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# Investigating the frequency of adenoid hypertrophy and allergic rhinitis in children with mouth breathing complaints

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## Abstract

**Background and Objectives**: Nocturnal snoring and open mouth breathing in children is one of the common causes of referrals to pediatricians. The two most common reasons of this problem are adenotonsillar hypertrophy and allergic rhinitis. Based on the findings, there is still no significant relationship between these two diseases. Therefore, the aim of this study was to determine the frequency of adenoid hypertrophy and allergic rhinitis in children with mouth breathing complaints who referred to the allergy or ENT clinic of Ali Asghar Hospital in Tehran during 2015-2016.

**Methods:** The population included all children between the ages of 4 and 12 years with symptoms of mouth breathing and nocturnal snoring referred to Allergy clinic of Ali Asghar Hospital during 2015-2016. These patients were examined by allergy sub-specialist in terms of atopy, allergic rhinitis, and allergy tests history. Patients were also examined by hospital otolaryngologist and otolaryngologist and the severity of tonsil hypertrophy and conchae was found. A checklist of the patient gender and age, age of the first allergic rhinitis symptoms, clinical signs at referral time, the severity and frequency of allergic rhinitis symptoms, other diseases, selected therapies by doctor, is also completed by researcher. Allergic rhinitis symptoms and adenoid hypertrophy symptoms and severity of asthma, duration of allergic rhinitis symptoms, quality of life, parent's history of smoking in children, and parent's history of snoring were also included in.

**Results**: 104 children at mean age of 6.35 ± 2.65 years were enrolled. Of these, 54.8% were male. Only 17.3% of children had adenoid hypertrophy, and other children had seasonal or perennial allergic rhinitis, or had both of them. The highest prevalence of nasal congestion symptoms was 92.3% and rhinorrhea was 79.8%. Mite allergy was 28.8%, weeds mixtures allergy 26.0%, pollen trees allergy 15.4%, dog and cat's hair allergy in 8.7%, and food allergies in 2.9% of children. The frequency of rhinorrhea, nasal congestion, sneezing, nasal itching, tearing and itching eyes, pulmonary allergy, asthma, gastro esophageal reflux and mites, weeds mixtures, pollen trees, dogs and cats hair allergies was significantly more ($p<0.05$) in children with allergic rhinitis. However, the frequency of otitis media in children with adenoid hypertrophy was significantly higher than in children with allergic rhinitis ($p<0.05$).

**Conclusion**: It can be concluded that the prevalence of allergic rhinitis which responds to avoidance of specific allergen and intranasal corticosteroid in children who referred with mouth breathing complaints is much higher than adenoid hypertrophy with no response to pharmacological therapy, and in case of proper diagnosis and treatment, a few children will ultimately require surgery. Therefore, considering the appropriate strategies and planning for early diagnosis and treatment of these patients, can reduce the need for surgery, its complications for patients.

**Keywords:** Allergic rhinitis, Adenoid hypertrophy, Mouth breathing, Night snoring

## Background

Adenotonsillar hypertrophy is seen in one third of general population of children (1-5), which is why tonsillectomy is one of the most commonly used surgeries in children's age group (2.3). The tonsils are part of the lymphoid tissue are lied in oropharynx, and this structure is known as the Waldeyer's ring. The pharyngeal tonsil located in ceiling and the posterior wall of the nasopharynx. which is also called adenoid. The tonsils act as a

barrier against antigens (including microbes, allergens, etc.) that we daily breathing and also play an important role in the body's innate and adaptive immune system (3-5). Allergic rhinitis is also a common disease with a prevalence of 10-40%, which in fact is an inflammatory reaction in body that engenders after encounter with allergens.(5) Although allergic rhinitis is not a life threatening disease, but associated with Illnesses such as asthma, sinusitis, otitis media, and adenoid hypertrophy (6,7). The severity of the disease varies from weakness conflict to severely disabling conflict. Allergic rhinitis are also important in patient's quality of life due to its effects on sleep (snoring, etc.), mood, physical activity and social activity, as well as its effects on behavior, learning power and attention in children.(8) Considering the increasing prevalence of allergic rhinitis and impact of this disease on patients quality of life as well as it's relation with Adenotonsillar hypertrophy, it is expected to determine this relation in order to avoid improper adenotonsillectomy in the future.

