Clinical and Experimental Health Sciences

Is Allergic Rhinitis Associated with Enuresis Nocturna in Childhood?

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ABSTRACT

Objektive: Allergic rhinitis is the most common form of non-infectious rhinitis and is manifested with the symptoms of nasal congestion, sneezing, nasal discharge, and itching. Primary enuresis nocturna is involuntary urination while asleep after five years, at which bladder control usually begins. Our objective was to evaluate the relationship between allergic rhinitis and primary enuresis nocturna in childhood in this research.

Methods: We included 300 children with allergic rhinitis and 300 control cases between the age of 5 and 17 years. With allergic rhinitis cases, age, gender, body mass index percentile, other allergic disorders, allergic rhinitis diagnosis age, allergic rhinitis severity and distribution, presence of primary enuresis nocturna, and presence of primary enuresis nocturna in the family were recorded. Subjects with disorders causing enuresis were excluded from the study.

Results: The mean age in the allergic rhinitis and control groups was 9.6 ± 3.4 vs. 10.0 ± 3.1 years, respectively (p=0.15). There was no statistical difference between the two groups in terms of gender, age, body mass index percentile, and primary enuresis nocturna presence in the family (p=0.29, p=0.15, p=0.46, p=0.17; respectively). Primary enuresis nocturna was significantly higher in allergic rhinitis cases (p=0.02). Primary enuresis nocturna was significantly higher in boys than in girls (p=0.007). There is a significant difference in age and gender between those with and without primary enuresis nocturna in allergic rhinitis groups (p=0.001, p=0.01, respectively)

Conclusion: We conclude that as allergic rhinitis increases the incidence of primary enuresis nocturna and worsens the quality of life, its treatment should not be neglected.

Keywords: allergic rhinitis, primary enuresis nocturna, childhood, quality of life

1. INTRODUCTION

Allergic rhinitis (AR) is the most common form of non-infectious rhinitis and is accompanied by symptoms including nasal congestion, sneezing, nasal discharge and itching (1). The frequency of allergic rhinitis in Turkey has been reported as 11.8% to 36.4% (2). The prevalence of AR increases parallel to age. The prevalence of AR was found to be 5% at the age of four and increased up to 14% in the upcoming eight years (3). Sleep disorders at different levels are seen due to nasal congestion in AR, which is thought to be amongst the risk factors for obstructive sleep apnea (4).

Primary enuresis nocturna (PEN) is involuntary urination while asleep in children over five years of age at which bladder control develops (5). The incidence rate of PEN varies across cultures and decreases with age (5,6). Genetic factors, detrusor activity, psycho-behavioral problems, circadian rhythm of vasopressin, and sleeping disorders are emphasized for nocturnal enuresis pathogenesis; the underlying cause of PEN is unknown (7).

In this research, we aimed to determine the relationship between primary enuresis nocturna and allergic rhinitis.

2. METHODS

2.1. Study Design and Ethical Approval

This prospective cross-sectional study was approved by Celal Bayar University School of Medicine Institutional Review Board (30/05/2018-20.478.486).

2.2. Study Population

We enrolled 5-17 year old subjects who applied to the pediatric allergy outpatient clinic for the first time between July 2018 and June 2019 and had never received regular treatment for AR. Allergic rhinitis was diagnosed according to ARIA (Allergic Rhinitis and its Impact on Asthma) guidelines with

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recurrent sneezing, nasal drainage, nasal itching and, nasal obstruction (8). A control group was formed with cases aged 5-17 who applied to pediatrics outpatient clinics for healthy child follow-up. Exclusion criteria; having adenotonsillar hypertrophy, being diagnosed with obstructive sleep apnea syndrome, having an irregular sleeping pattern and school/ work activities associated with AR, having neurological and metabolic syndrome, having an anatomical disorder causing upper airway obstruction, having a urinary system disorder.

2.3. Data Collection

Informed consent forms were obtained from all cases included in the study. With allergic rhinitis subjects, age, gender, body mass index (BMI) percentile, presence of other allergic disorders, allergic rhinitis diagnosis age, allergic rhinitis severity and distribution, total Ig-E, eosinophil count, skin prick test, presence of PEN, and PEN presence in the family were recorded. Control subjects' age, gender, BMI percentile, presence of PEN, and PEN presence in the family were recorded in the control group. The body mass index percentile was calculated using reference values for Turkish children (9).

2.4. Skin Prick Test

Skin prick test performed according to The European Academy of Allergy and Clinical Immunology (EAACI) recommendations (10). Skin prick tests applied with standardized solutions with Dermatophagoides Mix, Canis Familiaris, Felis Domesticus, Olea Europaea, Plantago Lanceso, Grasses Mix, Alternaria tenuis and Cockroach (Allergopharma, Germany / ALK, Denmark). Positive and negatives (saline) control was applied (histamine 10 mg/ml Allergopharma).

