HABITUAL SNORING IN CHILDHOOD AND ASSOCIATED FACTORS

Yusuf Çetin Doğaner[1], Ümit Aydoğan[2], James Edwin Rohrer[1], David Agerter[1], Oktay Sarı[2], Bayram Koç[2]

[1] Mayo Clinic, Department of Family Medicine, Rochester, MN, USA

[2] Gülhane Military Medical Faculty, Department of Family Medicine, Ankara

ABSTRACT

Objective: *The aim of the study is to evaluate the prevalence of habitual snoring (HS) and HS associated risk factors among children aged 6-12 years in Ankara, Turkey.*

Material and Method: *Our cross sectional study sampled 2500 students from 3 primary schools selected randomly in Ankara between January-May 2011. The survey questionnaires including demographic characteristics and health conditions of the participants due to HS were delivered to parents.*

Results: *Two thousand eighty-nine (83.56%) of questionnaires distributed to parents provided complete data. HS prevalence was 14.9 % (n=312). HS was significantly more prevalent in boys than girls (56.1 %, n=175 vs 43.9 %, n=137) (p=0.006). HS also was significantly more common in students with asthma, chronic allergies and parent-reported apnea (p=0.007, p=0.017, p<0.001). Multivariate logistic regression analysis revealed that the following independent risk factors such as younger ages (p=< 0.001, OR=0.856; 95% CI [0.791-0.926]), greater BMI (p< 0.001, OR=1.199; 95% CI [1.147-1.253]), having Upper Respiratory Tract Infection (URTI) 3-4 times per year (p=0.008, OR=2.084; 95% CI [1.210-3.588]) and 5-6 times per year (p=0.017, OR=2.239; 95% CI [1.156-4.339]), and having Acute Otitis Media (AOM) > 6 times per year (p=0.036, OR=14.980 [1.186-189.157]) were significantly associated with HS.*

Conclusion: *HS is a common health problem among children in Ankara, Turkey. Warning signs in childhood worthy of note by primary care providers include being younger age, having higher BMI, having frequent URTI and frequent AOM.*

Keywords: *Childhood, habitual snoring, risk factors.* ***Nobel Med 2016; 12(1): 55-61***

ÇOCUKLUK ÇAĞINDA HABİTÜEL HORLAMA VE İLİŞKİLİ FAKTÖRLER

ÖZET

Amaç: Ankara ilinde öğrenim gören 6-12 yaş grubundaki çocuklardan oluşan örneklem grubunda, horlama alışkanlığı (HA) sıklığı ve HA ile ilişkili olabilecek risk faktörlerini belirlemektir.

Materyal ve Metot: Kesitsel tipteki çalışmamız Ocak-Mayıs 2011 tarihleri arasında Ankara ilinde rastgele seçim yöntemi ile belirlenmiş 3 ilköğretim okulunda gerçekleştirildi. Çalışmaya katılanların ebeveynlerine HA ile ilişkili öğrencilerin kısa sosyodemografik bilgileri ve sağlık durumlarını sorgulayan anket formları dağıtıldı.

Bulgular: Ebeveynlere dağıtılan anket formlarının 2089 (%83,56)'u kurallara uygun ve eksiksiz doldurulmuştu. HA özelliğini taşıyan öğrenci sıklığı %14,9 (n=312) olarak saptandı. HA sıklığı erkeklerde (%56,1; n=175), kızlara (%43,9; n=137) oranla anlamlı ölçüde fazla idi (p=0,006). HA olan öğrencilerde; astım, kronik alerjik rahatsızlıklar ve ebeveyn bildirimine dayalı apne sıklığı anlamlı olarak fazlaydı (sırasıyla; p=0,007, p=0,017, p<0,001). Yapılan çok değişkenli lojistik regresyon analizinde; daha küçük yaş (p< 0,001, OR=0,856; 95% CI [0,791-0,926]), daha yüksek vücut kitle indeksi (VKİ) (p=<0,001, OR=1,199; 95% CI [1,147-1,253]), yılda 3-4 (p=0,008, OR=2,084; 95% CI [1,210-3,588]) ve 5-6 defa üst solunum yolu enfeksiyonu (ÜSYE) ile karşılaşma (p= 0,017, OR=2,239; 95% CI [1,156-4,339]), yılda altıdan fazla akut otitis media (AOM) geçirme durumu (p=0,036, OR=14,980 [1,186-189,157]) gibi bağımsız değişkenler HA ile anlamlı derecede ilişkili olarak saptandı.