According to previous studies, there is no precise information that how many adenotonsillar hypertrophy are caused by allergic factors and how many of them are caused by non-allergic factors, (9,6) Bside, demonstrations and some complications of adenoid hyperplasia such as snoring, adenoid face, noisy breathing, mouth breathing, recurrent acute otitis media, not paired rows of teeth and chewing disorders , as well as sleep disorders, etc., not only have detrimental effects on children's health and decreasing the levels of intelligence and developmental disorders In children, but also imposes financial burden and causes to devastating effects on the health system of the country (9,10).

Immunological science promotions in the last few decades has also led us to better understand the function of lymphatic system and tonsils, which can provide guidance on whether or not to perform adenotonsillectomy. Considering these causes, it seems that allergy control can reduce the rate of Adenotonsillectomy in children and, considering that this surgery, like other surgeries, has its own dangers (11, 12). Therefore, the results of this study clearly have an important impact on improving the patient's quality of life and will also prevent additional costs incurred in treating these patients.

Considering that the pediatric group is considered as a very sensitive and valuable group for communities, we decided to investigate the relation between Adenotonsillar hypertrophy and allergic diseases (especially allergic rhinitis) and non-allergic diseases, so we would have a better performance in this disease diagnosis and treatment in a timely manner by obtaining the better estimates of the allergic and non-allergic prevalence of this disease. Certainly، choosing the appropriate treatment would be facilitated and affordable by clarification of this relationship, and we can also take steps to improve the patient's quality of life.

We are also trying to eliminate the contradictions that have occurred in previous studies, and take a small step towards medical science promotion.

**Methods**

In this sectional study, the under studied population included all children between the ages of 4 and 12 years who referred to allergy or ENT clinics of Ali Asghar Hospital with mouth breathing and nocturnal snoring symptoms during 2015-2016.

These patients were examined by an allergy specialist in terms of Atopy, allergic rhinitis, and allergy tests history. The allergy test performed on patients was a RIDA allergy test (which examines common allergens) that conducted on a Serum sample of patients by a Biorad laboratory kit and dedicated Ig E identified the allergens that people were sensitive to them. This test was performed in specified laboratory of Ali Asghar Hospital. The test was carried out to find allergens that people were sensitive to them, and due to disease control and treatment, it was necessary to eliminate them from the living environment of people. The under-exanimated Inhalation allergens were included bird's feathers, dog and cat's hair, weeds mixtures,

Table 1. Frequency of diagnostic types in under- studied children

| Patients | | Diagnosis |
|---|---|---|
| Percentage | Frequency | |
| 25 | 26 | Seasonal allergic rhinitis |
| 35.6 | 37 | Perennial allergic rhinitis |
| 22.1 | 23 | Seasonal allergic rhinitis + perennial allergic rhinitis |
| 17.3 | 18 | Adenoid hypertrophy |
| 100 | 104 | Total |

mite and pollen trees (including birch, Mugwort, Oak, Hazel, Plantain, etc.). Patients were also examined by an otolaryngologist of hospital and the tonsillar hypertrophy Severity is determined.

A checklist was also completed by the researcher. Exclusion criteria include the children with:1-face anomalies with or without trauma on face 2- Nasal septum deviation 3- acute rhinosinusitis 4- history of adenotonsillectomy 5- history of topical intranasal corticosteroid use. Finally, the recorded data in checklists entered to the software in order to statistical analysis. Data were analyzed by SPSS v.22 software.

**Results**

The mean age of children in this study was 6.35 ± 2.65 years (range from 4 to 13 years). Of these, 57 persons (54.8%) were male and 47 persons (45.2%) were female. The mean age of first symptoms in this study was 1.87 ± 4.58 years. According to the results, history of parents' snoring in night was positive in 64 children (61.5%). History of smoking in parents of 44 children (42.3%) was positive.

