchial asthma, atopic dermatitis, atopic conjunctivitis and atopic rhinitis; allergic sensitivity to house dust, pollen, cockroach and cigarette smoke exposure. Sign-symptoms arising from AH were documented. All the symptomatic patients and asymptomatic but had history or presence of any risk factor was advised to do a lateral nasopharyngeal x-ray to confirm the presence of enlarged adenoid. As these asymptomatic children might have AH not large enough to produce symptoms, they were evaluated.

Children whose diagnoses were not proven by lateral nasopharyngeal x-ray were excluded from the study. Children who had enlarged adenoid were analyzed to estimate the incidence and to evaluate of pattern of presentations. All diagnosed patients were treated as per current guidelines. The cases that had at least one indication (Otitis media with effusion of at least 3 months duration, Chronic adenoiditis, OSA lasting 3 months or greater, and Recurrent upper respiratory infections) for adenoidectomy were referred to ENT OPD of same hospital for evaluation and management. OSA was diagnosed clinically by the occurrence of daytime sleepiness, loud snoring, witnessed breathing interruptions or awakenings due to gasping or choking in the presence of at least 5 obstructive respiratory events (apneas, hypopneas or respiratory effort related arousals) per hour of sleep.²⁰ The presence of 15 or more obstructive respiratory events per hour of sleep in the absence of sleep related symptoms was also diagnosed as OSA.²¹

Statistical analysis

Data collection was done with structured data collection sheet which included demographic variables, necessary history and examination as well as investigation findings. Data analysis was performed using SPSS version 20 (SPSS, Chicago, IL). The analysis of patient demographics and baseline outcome variables were summarized using descriptive summary measures: expressed as mean $\pm$ standard deviation for continuous variables and frequencies and percentage for categorical variables. Appropriate statistical test (e.g., Chi-square test, unpaired t-test,) was applied for data analysis. $P < 0.05$ was considered statistically significant. The purpose and procedure of the study were properly explained to the parents/guardian and informed written consent was taken from them. The study did not involve any additional burden on the patients. All participants in a research study had a right to have the information that they provided to be kept confidential.

III. Result

A total of 1289 children aged 1-18 years attended the pediatric OPD over 1 year of the study period, out of them, 118 had evidence of enlarged adenoid on lateral nasopharyngeal x-ray, giving a prevalence of 2%. Among the 118 radiologically proved the adenoid hypertrophy cases, 112 (95%) were symptomatic and 6 (5%) were asymptomatic having risk factors only. The peak age of diagnosis of Adenoid hypertrophy in this study was between 12-72 months (43.4%). The mean age of presentation was 100.6 ± 58 months. There was a male

predominance with male to female ratio of 1.6:1. Adenoid hypertrophy was more common in the rural children than the urban (57.63% versus 42.37%) (Table 1).

Table no 1 : Demographic variables distribution of the AH cases, (n=118).

Variables	Number of children	Percentage (%)
Age (months)		
12-72	51	43.41
73-156	38	32.18
157-216	29	24.41
Gender		
Male	72	61.34
Female	46	38.66
Resident		
Urban	50	42.37
Rural	68	57.63

The 86% children of cold exposure, 60% allergic sensitivity to house dust, 60% had AR, 55.5 % had history of recurrent tonsillitis with or without pharyngitis and 55.3% of children were exposed to cigarette smoke specially at home (Table 2).

Table no 2: Risk factors distribution among the diagnosed AH cases, (n=118).

Risk factors	Number of children	Percentage (%)
No risk factor	9	8
Frequent infections in the throat, head or ears chronic sinusitis	13	11
Recurrent tonsillitis ± pharyngitis	65	56
Allergic conditions		
Atopic rhinitis (AR)	71	60
Bronchial asthma (BA)	27	22
Atopic dermatitis (AD)	23	19
Atopic conjunctivitis (AC)	3	2
Allergic sensitivity to house dust	71	60
Cigarette smoke exposure especially at home	65	55
Temperature change/ cold exposure	101	86

The most common presentation of AH in children detected in the study was mouth breathing especially during sleep time (90%). Other common presenting features were nasal obstruction (84%), nasal discharge (73%), drooling of saliva (72%), daytime somnolence (65%), and snoring during sleep (62%). AH may be presented without symptoms in 5% cases or may be presented with complications such as OSA (27%), adenoid facies (14%) and otitis media with effusion with or without hearing impairment (13%) (Table 3).

