Original Article

Risk Factors, Clinical Profile and Association of Clinical Grading With Radiological Grading of Adenoid Hypertrophy in Children

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ABSTRACT:

BACKGROUND: *Adenoid hypertrophy producing obstructive airway symptoms is the most commonly encountered pediatric ENT problem. Clinical symptoms in combination with lateral nasopharyngeal x ray is a reliable technique for selection of children requiring surgical intervention.*

METHODOLOGY: *The current cross sectional prospective study was conducted among 250 children aged 3-12 years with clinical symptoms and radiological evidence suggestive of enlarged adenoids, at Pediatric outpatient department of a tertiary care center, Dhaka, during 1-year period.*

RESULT: *In our current study, majority children (74%) with adenoid hypertrophy were 3-6 years old followed by 26% between 7-12 years. 66% children were male and 34% were female with a male to female ratio of 1.9:1. 44% children were from lower class family and history of atopy was present among 54% children. Clinical grading of adenoid hypertrophy was done on the basis of presenting symptoms (mouth breathing, snoring, sleep disturbances and adenoid facies) and radiological grading was done from calculating adenoid nasopharyngeal ratio. Correlation between clinical scoring and radiological grading of adenoid hypertrophy among study population was observed. Clinical score of 0-4, 5-8, 9-12 and 13-16 was graded clinically into Grade I, II, III and IV respectively. Highly significant p value (.000) was observed in Grade II clinical and radiological grade of enlarged adenoid. The remaining clinical and radiological grade of enlarged adenoids showed significant p value .031, .024 and .019 among grade I, III and IV respectively.*

CONCLUSION: *Though various diagnostic modalities for detection of degree of obstruction caused by enlarged adenoids are available, clinical scoring in combination with radiological grading can be effectively used to select patients requiring surgical intervention for pediatric adenoid hypertrophy.*

Key Words:
Carbapenemase,
Drug Resistance,Genes,
Gram-negative bacilli, Imipenem

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Introduction:

The adenoids are a collection of lymphoepithelial tissue in the superior aspect of the nasopharynx medial to the Eustachian tube orifices. Adenoid hypertrophy (AH) is an obstructive condition related to an increased size of the adenoids.[1] Although present at birth, they are usually invisible until age 3 to 6 months. They can grow until about age 6, then involute through adulthood. Enlargement is pathological when they encroach on the nasopharyngeal airway, and this usually does not occur until age 1 to 2 years.[2] As the adenoids naturally atrophy and regress during adolescence, AH is more common in young children.1 A recent meta-analysis showed the prevalence of AH among a randomized representative sample of children and adolescents was 34.46%.[3]

AH results from either infectious (viral/bacterial) or noninfectious etiologies (allergy, gastroesophageal reflux, exposure to smoking).[4,5,6] Nasal obstruction by hypertrophic adenoid tissue can cause the patient to complain of bilateral nasal obstruction, rhinorrhea, difficulty in breathing through the nose, chronic cough, post-nasal drip, snoring, sleep-disordered breathing and occasionally epistaxis in children. If the nasal obstruction is significant, the patient can suffer from sinusitis as a result and may complain of facial pain. 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 infections.[7] On physical examination, the patient with AH will often breathe through the mouth, have a hypo nasal character of voice and may have the facial characteristics known as adenoid facies.[8,9]

Children with significant AH are at risk for developing speech, language, and/or learning difficulties as a result of conductive hearing loss which can occur with persistent secondary middle ear effusion. AH also places patients at risk for sleep-disordered breathing and sleep apnea which in children can lead to behavioral problems, bedwetting, pulmonary hypertension and has been associated with psychiatric disorders such as depression and attention deficit hyperactivity disorder (ADHD).[10]

Medical management with antibiotics with/without intra nasal steroids are the first step for treatment of AH in children. Adenoidectomy with/without tonsillectomy is the most frequently performed pediatric surgical intervention.[11] Appropriate selection of candidates who require surgical intervention for relief of symptoms will minimize unnecessary anesthetic and surgical exposure and postoperative complications. Objective methods for diagnosing AH are valuable in providing information about the need for surgery.[12] Diagnosis of AH is based on symptoms, physical examination finding and investigation (lateral nasopharyngeal x ray, nasal endoscopy and CT scan of nasopharynx). The inaccuracy of patient history and difficulties in approaching young children are examples of subjective drawbacks in the process of clinical decision making.[13] Lateral nasopharyngeal x ray have been shown to be effective in the assessment of adenoid size and airway patency. This is simple, available in most of the centers and reproducible. In a comparative study among four different methods of adenoid measurement on lateral neck x ray, Wormald et al concluded that the Cohen and Konak method showed the highest positive predictive value and described this method as a useful diagnostic tool in children with AH.[14] Disadvantages of lateral neck x ray includes, exposure of the child to radiation, film interpretation, rotation of the skull and inspiration or phonation during x ray examination could result in film misinterpretation.[15]

Nasal endoscopy and CT scan of nasopharynx are reliable and safe diagnostic method but require cooperation of the child and is difficult to perform in young children.[12]

In our current study we observed prevalence, clinical profile and risk factors of pediatric AH and observed correlation of clinical scoring of enlarged adenoid with radiological grading. As lateral nasopharyngeal x ray for detecting size of enlarged adenoid are excellent diagnostic tool, easy to perform and widely available this method alone can be chosen for selection of patients requiring surgery.