2.5. Statistical analysis

The data obtained were analyzed by SPSS for Windows v18 (Chicago, IL). Gender, age, BMI percentile, and allergic rhinitis data were analyzed by calculating the mean, standard deviation, and percentages. While analyzing the enuresis nocturna data, the data showing normal distribution were analyzed with the Student – T test, the data not showing the normal distribution were analyzed with the Mann Whitney U test, and the categorical data were analyzed with the Pearson Chi Square test.Statistical significance was defined as $p < 0.05$.

3. RESULTS

3.1. Sociodemographic Characteristics

The mean age of 300 AR cases was 9.6 ± 3.4 years, control cases' mean age was 10.0 ± 3.1 years (p=0.15). Of the patients with AR, 51% (n=153) cases were male, whereas of the subjects in the control group, 46% (n=143) cases were male (p=0.29). The mean BMI percentile in the rhinitis group was 37.9% ± 18.7% and the mean BMI percentile in the control group was 39.1% ± 20.1% (p=0.46). Primary enuresis nocturna was detected 19.6% (n=59) in the allergic rhinitis group, and 12.3% (n=37) in the control group and PEN was significantly higher in the AR group (p=0.02). There was no difference between the groups in terms of the presence of PEN in the family (p=0.17). (Table 1)

Table 1. *Socio-demographic characteristics of the allergic rhinitis group and the control group*

	With Allergic Rhinitis (n=300)	Control Group (n=300)	p=
Boys *	153 (51)	139 (46)	0.29 ***
Age (year)	9.6 (3.4)	10.0 (3.1)	0.15 ****
BMI Per (%) **	37.9 (18.7)	39.1 (20.1)	0.46 ****
With Primary enuresis Nocturna *	59 (20)	12 (37)	0.02 ***
Precense of Primary enuresis Nocturna in Family *	28 (9)	18 (6)	0.17 ***

** Expressed as n (%)** Expressed as mean (standard deviation); *** Chi square test; **** Student t test*

3.2. Primary Enuresis Nocturna Outcomes

The mean age of 600 cases was 9.8 ± 3.3 years, and PEN incidence was 16% (n=96). The mean age of the group with PEN was 8.4 ± 2.7 years, and the mean age of the group without PEN was 10.0 ± 3.1 years (p=0.001). Primary enuresis nocturna was 29.8% (n=59) in boys, 6.1% (n=37) in girls, and was significantly higher in boys than girls (p=0.007). There was no difference between groups with and without PEN in terms of BMI percentile and PEN presence in the family (p=0.19, p=0.88; respectively) (Table 2).

Table 2. *Sociodemographic Characteristics of With and Without Primary Enuresis Nocturna (PEN) Cases*

		With PEN	Without PEN	p=	OR
Age (years) *		8.4 (2.7)	10.1 (3.3)	0.001 ***	
Sex **	***Boys***	59 (20)	233 (80)	0.007 ****	1.86
	Girls	37 (12)	271 (88)		
BMI pers (%) *		36.0 (38.6)	38.9 (19.7)	0.19 *****	
Have Allergic Rhinitis *	***Yes***	59 (20)	241 (80)	0.02 ****	1.74
	No	37 (12)	263 (88)		
PEN in Family *	***Yes***	7 (15)	39 (85)	0.88 ****	
	No	89 (16)	465 (84)		

** Expressed as mean (standard deviation); ** Expressed as n (%) ; *** Student t test; **** Chi square test; ***** Mann Whitney-U test; OR: Odds Ratio*

3.3. Allergic Rhinitis Outcomes

In the AR group, the mean age with PEN was 8.3 ± 2.6 years, and the mean age of without enuresis nocturna was 9.9 ± 3.5 years (p=0.001). Primary enuresis nocturna incidence in the AR group was significantly higher in boys (13% vs. 6%) (p=0.01). There was no significant difference in PEN according to the allergic rhinitis severity score (p=0.19), but PEN was higher in the persistent AR group according to the AR distribution score, although it was not statistically significant (OR=0.58; p=0.08). The most common additional atopic diseases were 9% (n=27) asthma, 3.6% (n=11) atopic dermatitis and 2.3% (n=7) food allergy. Body mass index percentile, presence of PEN in the family, age of AR onset, additional atopic disease, AR distribution, and AR severity were not significantly different between the groups with and without enuresis (p=0.31, p=0.46, p=0.19, p=0.43, p=0.08, p=0.19; respectively) (Table 3).