Table no 3: Clinical presentations of AH, (n=118).

Clinical presentations	Number of children	Percentage (%)
Asymptomatic (with risk factors)	6	5
Symptomatic (with or without risk factors):		
Mouth breathing	107	90
Snoring	73	62
Drooling of saliva	85	72
Nasal discharge	86	73
Nasal obstruction	99	84
Sneezing	28	24
Hyponasal speech	62	53
Cough	68	57
Daytime somnolence	77	65
Deterioration of school performance	65	55
Defective speech	40	34
Obstructive sleep apnea	31	27
Adenoid facies	16	14
Hearing impairment speech complications	15	13

Among the total 118 AH cases, 21 (18%) were referred to ENT OPD for adenoidectomy with or without tonsillectomy as they had at least one indication for this surgery (Table 4).

Table no 4: Children with AH who were referred for adenoidectomy, (n=21).

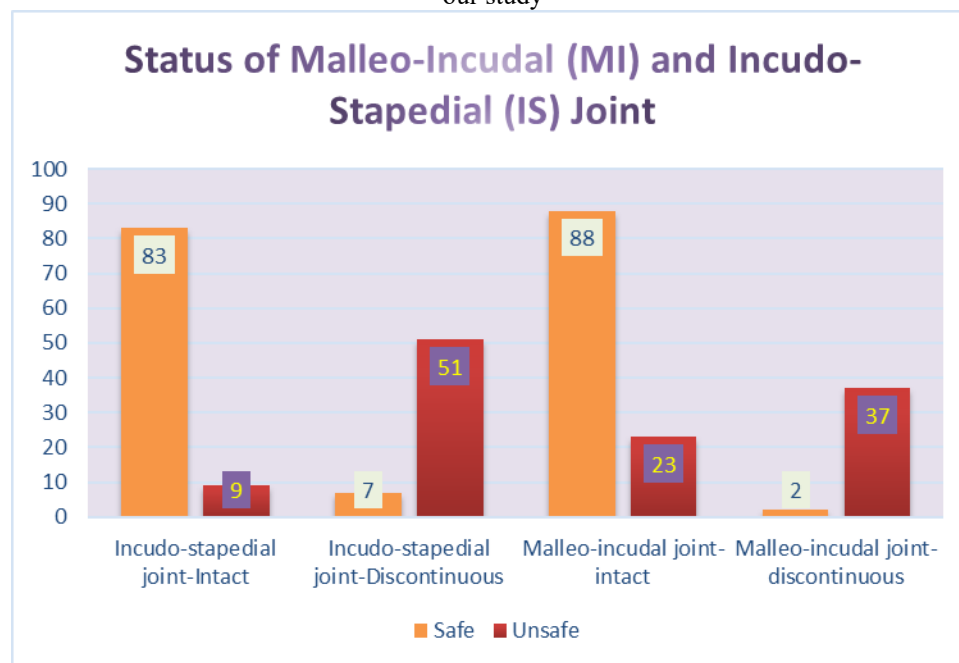
Indications for adenoidectomy ²⁰	Number of percentage (%)	Children
OSA lasting 3 months or greater	9	43
Chronic adenoiditis	5	24
Recurrent upper respiratory infections	7	33

Status of Malleo-Incudal (MI) and Incudo-Stapedial (IS) Joint

The malleo-incudal joint was found intact in 111 (74.00%) and discontinuous in 39 (26.00%) cases. In safe CSOM, malleo incudal joint was intact in 88 (97.78%) cases. In unsafe CSOM, malleo incudal joint was and discontinuous in 37 (61.67%) cases.

The incudo-stapedial joint was found intact in 92 cases (61.33%) and discontinuous in 58 (38.67%) cases of CSOM. In safe CSOM, it was intact in 83 (92.22%) cases of the cases and discontinuous in 7 (7.78%). In unsafe CSOM, it was intact only in 9 (15.00%) cases and discontinuous in 51 (85.00%) (Fig. 1).