Sonuç: HA, Ankara'daki çocuklar arasında sık karşılaşılan bir sağlık problemiydi. Daha küçük yaşta olma, daha yüksek VKİ'ye sahip olma, sık ÜSYE ve AOM geçirme gibi risk faktörleri sağlık çalışanlarının dikkat etmesi gereken risk faktörleridir.

Anahtar kelimeler: Çocukluk çağı, horlama alışkanlığı, risk faktörleri. **Nobel Med 2016; 12(1): 55-61**

INTRODUCTION

Habitual snoring (HS), a prominent symptom of sleep breathing disorders, is usually defined as the presence of loud snoring at least 3 nights per week. Habitual snoring is prevalent in children.[1,2] HS may cause a number of childhood health problems, including such parameters as poor physical growth, emotional and behavioral problems, neurocognitive impairment and decreased academic performance.[3-5]

HS is also the most significant and prominent clinical stage in Obstructive Sleep Apnea Syndrome (OSAS). During this process, hypoxemia and hypercapnia may develop due to partial obstruction of upper airway during sleep.[6] These pathologies may cause hypertension, cardiovascular/cerebrovascular diseases and daytime sleepiness problem during adulthood.[7-10] A few numbers of studies on large sample suggest that risk factors regarding HS among children are multidimensional, including adenotonsillar hypertrophy, obesity and dental malocclusion, exposure to respiratory infections, smoking, recurrent otitis media, allergic rhinitis and low socioeconomic status.[11-14]

HS is stated to be partly determined by craniofacial structures. There are racial differences in craniofacial structures.[15] HS prevalence in school-age children is reported to range from 4.9% to 17.1% in Western countries, such as Germany, Portugal, Australia, and the USA.[1,2] On the other hand, in the studies conducted in Hong Kong and Turkey, the prevalence is found to be 10.9% and 38.9% (only 3.5% has HS), respectively.[16,17] The discrepancy in HS prevalence and the reasons may be attributed to such factors as acceptance of different HS definitions, use of different methods in sample selection and inclusion of different age groups in the studies.[18]

The present study aimed to assess the prevalence and associated risk factors of habitual snoring among Turkish school-age children in "6-12 year" age group living in Ankara, Turkey.

MATERIAL AND METHOD

Study Group

The present study was conducted in 3 randomly selected elementary schools between January-May 2011 in Ankara. The purposes of the research were explained to the administrators and interested counseling teachers of the study schools. A sample of 6-12 year-old 2500 students was expected to participate in the study. The questionnaire, developed to assess the socio-demographical background of the participants and presence of HS and associated risk factors, was given to students, invited to the study, to deliver to their parents. Assessment results showed that 2089 (83.56%) questionnaires were completed in accordance with stated instructions. The students,

who were determined to have HS, were classified into "HS (+)" group and the students without HS into "HS (-)" group. The cases with chromosomal anomalies and craniofacial syndromes, which could cause HS, were excluded from the study.

Questionnaire

The detailed questionnaire form, filled in by the parents of 6-12 year old students, included questions about socio-demographic characteristics; age, gender, income level, and the number of siblings, educational background of parents. In addition, it included questions inquiring the presence of HS and parent-reported apnea, the difficulty in waking up in the morning, daytime sleepiness, recurrent upper respiratory tract infection (URTI) and the presence of acute otitis media (AOM), accompanying allergic illnesses (food allergy, allergic dermatological diseases, pollinosis) and asthma, operations performed due to upper airway obstruction (tonsillectomy, adenoidectomy, adenotonsilectomy).

While investigating HS presence, the parents were asked to state if their children snored loudly at least 3 nights per week. All the questions were formalized as "Yes-No" questions. Parent-reported apnea was described as "respiratory standstill for more than 5-10 seconds during sleep due to any reason". Occurrence of more than 4 nights per week was classified as "almost always"; 3 to 4 nights per week as "frequently"; 2 nights per week as "occasionally" and 1 night per week as "very rare". Any household income <$500 was classified as "low"; household income in $500-$1000 range as "median" and household income >$1000 "high". Educational background of parents was determined as "low" (an elementary school degree literacy), "medium" (high school degree) and "high" (college or above). The frequency of diagnosed recurrent URTI and AOM was assessed. The current family structure was evaluated in terms of the number of siblings; no sibling, 1 sibling, 2 and more siblings.

The questionnaires were given to the students by the responsible researchers and associate researchers, in company with counselling teachers, to be delivered to their parents. After one week, teachers collected questionnaires and delivered to school administrators. Then, the researchers collected the questionnaires from the administrators.

Ethical Approval

The parents of participants were informed about the study before obtaining their written consent. After receipt of the necessary ethical approval from Gülhane Military Medical Academy, Local Ethic Board (May 25th, 2009; No: 1491–941–09/1539), necessary permission was received from Ankara Provincial Directorate for National Education.

