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# The relationship between adenoid hypertrophy and primary nocturnal enuresis among children in Al-Hasa population, Saudi Arabia: A cross-sectional study

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**Abstract**

**Background:** AH is a very common condition to encounter in otolaryngology clinics. Studies have shown that 58% of AH occurs between the age of six months and fifteen years old. It is controversial whether a relationship between AH and PNE do exist.

**Objective:** This study aims to investigate the relationship between AH and PNE among children Also, to report the prevalence of PNE among children with AH in Saudi Arabia, Al-Hassa.

**Methods:** A cross-sectional study was carried out among parents of children who diagnosed with AH from January 2018 to March 2018 at Al Jabr Eye and ENT Hospital, a specialized local hospital. All participants were asked to complete a confidential self-administered questionnaire. Diagnosis of PNE was according to DSM-5 criteria.

**Results:** 137 surveys were completed. 57% of study subjects were male and 43% female with an age range of five to fifteen years. AH was more common in children age five to eight and in urban than rural residence. The prevalence of PNE was 74% in males and 26% in females.

**Conclusion:** The study illustrated a possible link between AH and PNE where 20% of children with AH are also found to have PNE. Male gender and urban residents found to be most commonly affected. Early medical intervention and treatment should be considered towards these children in order to improve their quality of life.

**Keywords:** adenoid hypertrophy, primary nucturnal enuresis, children, Al Jabr Eye and ENT Hospital, Saudi Arabia

## 1. Introduction

The adenoid, nasopharyngeal tonsil, is part of Waldeyer's ring, a group of lymphatic tissue in a ringed arrangement at the pharynx. It is located at the junction of nasopharyngeal roof and its posterior wall. Nasopharyngeal tonsil is covered by three types of epithelium which are ciliated pseudostratified columnar, stratified squamous and transitional. In contrast to palatine tonsils, it does not contain crypts and capsule. Normally after birth, the adenoid continues to enlarge in size until the age of 5 to 7 years, then it starts to regress till it disappears almost completely by the age of twenty years [1]. However, Adenoid hypertrophy (AH) is a very common condition to encounter in otolaryngology clinics [2]. Studies have shown that 58% of AH occurs between the age of six months and fifteen years old [3]. In patients with AH, symptoms and signs appear usually during childhood [4]. It may include middle ear fluids, speech delays, snoring, mouth breathing, obstructive sleep apnea syndrome, recurrent rhinosinusitis, perceptions of low intelligence and enuresis where most of these are resolved by Adenoidectomies [5].

Enuresis is a communal health issue worldwide. Above 50 million children are accounted to have enuresis throughout the world [6]. Respiratory obstructive disease has been one of the many causes of enuresis [7-14]. The most (common) type of upper respiratory obstructive diseases during childhood is Adenotonsillar hypertrophy [15-17]. There is theory said that the (relationship / connection) between enuresis and sleep breathing disorder (SBD) is linked to release of both atrial and brain natriutic peptide (BNP) from cardiac myocytes, also recent researches found that children who snore have high BNP [18-19]. Additional literature review listed that the relationship between nocturnal enuresis and Obstructive sleep apnea (OSA) is influenced by different factors including: decreased arousal response, impaired urodynamic, increased intra-abdominal pressure during obstructive respiratory events increases bladder pressure and altered secretion of hormones that regulate fluid balance as Vasopressin hormone whose inappropriate levels are 2.7 times more likely to occur in children complain of bedwetting issue [20]. Previous studies found patients with OSA to have excessive amount of sodium and urine overnight, this might be related to distended secretion of atrial natriuretic peptide because the stimulation of right atrial receptors exposed to the exaggerated intra-thoracic pressure swings which accompany narrowing and obstruction of the upper airway [21, 22] also, some researches have been revealed that there is concomitant enuresis in children with OSA [23-26]. Other articles report that there is an important relationship between habitual snoring and nocturnal

enuresis [27, 28]. There is theory said that “enuresis is poor nocturnal regulation of vasopressin hormone release and increased atrial natriuretic peptide, which is related to rapid eye movement (REM) sleep disorders” [9].