Methods And Materials:

Conceptualization of the study: Our current observational, cross sectional prospective study was conducted with an aim to observe the prevalence, clinical profile and risk factors of AH in children and correlate clinical scoring (CS) with radiological grading of AH. As radiological evaluation of AH is an accurate and simple diagnostic tool for assessment of accurate size of enlarged adenoid, this test alone along with significant clinical manifestations can be used to select candidate who require surgical intervention. The proposal of the study was approved by

the Ethical Committee of the respective institute. Informed consent was obtained from the accompanying caregiver of the child. Confidentiality of the data derived from the sample were maintained.

The present study was conducted among 250 children at Pediatric outpatient department (OPD) of a tertiary care hospital during 1- year period from March 2021 to February 2022. A systematic questionnaire was used to collect data from the study population. Children aged 3-12 years with symptoms and signs suggestive of AH, and having radiological evidence of enlarged adenoid were included in this study. Children with chromosomal/genetic disorder, congenital malformation and AH not confirmed radiologically were excluded from the study. Partially modified clinical scoring (CS) of enlarged adenoid was done on the basis of specific symptoms and signs and accordingly scored from 1 (absent) to 4 with a total CS of 16. Modification of CS was done according to clinical features of study group during enrollment in the study. [16,17,18,19]

Laboratory Investigations: Lateral nasopharyngeal x ray to measure adenoid nasopharyngeal ration (ANR) was done in all study participants presenting with clinical features consistent with enlarged adenoids. The films were then assessed by radiologists and reevaluated by ENT specialists. The adenoidal measurement represents the distance from the point of maximal convexity of the adenoid shadow (A1-Figure 1) anterior inferiorly to the anterior margin of the basi-occiput (A- Figure 1).[12] The ANR was categorized as Grade I (0-25%), Grade II (25-50%), Grade III (50-75%) and Grade IV (75-100%).[16]

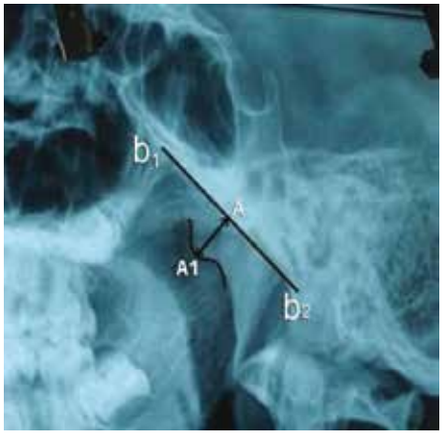

Figure 1: Adenoid nasopharyngeal ratio measurement in lateral nasopharyngeal x ray.

Data Analysis: Clean coded data was input into Microsoft Excel and exported to SPSS version 22 for further analysis. The descriptive statistical analysis was described using sentences, graphs, tables, frequencies, percentages, mean and standard deviation. The frequencies of the variables were used in a descriptive analysis and the 95% confidence intervals (CIs) were produced. The statistical analysis was omitted from questionnaires that were incomplete. The chi-square test was used during bivariate analysis for identifying variables associated with prevalence of Adenoid Hypertrophy.

Results:

A total of 250 children with clinical symptoms and radiological evidence of enlarged adenoids were enrolled in our current study. There were 165 (66%) male and 85 (34%) female children with M: F ratio of 1.9:1. The age of the patients ranged from 3-12 years with 74% children belonging to 3-6 years' group having significant adenoid hypertrophy. (Table 1) Majority cases (44%) were from lower social class followed by 34% and 22% from middle and upper social class. History of atopy was present among 54% cases. (Table 1)

Table 1: Sociodemographic profile of study population (n=250)

	Frequency (n)	Percentage (%)
AGE:		
3-6 years	185	74
7-12 years	65	26
SEX:		
Male	165	66
Female	85	34
SOCIAL CLASS:		
Lower	110	44
Middle	85	34
Upper	55	22
HISTORY OF ATOPY		
Present	135	54
Absent	115	46

