

# The Association Between Adenoid Hypertrophy and Enuresis in Children

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## Abstract

**Background:** Considering that enuresis is a common health problem among Iranian children, identifying the frequency of enuresis among children with adenoid hypertrophy (AH) and its related factors could help us design appropriate management plans as well as preventative and interventional studies.

**Objectives:** We aimed to evaluate the prevalence of enuresis among children with AH and its associations with different characteristics of the disease.

**Patients and Methods:** This study was designed as a cross-sectional study. Children aged 5 - 12 years diagnosed with adenoid hypertrophy and as well as a group of normal children were studied (2010 - 2011 in Shariati hospital). The prevalence of enuresis was determined and compared in the two groups. The frequencies of different symptoms related to AH were compared in AH patients with and without enuresis.

**Results:** During this study, children with (n = 60) and without (n = 60) adenoid hypertrophy were investigated. The prevalence of enuresis was significantly higher in patients with AH compared with the control group (40% vs. 15%, P = 0.004, OR = 8.19). Enuresis was more prevalent among patients with AH who had a severe form of the disease, the signs of which are obstructive sleep apnea (OSA), growth impairment, and irritability (P < 0.05).

**Conclusions:** The results of our study indicated that enuresis was a common health problem among children with AH and it is associated with some symptoms of AH such as OSA, growth retardation and irritability. Using these findings as baseline data, we could determine the appropriate treatment approach for improving the course of the disease as well as the quality of the affected patients' lives.

**Keywords:** Adenoid Hypertrophy, Enuresis, Children

## 1. Background

Adenoid hypertrophy (AH) is one of the common conditions among the pediatric population and the most important cause of impaired nasal airflow and nasopharyngeal obstruction (1). The estimated prevalence rate of AH among children aged between six months to 15 years has been reported to be 19 - 58% (2).

AH on a spectrum of harmful clinical conditions ranges from mouth breathing to obstructive sleep apnea (OSA). Its associations with several health consequences including growth impairment, systemic and pulmonary hypertension, enuresis, behavioral problems, hyperactivity and attention deficit hyperactivity disorder and poor school achievement have been indicated in previous studies (3-5).

Enuresis is one of the AH-related complications which is defined as involuntary urination or urinary inconti-

nence of children above five years of age (6). It is considered as an important multifactorial clinical problem which could have significant adverse effects on the quality of the affected children's lives and their parents (7). Evidence indicated that complications such as low self-esteem, attention deficit hyperactivity disorder, reading difficulties, reduced fine motor coordination, visuomotor integration abnormalities and migraine are commonly reported in enuretic children (8, 9). Some of the reported complications of both enuresis and AH are overlapped.

The relation of AH and enuresis with OSA, the most important consequence of severe AH, has been demonstrated in several studies (10-12). In addition, findings of some reports regarding improvement of enuresis after appropriate management of AH or adenotonsillectomy support the association between the mentioned two conditions (13, 14).

The suggested mechanism for the association is inappropriate antidiuretic hormone (ADH) secretion due to in-

sufficient or inadequate time of sleeping (15).

However, there are also reports which have not confirmed such a relation (16) and it seems that available data in this field are controversial and not conclusive enough. Therefore, considering that enuresis is a common health problem among Iranian children (17), identifying the frequency of enuresis among children with AH and its related factors could help us design appropriate managements plans as well as preventative and interventional studies.

## 2. Objectives

We aimed to evaluate the prevalence of enuresis among children with AH and its associations with different symptoms of the disease (18).

## 3. Patients and Methods

### 3.1. Study Population

This study was designed as a cross-sectional study. Children aged 5 - 12 years who were diagnosed with adenoid hypertrophy and referred to the ear, nose, throat clinic or the pediatric clinic of Shariati hospital, affiliated to Islamic Azad university of Isfahan, were enrolled (2010 - 2011).

The protocol of study was approved by scientific and ethical review board of Najafabad Islamic Azad university, Isfahan, Iran.

Children aged 5 - 12 years with confirmed diagnosis of AH and history of AH-related snoring for at least four months were included as case group. Those with allergic rhinitis, nasal septum deviation, otitis media and asthma were excluded from the study.

Children in the control group were selected from normal children who referred to the pediatrics clinic of the hospital and were age and gender matched. After selection of participants in each group, written informed consent was obtained from each participant or their parents.