There were the history of respiratory distress due to upper respiratory infections in 79 children (76.0%). Our surveys showed that in parents of under-studied children, fathers in 19 children (18.3%), mothers in 30 children (28.8%), both father and mother in 11 children (10.6%), had allergy history.

Also in 44 children (42.3%) none of parents had allergy history. In studying symptoms, the highest prevalence was related to nasal congestion with 96 children (92.3%), and followed by rhinorrhea in 83 children (79.8%). Sneezing in 68 children (65.4%), nasal itching 48 children (46.2%) and tearing and itching sensation in eyes in 34 children (32.7%).

Investigating the effect of symptoms on children's life showed that these symptoms effects on sleep quality in 84 children (80.8%). It also prevented 37 children (35.6%) to do daily activities and prevented 13 children (12.5%) to effective presence in the school. The highest frequency of tonsil grading in under-studied children based on physical examination was related to Grade II in 51 children (49.0%). Investigating the allergens showed that there were mite allergy in 30 children (28.8%), weeds mixtures allergy in 27 children (26.0%), pollen tree allergy in 16 children (15.4%), dog and cat's hair allergy in 9 children (8.7%) and food allergies in 3 children (2.9%). Only 18 children (17.3%) had adenoid hypertrophy, and other children had seasonal, perennial allergic rhinitis or had the combination of both of them (Table 1).

According to our findings, the frequency of rhinorrhea, nasal congestion, sneezing, nasal itching, tearing and itching sensation in eyes, pulmonary allergy, asthma, gastro esophageal reflux and mites, weeds mixtures, pollen trees, dogs and cats' hair allergies was significantly more ($p<0.05$) in children with allergic rhinitis.

However, the frequency of otitis media in children with adenoid hypertrophy was significantly higher than in children with allergic rhinitis ($p<0.05$).

In our study, 18 children (17.3%) were surgically treated. Among them 7 children had partial improvement in symptoms. Also, only one persons of these children who were surgically treated had adenoid hypertrophy Diagnosis and the rest of them (%94.5) according to our findings had allergic rhinitis that resistant to pharmacological therapy so adenotonsilectomy was selected as a treatment for them. In this study, the frequency of asthma, otitis media and food allergies history in children who were surgically treated was significantly higher than those who received only pharmacological therapy ($p<0.05$). In other cases, there was no significant difference between two groups ($p<0.05$).

**Discussion**

In our study, only 17.3% of children who referred with mouth breathing had adenoid hypertrophy, and the rest of the children suffered from seasonal, pernnial allergic rhinitis or combination of both. In this regard, Ameli et al in a study the in 2013, found that 9.44% of 205 under- examined children had complete nasal obstruction, and 13.7% had Choanae conquer.

There was a significant correlation between the severity of nasal obstruction and adenoid volume. The risk of decreasing adenoid volume was associated with increasing the severity of nasal obstruction in patients with allergies compared to non-allergic patients (13). Sih and Mion reported that adenoid hypertrophy is one of the diseases associated with allergic rhinitis (4). A study also found that nocturnal snoring had a significant relationship with allergic rhinitis (10). In Hultcrantz and Modrzynski studies, the risk of adenoid hypertrophy among allergic children was found only in those who had allergic rhinitis (10, 14) that is compatible to our study. Thus, according to the findings of our study and mentioned studies, high prevalence of allergic rhinitis were seen in children with mouth breathing that it was often disre-

garded and adenotonsillectomy is selected as a treatment for this group of children.

However, evidences suggest that the appropriate response to pharmacological therapy and improvement in most children with mouth breathing complaints that in case of paying proper attention to this phenomenon, can be able to decrease the surgical complications and high cost of aggressive treatments. Of course there are still contradictory studies in this regard.