Large tonsils and adenoids block normal breathing through the nose and mouth, which interrupts sleep architecture and decreases normal brain and brainstem control of urinary function and cause enuresis, studies approved that tonsillectomy and adenoidectomy (T&A) (are) indicated in this case [5]. The question of whether AH can lead to NE is somewhat controversial [29]. The problem is raised in many published researches. One research showed that primary nucturnal enuresis (PNE) and obstructive sleep apnea syndrome (OSAS) has correlation, OSAS may be one of the causes of PNE. Also, it showed children who have PNE and OSAS are indicated of adenoidectomy, and after the surgery, they improved or cured of PEN. Another research concludes that there is no relationship between AH and NE [9].

Anyway, the studies in this field are limited and we need more researches to fill the gap to understand the relationship between AH and NE. Knowing if the AH has a role to increase the prevalence of NE or not is very important in the medical field. This is significant because it may change the protocol of managing the children who present with AH or NE without any clear cause.

## 2. Methods

### 2.1 Study design and sample size

#### 2.1.1 Study design

Retrospective cross-sectional study.

#### 2.1.2 Sample size

- 137 patients.
- Convenience sampling technique.
- Paediatric patients who are diagnosed with AH or underwent adenoidectomy from age 5 – 15 years old (Alhasa residents).
- Statistical formula was used to calculate the representative sample size based on study population; CI 95%; margin of error 5%.

### 2.2 Study tool

- A questionnaire was designed and distributed to collect the data needed for the research.
- Data source: patients’ medical records and personal interview with patient’s parents.

### 2.3 Statistical Analysis

Analysis was conducted by using SPSS version 23. Descriptive statistics (means, SDs, percentages) was used to describe the mean of ages, percentages of male and female patients with AH and NE, percentage and number of all cases of NE and AH. Correlation analysis (chi-square) was used to determine the correlation between AH and NE. A probability value (P-value) of less than 0.05 would be accepted to be statistically significant.

### 2.4 Study area

Alhasa, Saudi Arabia, including patients treated at Al - Jabr Eye, Nose and Throat hospital.

### 2.5 Study date and time

Three months duration in the period 2018.

### 2.6 Inclusion criteria

- Age between 5 -15 years old.
- Male and female children who are diagnosed with AH or underwent Adenoidectomy.
- Subjects underwent a complete ENT examination.
- Signs and symptoms of adenoid hypertrophy.
- Indicated tests and imaging techniques (e.g. nasal endoscopy, lateral neck soft tissue x ray).
- Children with primary nocturnal enuresis.
- Subjects should be resident in Al-Hasa region.
- Subjects could be Saudi’s and non-Saudi.
- Diagnosed with adenoid hypertrophy only.
- Clinically significant PNE (The behavior of PNE is clinically significant if the frequency is twice a week for at least 3 consecutive months.

### 2.7 Exclusion criteria

- Diagnosed with adenoid hypertrophy and tonsillar hypertrophy.
- Children younger than 5 years old or older than 15 years old.
- The enuresis due to the direct physiological effect of a substance (e.g. a diuretic) or a general medical condition (e.g. diabetes, spina bifida and seizure disorder).
- The enuresis is clinically significant distress or impairment in social, academic (occupational), or other important areas of functioning.
- Hypertrophic tonsils detected by physical examination.
- Family history of enuresis

## 3. Results

A total of 137 questionnaires were distributed, completed and analysed with a response rate of 100%. The subjects include 78 (60%) male and 59 (43%) female children. The majority of subjects was between 5-8 years old and urban (76%). Subjects with an unremarkable past medical history account for 45% of the study sample. One-third (32%) of the study sample had a free surgical history. Most of the participants (43%) did not use any medication on a regular basis. The most common symptom presented in children with AH was snoring.

Table (1) shows that the prevalence of AH among male children (57%) is slightly more than in female children (43%). However, this difference in prevalence is not statistically significant ($p>0.05$). The prevalence of AH is significantly higher among children at age between 5-8 years than at age between 9-11 years ($p<.000$). Urban Children had a higher prevalence of AH (76%) compared to children who live in rural areas (24 %). This difference is statistically significant ($p<.000$).

Table (2) illustrates that most children with AH had an unremarkable medical and surgical history.

Table (3) demonstrates that only 37% of children with AH have nocturnal enuresis. The most common attributed cause was idiopathic. The majority of subjects denied having a family history of nocturnal enuresis.