Table 2: Clinical Grading of Adenoid Hypertrophy among study population

Symptoms & Signs	Severity Score
1. Mouth Breathing	
Absent	1
Occasionally present	2
Present during an episode of ARI	3
Always present	4
2. Snoring	
Absent	1
Occasionally present	2
Present during an episode of ARI	3
Always present	4
3. Sleep Disturbances	
Absent	1
Occasionally present during an episode of ARI	2
Present every day with < 3 episode/night daily	3
Present every day with > 3 episode/night daily	4
4. Adenoid Facies	
Absent	1
Elongated dull looking face	2
Crowded dentition, high arched palate	3
All features of adenoid facies	4

Clinical grading of enlarged adenoid was done on the basis of clinical symptoms during enrollment in the study, shown in Table 2. The score ranged from 1-4 with total scoring of 16. Accordingly, severity scoring was clinically graded into Grade I (score: 1-4), Grade II (score: 5-8), Grade III (score: 9-12) and Grade IV (score: 13-16). Majority children (44%) had clinically Grade II adenoid hypertrophy followed by Grade III, I and IV among 28%, 18% and 10% study group. (Table 3)

Table 3: Distribution of study population according to Clinical Grading (n=250)

Clinical Grading	Number of Cases	Percentage (%)
Grade I	45	18
Grade II	110	44
Grade III	70	28
Grade IV	25	10

Table 4: Distribution of study population according to Radiological Grading (n=250)

Clinical Grading	Number of Cases	Percentage (%)
Grade I	38	15
Grade II	115	46
Grade III	75	30
Grade IV	18	8

Lateral nasopharyngeal x ray was advised in all cases and radiological grading was done on the basis of adenoid-nasopharyngeal ratio (ANR). Majority (46%) had Grade II radiological grading followed by 30%, 15% and 8% had radiological Grade III, I and IV. (Table 4)

Table 5: Correlation between Clinical Scoring and Radiological Grading of Adenoid Hypertrophy among study population (n=250)

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Clinical Scoring	Clinical Grade	Percentage	Mean + SD	Radiological Grading	Percentage	Mean + SD	p value
0-4	I	18	1.88 + 1.40	I	15	1.92 + .99	.031
5-8	II	44	6.48 + 1.12	II	46	6.89 + .95	.000
9-12	III	28	10.47 + 1.12	III	30	10.45 + .87	.024
13-16	IV	10	14.44 + 1.15	IV	7	14.50 + .98	.019

Table 5 shows correlation between Clinical Scoring and Radiological Grading of AH among study population. Clinical score of 0-4, 5-8, 9-12 and 13-16 was graded clinically into Grade I, II, III and IV respectively. Highly significant p value (.000) was observed in Grade II clinical and radiological grade of enlarged adenoid with mean and standard deviation of 6.48 + 1.12 and 6.89 + .95 respectively. The remaining clinical and radiological grade of enlarged adenoids showed significant p value .031, .024 and .019 among grade I, III and IV respectively.

Discussion:

Adenoid hypertrophy (AH) due to various etiologies is one of the commonest pediatric ENT problem requiring seek for health care advice. Though self-resolving and age related regression of enlarged adenoids, significant untreated prolonged AH may lead to various co morbidities. Our current study was conducted with an aim to observe the prevalence of AH among 3-12 years old children attending pediatric OPD in a tertiary care center, identify possible risk factors of AH, clinical and radiological grading of children with enlarged adenoids and to see correlation between these two.

The preponderance of AH among male children (66%) and young age group (74% among 3-6 years' age with mean age 48.6 months) was similar to previous studies conducted by various authors.[20,21] This is due to the fact that adenoids increase in sizes mostly between 2-5 years of age.19 Sunaina et al in her study found, majority children (30%) with AH were in age group 3-5 years and 28% were between 5-7 years followed by decrease prevalence among 7-12 years old group.[12] Whereas, ASL Jyothermai in his study found, 38% children with AH were from 6-8 years' age group.[16] Md. A Bitar in his study found, 85.7% children with AH were younger than 3 years' vs 29.2% children with AH were older than 3 years. Symptoms of AH were more prevalent (71.4%) among the younger age group.[20] The overall prevalence of AH in our study was 34% which as similar to another study conducted by Pereira L.[3]

44% of our study population were from poor socioeconomic background followed by 34% and 22% belonging to middle and upper class family. Josephat et al in his study found similar result of majority (30.8%) children with AH coming from poor social class.11 Eziyl J A in his study stated, prevalence of AH is lowest among children from high social class.[25] This is probably due to the fact that poor family residing in overcrowded unhygienic environment fascilate spread of infections, one of the major risk factor of pediatric AH.