Table 3. *Characteristics of Cases With and Without Primary Enuresis Nocturna (PEN) in Allergic Rhinitis (AR) Cases*

		With PEN (n=59)	Without PEN (n=241)	p=	OR
Age *		8.3 (2.6)	9.9 (3,5)	0.001 ***	
Sex **	*Boys*	39 (25)	114 (75)	0.01 ****	2.17
	Girls	20 (14)	127 (86)		
BMI Per (%) *		35.7 (18.9)	38.4 (18.6)	0.31 ***	
PEN in Family *	*Yes*	7	21	0.46 ****	
AR Diagnosis Age **	*< 5 years*	36 (23)	124 (77)	0.19 ****	
	> 5 years	23 (16)	117 (84)		
Additional Atopic Disease **	*Yes*	7 (14)	42 (86)	0.43 ****	
AR Distribution **	*Intermittant*	37 (17)	179 (83)	0.08 ****	0.58
	Persistant	22 (26)	62 (74)		
AR Severity **	*Mild*	48 (21)	181 (79)	0.19 ****	
	Moderate	7 (12)	51 (88)		
	Severe	4 (30)	9 (70)		

** Expressed as mean (standard deviation); ** Expressed as n (%) ; *** Student t test; **** Chi square test; OR: Odds Ratio*

4. DISCUSSION

Allergic Rhinitis is the most common chronic respiratory tract disease seen in childhood and for children, is reported to be the most common chronic disease in developed countries (8,11). Allergic rhinitis is classified as the seasonal/intermittent type in which the symptoms develop in the pollen season and last no more than four days a week or less than four weeks in total, and the persistent/perennial type in which the symptoms occur year-round and last more than four days a week or more than four weeks (4). Moreover, based on the severity of the symptoms, it is classified as the mild type in which both sleeping and daily school and working activities are regular and the severe type in which both sleeping and daily school and working activities are disturbed (4,12). Our study cases generally were of the mild, intermittent type having no allergic rhinitis-related sleeping disorders with regular school and work activities.

Primary enuresis nocturna is one of the most common urinary system disorders in childhood (13). The incidence rate of PEN is 3.8-18% in the literatüre (14). This broad difference is thought to be stemming from the differences between the criteria such as cultural, racial, environmental features, variable case definition, and age group adopted in studies (15). The incidence rate of PEN among 600 cases in our study was 16% conforming with the literature.

It is reported that nocturnal enuresis is more common among boys than girls (16), which is thought to be due to the fact that PEN is related to developmental maturity, and girls develop more rapidly than boys do (17). However, there is no gender-based difference at all (18). As a result of our research, PEN was found more frequently in boys both in all cases and in cases with AR.

The pathophysiology of nocturnal enuresis is not clear yet; however, some publications indicate that causes of sleep disorder also increase PEN (19,20). It is believed that disorders causing upper respiratory tract obstructions are often related to enuresis in the mechanism of which the brain natriuretic peptide secreted from cardiac atrial walls that are dilated due to the increased negative intrathoracic pressure in case of upper respiratory tract obstructions increases the sodium and water excretion and inhibits the renin-angiotensin-aldosterone system and vasopressin release (21,22). In another mechanism associated with nocturnal enuresis, sleeping respiratory disorder reduces the responses to the awakening stimuli, and recurrent short-term sleep and awakening caused by upper respiratory tract obstruction lead to an increase in the response threshold given to such stimuli as a full bladder and/or the contraction of the detrusor muscle (23). In this study, the incidence rate of PEN was significantly higher in the cases who had allergic rhinitis.

There are publications in the literature suggesting a relationship between allergic diseases and NE (24-26). Primary enuresis nocturna is associative for those with known bronchial asthma, allergic sensitization confirmed through skin tests, and a family history of PEN (27). In the pathogenesis of PEN associated with allergic reactions, some allergens cause a decrease in the functional bladder capacity, smooth muscle contractions, and bladder inflammation, and thus detrusor instability, which leads to enuresis (28). According to another theory, allergic reactions triggered by allergens may lead to smooth muscle contractions in the bladder, and the bladder hypersensitivity or allergic bladder inflammation may cause the functional bladder capacity to decrease (28). In our study, we believe that allergic reactions increase PEN incidence through various mechanisms in the

urinary system because the incidence rate of PEN differs significantly between the control group and the group with allergic rhinitis.

The limitations of our study are that we could not reach the sufficient number of cases in both the allergic rhinitis group and the non-allergic rhinitis group. Moreover; In order to understand the relationship between allergic rhinitis and primary enuresis nocturna, whether cytokines and mediators that play a role in the pathophysiology of allergic rhinitis affect the bladder muscles; or not being able to understand whether it causes enuresis nocturna by stimulating diuresis hormonally are our limitations.

5. CONCLUSION

The frequency of PEN was significantly higher in children with allergic rhinitis. PEN and allergic rhinitis impair the quality of life. Allergic rhinitis further impairs the quality of life by increasing the frequency of PEN. Thus, allergic rhinitis is a disease that should be treated in order to increase the quality of life and reduce comorbidities.

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