It is apparent from table (4) that 20% of children carry a diagnosis of PNE according to DSM-5 criteria which consist of 1) idiopathic nocturnal enuresis, 2) negative family history of nocturnal enuresis, 3) age more than 5 years.

**Table 1:** Relationship between Adenoid hypertrophy and personal as well as sociodemographic characteristics of children in Al-hasa.

| **Adenoid hypertrophy (AH)** | | **Frequency** | **Percentage** | **Chi-Square** | **P-value** | **In favour of** |
|---|---|---|---|---|---|---|
| Sex: | Male | 78 | 57% | 2.635 | .105 | |
| | Female | 59 | 43 % | | | |
| Age | 5-8 years old | 91 | 67% | 68.599 | .0001 | 9-11 years old |
| | 9-11 years old | 28 | 20% | | | |
| | 12-15 years old | 28 | 20% | | | |
| Residency | Urban | 104 | | 76% | 36.796 | .0001 Urban |
| | Rural | 33 | 24 % | | | |
| Signs and Symptoms | 1.mouth breathing | 14 | 10 | | | |
| | 2.Sleep disturbance | 8 | 6 | | | |
| | 3.Snoring | 87 | 64 | | | |
| | 4.Nasal discharge | 22 | 16 | | | |
| | 5.Nasal tone of voice | 5 | 4 | | | |
| | 6. Nasal congestion | 1.7 | | | | |

**Table 2:** Relationship between Adenoid hypertrophy and health background of children in Al-hasa

| **Adenoid hypertrophy (AH)** | **Medical Hx No. %** | **Free medical Hx No. %** |
|---|---|---|
| chronic disease | 23 | 62 |
| | 18 | 45 |
| Surgical Hx | 20 | 65 |
| | 15 | 47 |
| Medication Hx | 19 | 59 |
| | 14 | 43 |

**Table 3:** Questionnaire result

| **Adenoid hypertrophy** | **No.** | |
|---|---|---|
| Is he /she repeatedly wetting his/her bed involuntary? | | |
| A. Yes | 53 | 39 |
| B. NO | 84 | 61 |
| If yes, is the frequency of bed-wetting equal or more than twice a week for at least 3 consecutive months? | | |
| A. Yes | 50 | 37 |
| B. NO | 85 | 61 |
| If diagnosed with nocturnal enuresis, what was the attributed cause? | | |
| A. Idiopathic | 65 | 47 |
| B. Diabetics | - | - |
| C. Neurological problem | - | - |
| D. Urological problem | 3 | 2 |
| E. Used medication | - | - |
| F. Psychological problem | 6 | 4 |
| Is there a family history of nocturnal enuresis? | | |
| A. Yes | 20 | 15 |
| B. No | 84 | 61 |

**Table 4:** Features of children in Al-has who presented with adenoid hypertrophy accompanied by primary nocturnal enuresis.

| **Adenoid hypertrophy (AH)** | | **Frequency Percentage** | | **Chi-Square** | **P-value** | **In favour of** |
|---|---|---|---|---|---|---|
| Frequency of bed-wetting is equal to or more than twice a week for at least 3 consecutive months. | | 27 | 20% | 2.635 | .105 | |
| Gender | Male | 20 | 74% | 6.259 | .012 | Male |
| | Female | 7 | 26% | | | |
| Age: | 5-8 years old | 22 | 81% | | | |
| | 9-11 years old | 5 | 19% | | | |
| | 12-15 years old | - | - | | | |
| Residency | Urban | 24 | 89% | 16.333 | .0001 | urban |
| | Rural | 3 | 11% | | | |
| Past medical Hx | bronchial asthma | 11 | 41% | | | |
| | otitis media | 2 | 7% | | | |
| Surgical Hx | Unremarkable | 12 | 44% | | | |
| | Hernia | 2 | 7% | | | |
| Medication Hx | Unremarkable | 12 | 44% | | | |

| Signs and Symptoms | 1.mouth breathing | 3 | 11% | 22.630 | .0001 | Snoring |
|---|---|---|---|---|---|---|
| | 2.Sleep disturbance | - | - | | | |
| | 3.Snoring | 17 | 63% | | | |
| | 4.Nasal discharge | 6 | 22% | | | |
| | 5.Nasal tone of voice | - | - | | | |
| | 6. Nasal congestion | - | - | | | |
| Attributed cause of nocturnal enuresis | Idiopathic | 27 | 100% | | | |
| Family history of Nocturnal enuresis | No | 27 | 100% | | | |