History of atopy was present among almost half (54%) of our study population. (Table 1) Emanuel Capistrano et al in his study found, among total children who had AH, 37% were atopic.[25] Another study conducted by Marek Modrzyński et al found, in children with AH, allergic rhinitis was the most commonly found allergic disease which seems to be the risk factor for AH in hypersensitive children.[22] Most recent study by Kyu-Sup Cho et al revealed, allergic response may be a risk factor for adenotonsillar hypertrophy.[27]

Adenoidectomy with or without tonsillectomy is the most frequently performed pediatric ENT surgery, as untreated significantly enlarged adenoids may lead to obstructive sleep apnea, ear problems, craniofacial abnormalities, pulmonary hypertension and failure to thrive. Appropriate selection of patients requiring surgical intervention is important as the procedure isn't devoid of post-operative complications and also to avoid unnecessary expense burden on the parents.

In symptomatic children, preliminary diagnosis of AH can be made clinically but clinical assessment alone is often considered unreliable as the glands are not visualized directly. In our present study, we did clinical grading of study population (Grade I-IV) by partially modifying previous clinical scoring systems.[16] Modification was done on the basis of common symptoms of our cases during enrollment in the study (mouth breathing, snoring, sleep disturbances and adenoid facies). Table 2

Accordingly, in our study, 44% children had clinical Grade II AH followed by 28%, 18% and 10% having Grade III, I and IV AH. (Table 3) ASL Jyothirmai et al in his study found 60% children had clinical Grade III AH followed by Grade II (20%), Grade IV (18.3%) and Grade I (1.7%).[16]

In our study, confirmation of AH was made from lateral nasopharyngeal radiograph in all cases and adenoid nasopharyngeal ratio (ANR) was calculated. Accordingly, radiological grading of AH was categorized into, ANR of 0-25% (radiological grade I), ANR 25-50% (radiological grade II), ANR 50-75% (radiological grade III) and ANR 75-100% (radiological grade IV).[16] Majority (46%) children in our study had Grade II radiological grading followed by 30%, 15% and 8% having Grade III, I and IV grading. This finding was similar to study by Sunaina et al in which 63% of study sample had radiological grade II AH followed by grade III AH in 36% children.[12] On the contrary, on analyzing lateral neck x ray, ASL Joyothermai found 51% of cases had grade III AH followed by grade II (30%), grade IV (11.7%) and grade I among 6.7%.[16]

Enlarged adenoids producing obstructive symptoms is a common problem encountered in pediatric age group.

Besides clinical assessment, various investigation modalities are available to see the degree of airway obstruction by enlarged adenoids (lateral neck x ray, nasal endoscopy, CT scan of nasopharynx). Investigations for detection of enlarged adenoids other than radiographs are either invasive or not available in all centers, are not cost effective and not feasible to perform in young children. Whereas, radiology is a simple, widely available and useful diagnostic tool for detection of the size of the enlarged gland. In combination with clinical features and x ray, appropriate selection of patients can be made who require surgical intervention. So in our present study we correlated clinical scoring with radiological grading. (table 5) Highly significant p value (.000) was observed in Grade II clinical and radiological grade of enlarged adenoid with mean and standard deviation of 6.48 + 1.12 and 6.89 + .95 respectively. The remaining clinical and radiological grade of enlarged adenoids showed significant p value .031, .024 and .019 among grade I, III and IV respectively.

ASL Jyothermai et al in his study showed significant correlation between clinical and x ray grading (p= 0.04). In his study, all cases with mild (grade I) obstruction in clinical grading showed grade I hypertrophy on x ray and 63% of cases who had severe obstruction (grade IV) in clinical grading had grade III hypertrophy on x ray.[16] Sunaina et al in her study found, radiology relates well with symptoms of AH in children. 94.4% children with x ray grade III and 65.1% children with x ray grade II had significant symptoms at presentation.[12]

Mohammad A Bitar et al in their study observed a significant correlation between CS and the degree of obstruction of the palatal airway. (p< 0.05)23 In his study, a CS of at least 3 predicted severely obstructive adenoid with moderate to severe obstruction in 98% of these children as measured on x rays.

Shervin et al in their study developed a new clinical scoring (CS) for AH in children and observed correlation of CS with radiological grading. In their study correlation between lateral nasopharyngeal x ray and CS was very weak (p=0.78). Only 17% children with severe obstruction in clinical score demonstrated severe hypertrophy in lateral neck radiograph. This finding was not consistent with our study result. However, in their study, the CS correlated very well with endoscopic findings. (p<0.000) 28

Conclusion:

In children with suspected adenoid hypertrophy, lateral nasopharyngeal x ray can be used as a reliable, useful, and cost effective diagnostic tool for detection of degree of airway obstruction. In conjunction with clinical scoring, x ray nasopharynx is a reliable technique for selection of children requiring surgical intervention in resource limited settings.

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