After selection of cases with AH, radiologic evaluation for confirming hypertrophy of adenoid and determining the degree of obstruction was performed. A lateral neck postnasal space X-ray was performed for each patient. Considering the A/N ratio on cervical lateral views of plain X-rays, the degree of obstruction was classified as mild (< 25%), moderate (25 - 50%) and severe (> 50%). N is the distance between the posterior superior edge of the hard palate and the anteroinferior edge of the sphenobasioccipital synchondrosis, and A is the distance between the maximum convexity of the adenoid and a line drawn along the basiocciput.

Enuresis was defined as any intermittent incontinence, at least twice per week for three consecutive months, and

chronological age of more than 5 years. Primary enuresis is defined as incontinence due to normal bladder development impairment. Secondary enuresis is defined as incontinence reoccurs after at least six months of continence.

Data regarding the demographic characteristics of the studied population, questions related to symptoms of AH including snoring, mouth breathing, OSA, irritability, dysmorphic teeth, growth retardation, behavioral problems, method of treatment and degree of AH were obtained using a valid questionnaire completed by a trained nurse.

The frequency of enuresis was determined and compared in case and control groups. Frequencies of different symptoms related to AH were compared in AH patients with and without enuresis.

### 3.2. Statistical Analysis

Data were processed by statistical package for the social science (SPSS) version 20 (SPSS Inc. Chicago, IL, USA). Comparisons between continuous and categorical variables were performed using Student's t-test and chi-squared test, respectively. P values less than 0.05 were considered statistically significant.

## 4. Results

During this study, children with (n = 60) and without (n = 60) adenoid hypertrophy were investigated. The characteristics of the studied population are presented in Table 1. The two studied groups were similar regarding age and gender distribution (P > 0.05).

**Table 1.** Characteristics of Children With Adenoid Hypertrophy as Well as the Control Group

	Patients With Adenoid Hypertrophy <sup>a</sup>	Control Group <sup>a</sup>	P Value
Age, y	7.72±2.22	7.52±2.33	0.63
Gender (female/male)	33/27	29/31	0.25
Enuresis <sup>b</sup>	24 (40)	9 (15)	0.004
Primary	6	3	0.1
Secondary	18	6	0.01

<sup>a</sup>N = 60.

<sup>b</sup>Values are expressed as No. (%).

The prevalence of enuresis was significantly higher in patients with AH than the control group (P = 0.004, OR = 8.19, 95% CI: 1.57 - 9.39). The difference between the studied groups was mainly due to secondary enuresis (P = 0.1 for primary enuresis and P = 0.01, OR = 3.857, 95% CI: 1.40 - 10.57 for secondary enuresis).

The frequencies of disease symptoms in AH patients with and without enuresis are presented in Table 2. The mean age of patients with AH and enuresis was lower than those without AH ( $P < 0.05$ ). The frequencies of OSA, growth impairment and irritability were significantly higher in patients with AH and enuresis (0.05). The severe form of AH was more prevalent in patients with enuresis than those without it ( $P < 0.05$ ). Enuresis was more prevalent among patients with AH who had a severe form of the disease, OSA, growth impairment and irritability ( $P < 0.05$ ).

**Table 2.** Frequencies of Disease Symptoms in Patients With Adenoid Hypertrophy With and Without Enuresis

	Patients With Adenoid Hypertrophy and Enuresis (n = 24)	Patients With Adenoid Hypertrophy and Without Enuresis (n = 36)	P Value
Age, y	5.96±1.65	8.89±1.73	< 0.001
Gender (female/male)	11/13	22/14	0.18
Snoring <sup>a</sup>	24 (100)	36 (100)	NA
Obstructive sleep apnea <sup>a</sup>	10 (41.6)	4 (11.1)	0.008
Growth retardation <sup>a</sup>	15 (62.5)	9 (25)	0.004
Irritability <sup>a</sup>	16 (66.66)	10 (27.77)	0.003
Dismorphic teeth <sup>a</sup>	18 (75)	21 (58.33)	0.14
Mouth speaking <sup>a</sup>	24 (100)	36 (100)	NA
Abnormal behavior <sup>a</sup>	20 (83.33)	26 (72.22)	0.24
<b>Grade of adenoid hypertrophy<sup>a</sup></b>			
Mild (< 25%)	4 (16.8)	9 (25)	0.04
Moderate (25 - 50%)	10 (41.6)	22 (61.1)	
Severe (> 50%)	10 (41.6)	5 (13.9)	
<b>Treatment<sup>a</sup></b>			0.17
Medical	13 (54.17)	25 (69.44)	
Tonsillectomy	11 (45.83)	11 (30.56)	

Abbreviation: NA, not available.