Figure no 1: Status of Malleo-Incudal (MI) and Incudo-Stapedial (IS) Joint in both safe and unsafe CSOM in our study



Status of Ossicular Chain

The ossicular chain was found intact (M+I+S+) in 92 (61.34%) cases. In safe CSOM, 83 cases (92.22%) had an intact chain, 7 cases (7.77%) had ossicular damage. In unsafe CSOM, intact malleus with eroded incus and stapes (M+S-) was seen in 16 (26.67%) cases, followed by M-S- in 15 cases (25.00%) (Figs. 2,3).

Figure no 2: Ossicular Status of Malleus-Incus and Stapedius in safe CSOM in our study

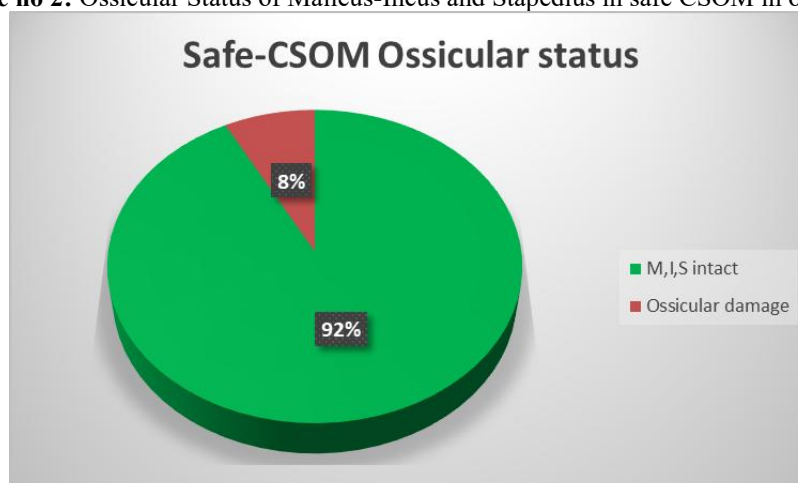
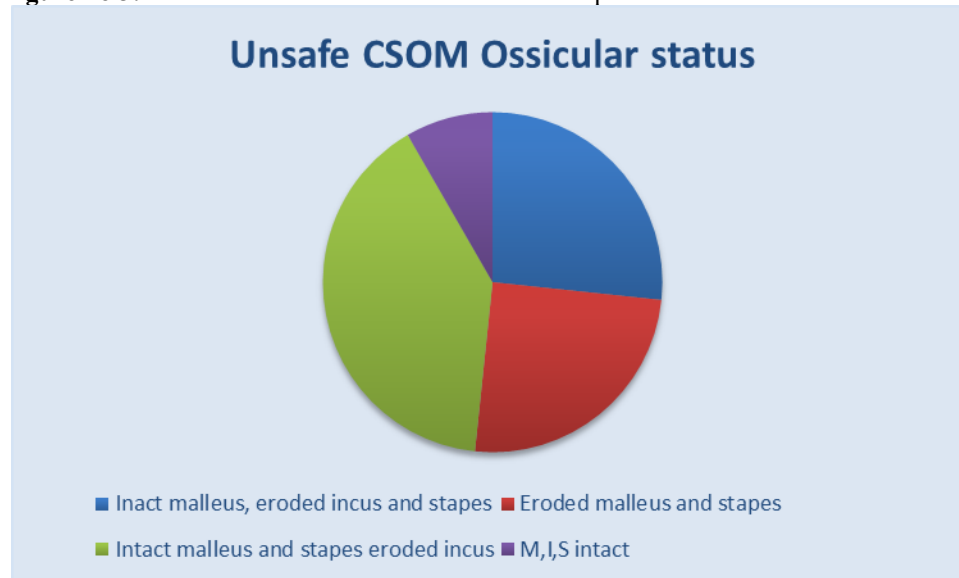


Figure no 3: Ossicular Status of Malleus-Incus and Stapedius in unsafe CSOM in our study



- **Incus** was the most frequently eroded ossicle in both types, but especially in unsafe CSOM.
- **Stapes erosion** was significant in unsafe CSOM, often involving the suprastructure.
- **Malleus** was relatively preserved, especially in safe CSOM.