## 4. Discussion

To our knowledge, this was the first comprehensive survey using the DSM-5 criteria to assess the prevalence of PNE among children with AH in Saudi Arabia, Al-Haas. In different studies, the range of prevalence of PNE among children with AH was 22 - 42%. In Iranian study published by Ali Neshat *et al*., (2016) states that the prevalence of enuresis among children with AH was 40 % [30]. The problem is raised for the first time in a research published in 2008 concluded that there is no relationship between AH and NE. The title of this study was "Prevalence of Adenoid Hypertrophy and Nocturnal Enuresis in Primary School Children in Istanbul, Turkey". Done by Sedat Aydin *et al*., [9]. Another research published in May 2008. "Obstructive Upper Airway Problems and Primary Nocturnal Enuresis Relationship in Pediatric Patients: Reciprocal Study". The results show primary nocturnal enuresis (PEN) and OSP have Correlation, and OSP is may be one of the causes in PEN, and shows children who have OSP are indicated for Adenoidectomy. The complaint of PEN for children who underwent surgery was improved or cure completely [17]. This study states 20% prevalence of PNE among children with AH. The difference in PNE prevalence among different previous studies is due to different diagnostic criteria and methods of studies used. PNE with AH prevalence in Male was significantly higher than in female in our study. A study of Sakellaropoulou *et al*. (2012) illustrates that PNE was diagnosed more commonly in females than males, among Thessalonikian children [31]. Zhifei Xu *et al*. (2006) found that, PNE is usually less common in female than in male, with a ratio 1:3 [32]. This research revealed that, the 5-8-year-old children have a higher prevalence of PNE according to the age. The reason behind this might be due regression size of adenoid and tonsillar happen with progression of age. Also in Mahgoob study states that PNE decrease by aging. One study by Khartoum *et al*. (2014) reported the prevalence of PNE in relation to AH a percentage of 13% among 5-7 years old children and a percentage of only 2% in 12-14 years old children [33]. Moreover, a study from Thessaloniki, Greece, showed that there was no report among children older than 10 years of age [31]. This study showed a high prevalence of PNE with AH found in Urban children. However, we did not see any study showed or explained this concept. These results may be due to the deference between urban and rural lifestyle. Soylu Ozler *et al.* (2014) showed that, children who have enuresis with AH, they have open mouth sleeping and snoring [34]. However, this study was contrasted to other studies result which is relationship between NE and obstructive sleep apnea and it is a strong physiologic association between them [35-36]. This study showed that a higher prevalence of snoring found in AH children with PNE.

An international study conducted by T. Sasaki *et al*., showed the most common age affected by AH is between 2-6 years old, this due to physiologic enlargement of adenoid and other contributable factors like infection, allergy and gastro-esophageal reflux [37]. Our study states a higher prevalence of AH among children age 5-8 (66%). Many studies have revealed that the most common symptom present with AH is sleep disorder [38, 39]. However, these studies were contrasted to our results. This study showed snoring is the most common symptom associated with AH in children. Many studies have shown the main reason behind the difference in prevalence of AH regarding the gender is uncertain [40, 41]. This research revealed that, the AH has a higher prevalence in Urban. The reason behind this might be due to immunological factors.

One study conducted by Dogru *et al*. (2016) reported that, 118 children with Allergic rhinitis have AH 21% [42]. This study illustrated only 4% children with AH have Allergic diseases. A study done in Tabriz, Iran, showed that there were association between Adenotonsillar hypertrophy and attention-deficit hyperactivity disorder (ADHD) [43]. Unlike our study, it showed only 2% of children with AH had ADHD. Also, only 4% of children with AH have anemia.

## 5. Conclusion

Adenoid hypertrophy and primary nocturnal enuresis are common paediatric problems encountered in general practice. In this study, 20% of children with AH are also found to have PNE. Despite, the low prevalence, a possible link between the two conditions is suggested. Thus, an early adenoidectomy as a management of AH could also improve patient's PNE. Awareness of this association should be raised among urologists, ENT physicians, and parents. Snoring was the most reported symptom in those children. The most common affected age was 5-8 years old with a male predominance. In addition, a significant relationship was found between PNE and urban residency.

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