<sup>a</sup>Values are expressed as No. (%).

## 5. Discussion

In this study, we evaluated the frequency of enuresis among children with AH and its association with different

symptoms of AH. The results indicated that enuresis was a common problem among this group of patients and it was more frequent among patients with severe form of the disease and was associated with more adverse consequences of the disease.

As mentioned, although there were studies on the association between AH and enuresis, the relation between enuresis and different complications of the disease was rarely studied (19, 20).

The suggested causes of enuresis in AH could be explained as follows; the antidiuretic hormone (ADH) is produced during the fourth stage of sleep. Children with AH, especially those with OSA, due to the unreserved integrity of both rapid eye movement (REM) and non-REM sleep stages and episodes of awakenings never reach the fourth stage of sleep, so ADH could not be released appropriately, resulting in impaired concentration of urine and enuresis (21).

In this study, the prevalence of enuresis among patients with AH was 40%. The reported range for enuresis in different studies was ranged from 22 - 42%. The results of the current study were in the reported range. It was similar to the results of Firoozi et al. (22-24).

In a similar study in Mashhad, Iran, the prevalence of enuresis among patients with AH and control group was 37% and 26%, respectively. The rate of enuresis was not different between the two studied groups, but enuresis was more prevalent among patients with AH who had sleep apnea syndrome (18). Taziki et al. in Gorgan, Iran, reported a lower prevalence rate of enuresis, 9%, in patients with AH (19). Aydin et al. in Turkey did not report any association between AH and enuresis (16).

In this study, most of the cases with enuresis had secondary enuresis. This was not similar to the results of previous studies. Most related studies have shown that primary enuresis has been the most frequent type of enuresis among patients with AH. Taziki et al. reported similar rate of primary and secondary enuresis among children with AH (19). Bakhtiar et al. showed that secondary enuresis was the most frequent type of enuresis in AH, especially in those with sleep apnea and they concluded that an intervention for the management of secondary enuresis could be implemented (17).

In this study, the mean age of patients with enuresis was lower than those without it, because the occurrence of enuresis decreases with increasing age. In this study, enuresis was more prevalent among patients with AH who had a severe form of the disease, OSA, growth impairment and irritability. Results of studies in this field have been different.

Taziki et al. did not indicate any association between enuresis and some complications of AH such as growth re-

tardation, month breathing, hyponasal speech, snoring, and morning stiffness (19). Aydin et al. did not report any relation between frequency of enuresis and symptoms of AH (16), whereas in another study in Turkey, Soylu Ozler et al. showed a higher rate of enuresis in patients with AH who had open mouth sleeping and snoring (23).

The great variability seen in different studies may be due to differences in diagnostic criteria, methods of studies, and ethnic or genetic background. Though, the rate of tonsillectomy was high in AH patients with enuresis, but the difference was not statistically significant. It may be due to small sample size or the cross-sectional design of the study. Some studies indicated that tonsillectomy of patients with AH resulted in significant improvement in enuresis and some of them recommended that in AH cases with enuresis, for better management of the disease tonsillectomy is favorable (13, 14).

The main limitation of this study was its cross-sectional design. It seems that designing prospective studies in this field would help us to achieve more conclusive results. Other limitations were the small sample size of the studied population and clinical diagnosis of OSA. A multicenter study with larger sample size and polysomnographic evaluation of OSA would be a more appropriate approach in this regard.

The results of our study indicated that enuresis was a common health problem among children with AH and it was associated with some symptoms of AH such as its severity, OSA, growth retardation and irritability. Using these findings as baseline data, we could determine the appropriate treatment approach for improving the course of the disease as well as the quality of life of the affected patients.

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The study protocol was approved by the scientific and ethical review board of Najafabad Islamic Azad university, Isfahan, Iran.

## Footnote

**Authors' Contribution:** Study concept and design, Ali Neshat, Sareh Miranzadeh-Mahabadi, and Hoda Miranzadeh-Mahabadi; analysis and interpretation of data, Ali Neshat, Sareh Miranzadeh-Mahabadi, and Roya Kelishadi; drafting of the manuscript, Ali Neshat and Sareh Miranzadeh-Mahabadi; critical revision of the manuscript for important intellectual content, Ali Neshat, Sareh Miranzadeh-Mahabadi, Hoda Miranzadeh-Mahabadi, and Roya Kelishadi; statistical analysis, Ali Neshat, Sareh

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