IV. Discussion

Adenoid facies were observed in 14% cases, otitis media with effusion with or without hearing impairment in 13% cases, but we could not detect any case of pulmonary hypertension/cor-pulmonale as routine echocardiography was not feasible. In our study 18% children were needed to refer for adenoidectomy. On other hand an untreated AH may presented with severe complications. In our study we found OSA in 27% cases. AH was little more common in rural children according to our study. Allergic sensitivity to house dust was the leading risk factors for AH in our study. The most common sensitivity to allergens among patients with AH was exposure to house dust in other study also.⁹ Cigarette smoke exposure at home and presence of AR significantly more frequent in the group of patients with AH observed by logistic model investigation in other study also.⁹ Presence of other risk factors are also showed as significant in other studies.^{4,10} Most common presentation of AH in children detected in our study was mouth breathing especially during sleep time (90.5%) which is consistent with other study.^{13,15,17} Wide variability in percentage of indications were found in different studies.^{17,20} The difference in the prevalence of these studies are probably due to different sample size, study places and diagnostic methods. Racial and geographical variability and seasonal as well as environmental influences may also cause differences in results. Ezyi et al used a small sample size compare to us. We diagnosed our cases clinically with the help of lateral nasopharyngeal x-ray and not with nasoendoscopy as used by others.^{5,9,10} The peak age of diagnosis of AH in this study was between 12-72 months (43.4%) with mild male predominance which is more or less similar to other studies.^{9,17} Other common presenting features were nasal obstruction (83%), nasal discharge (73%), drooling of saliva (72%), daytime somnolence (65%) and snoring during sleep (62%). It is important to note that 55.3% child may present with deterioration of school performance. All these symptoms are also common presentation showed in other study also.^{13,15,17} AH may be presented without symptom in 5% cases as shown in our study. AH had great negative influences on physical as well as mental health; Childhood sleep-disordered breathing (SDB) is the most important one. Children with SDB are suffering from behavior problems, intelligence quotient deficits, school performance problems, a high prevalence of abnormal neuropsychological diagnosis, poor quality of life, impaired growth, cardiovascular insults, and increase in health care utilization.^{22,23} We noted the prevalence of AH as 2%. This is at variance with the prevalence of 1.3% in general populations, 3% in non-allergic patient and 7.7% in patient with nasal diseases.^{9,17,24} Most common presentation of AH in children detected in the study was mouth breathing especially during sleep time (90%). Other common presenting features were nasal obstruction (84%), nasal discharge (73%), drooling of saliva (72%), Daytime somnolence (65%) and snoring during sleep (62%). AH may be presented without symptom in 5% cases or may be presented with complications such as OSA (27%), adenoid facies (14%) and otitis media with effusion with or without hearing impairment (13%) (Table 3). Despite the high burden of disease, late presentation remains a major hurdle in rural settings. Parents often dismiss mouth breathing and snoring as benign or temporary, seeking medical attention only when complications like ear infections or sleep apnea emerge. Health education

campaigns, school screenings, and integration of ENT evaluation in child health services are urgently needed to bridge this gap.

Lastly, this study underscores the need for a multidisciplinary approach, considering the high overlap between allergic, infectious, and anatomical causes. The success of treatment and prevention depends not only on medical or surgical intervention but also on improving indoor air quality, vaccination rates, and general pediatric hygiene.

Limitations

Since this a hospital-based study, the incidence does not reflect the actual incidence of the community. The study sample size was also small, it is not found to be statistically significant and no control was taken. The study was done only in one OPD which did not represent the whole country. Diagnosis was made clinically with help of x-ray findings; results may differ if naso- endoscopy could be done. Many risk factors and symptoms were subjective; we depended on parents or patients. Allergic prick test and echocardiography could not be done due to lack of feasibility.

V. Conclusion

AH tended to lead to mandibular retrusion and high mandibular plane angle. The prevalence of AH among children attending at pediatric outpatient department was 2%, of them 18% had an indication for adenoidectomy. Allergic sensitivity to house dust was the most common risk factor. The most common two clinical presentations were mouth breathing and nasal obstruction and most common complication was obstructive sleep apnea.

Recommendations

1. Training of ASHA workers and rural pediatricians to identify early signs of nasal obstruction.
2. Awareness drives on avoiding indoor air pollution.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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