In our study, the prevalence of allergic rhinitis in both gender was not significantly different. In the study by Hatami (15) in Bushehr and Khaldi (16), the prevalence of the disease was also equal in both gender, which is compatible to our study. On the other hand, in Kao (17) and Oliver (18), boys have allergic rhinitis more than girls. Wang et al. reported a higher prevalence in girls, while in the Wang study in 2006, Contrary of this result were reported (19).

Symptoms and complications of allergic rhinitis such as rhinorrhea, nasal congestion, sneezing, nasal itching, sleep disorders caused by these symptoms and Possible Migraines affect different aspect of this patient life and effect on their quality of life. As learning and irritability disorders have also been observed in children with rhinitis (17, 18) in our studies, the highest prevalence was related to nasal congestion with 92.3%, rhinorrhea, with 79.8%, and sneezing with 65.4%.

According to our findings, 42.3% of children had smoker parents, which was relatively higher than normal level in the community. In Franklin and his colleagues' research showed that smoking play a role as an independent risk factor in nocturnal snoring and also showed the children with smoker parents had more prevalence of nocturnal snoring complaints, especially those who had smoker mothers. (14) Analysis of allergens showed that mite allergy was in 28.8%, weeds mixtures allergy in 26.0%, pollen trees allergy in 15.4%, dog and cat's hair allergy in 8.7%, and food allergy in 2.9% of children. Mowhadi and colleagues in Karaj have declared the pollens as the most common allergens (20) , While in the Oliver's study, the most allergy is related to lawns (39%), weed (21%) (18). Also, in a study by Khazia et al. In Sistan and Baluchestan province, mites with 86% feathers with 76%, Aspergillus with 51%, and lawns with 24% showed the highest positive response to skin prick test. (21) Researchers consider the reason of existing differences in relation to the variations of living environment of the research units. Because allergens are the substances that according to the geographical texture and vegetation cover of each region which people contact with them more than other substances and their immune system has developed special immunoglobulin E against them.

Atopy is a reaction of improper sensitivity increasing that is created in response to certain allergens, and this sensitivity increasing is determined by producing of more IgE antibodies, which is used to test the Atopy by the allergy skin test. In a study by Cheng and colleagues, it was showed that, there was a significant relationship between snoring and Atopy (22).

In research, there was no significant difference in the prevalence of atopic dermatitis among children with allergic rhinitis compared to adenoid hypertrophic patients.

In this study, the prevalence of otitis media in children with adenoid hypertrophy was significantly higher than in children with allergic rhinitis.

In a study by Nabavizadeh et al in 2013 year, 61 patients with proved chronic otitis media and 58 patients with mild facial and neck trauma were evaluated for allergic rhinitis. They ultimately stated that the prevalence of allergic rhinitis in chronic otitis media was higher than the control group (23). In this study, the frequency of rhinorrhea, nasal congestion, sneezing, nasal itching, tearing and itching sensation in eyes, pulmonary allergy, asthma and mites allergens, weeds mixtures, pollen trees, dogs and cats' hair allergies was significantly more in children with allergic rhinitis. In research by Dogru et al., nasal itching was higher in allergic rhinitis patients without adenoid hypertrophic and nasal congestion was higher in allergic rhinitis patient with adenoid hypertrophy. Existence of asthma was higher in allergic rhinitis patients without adenoid hypertrophy which is compatible with our study (24).

**Conclusion**

According to our study, it can be concluded that the prevalence of allergic rhinitis with responding to pharmacological therapy in children who refer with mouth breathing complaints is much higher than adenoid hypertrophy with no response to pharmacological therapy, and in case of proper diagnosis and treatment, A few of these children will ultimately need surgery. Therefore, considering the appropriate strategies and planning for early diagnosis and treatment of these patients can significantly reduce the need for surgery and its costs and Complications for patients. Also In the

case of proper diagnosis and treatment, a small number of these children will eventually need surgery. Therefore, in patients who have an allergic condition, avoidance of specific allergens and intranasal corticosteroid treatments can be used to stop nocturnal snoring and remove symptoms.

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