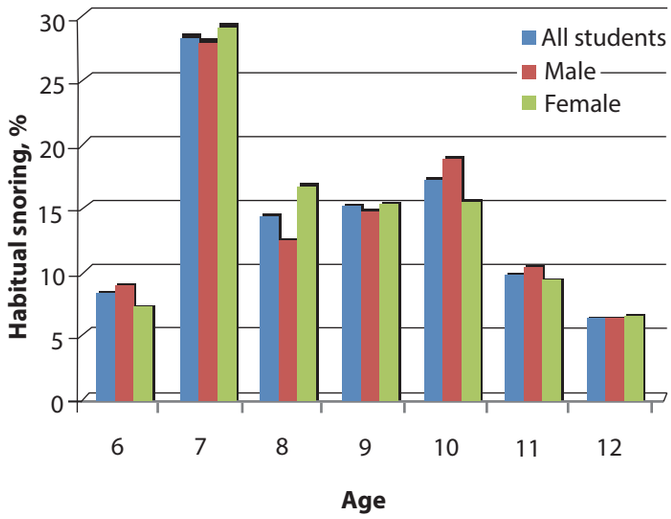

Figure: Distribution of habitual snoring due to age groups of students (n=2,089)

Statistical Analysis

All data analyses were performed using the Statistical Package for Social Sciences (SPSS) for Windows, version 15.0 (Chicago-USA). Descriptive statistical methods were presented in numbers and percentages for categorical variables and mean ± standard deviation for continuous variables. Chi-square test was used in comparing discrete variables. The association between HS and, related potential demographic and risk factors was analyzed with multivariable logistic regression in one model, adjusting for potential confounders including age, gender, weight, height, body mass index (BMI), parents educational level, household income, number of siblings, chronic health problems, associated operation history. The statistical significance was set at "$p<0.05$".

RESULTS

2500 elementary school students in "6-12 years" age group were included in the present study. 2089 (83.56%) questionnaires were completed in accordance with the instructions. The mean age of the sample was 8.83 years (SD=1.75, range in 6-12 years). Of all study students, 48.9% (n=1021) was male vs. 51.1% (n=1068) was female.

According to the criteria stated in the questionnaires, HS prevalence was determined to be 14.9% (n=312). The rate of HS in males (56.1%; n=175) was statistically significantly higher compared to females (43.9%; n=137) (p=0.006) (Table 1). Regarding HS, 7 year-old children had the highest risk, with 28.5% (n=89) (p=

Table 1: Sociodemographic features of children regarding HS and probable risk factors (n=2089)

	HS (+) (mean ± SD)	HS (-) (mean ± SD)	X^2	*p*
Age (years)	8.60 ± 1.74	8.87 ±1.76		0.011*
Weight (kg)	31.68 ± 9.91	30.01 ± 8.42		0.002*
Height (cm)	129.75 ±12.73	131.89 ±12.17		0.006*
BMI (kg/m2)	18.55 ± 3.65	17.08 ± 2.70		< 0.001*
Gender	% (n)	% (n)	7.64	0.006**
Male	56.1(175)	47.6(846)		
Female	43.9(137)	52.4(931)		
Household income		5.19	0.074	
Low (<$500)	24.7(77)	24.8(440)		
Medium ($500-$1000)	54.5(170)	48.7(865)		
High (>$1000)	20.8(65)	26.6(472)		
Mother education level		2.29	0.318	
Low	45.5(142)	45.1(802)		
Medium	40.1(125)	37.1(660)		
High	14.4(45)	17.7(315)		
Father education level			4.17	0.124
Low	27.6(86)	26.8(476)		
Medium	43.6(136)	38.7(688)		
High	28.8(90)	34.5(613)		
Number of siblings		0.35	0.836	
0	14.4(45)	14(249)		
1	51.6(161)	50.3(893)		
≥2	34(106)	35.7(635)		
Chronic health problems				
Asthma (+)	4.8(15)	2.2(39)	7.19	0.007**
Allergic diseases (+)	21.5(67)	16(284)	5.72	0.017**
Operation history		9.80	0.020**	
Tonsillectomy	0.6(2)	0.8(14)		
Adenoidectomy	4.8(15)	1.9(34)		
Tonsilloadenoidectomy	3.8(12)	4.2(75)		

*: Student t-test, **: Chi-Square test. **HS (+):** group of students with HS; **HS (-):** group of students without HS; **SD:** standard deviation; **BMI:** body mass index

0.038). HS prevalence decreased distinctively in "8-10 years" age group compared to "7 year" age group, drawing a plateau, and then significantly decreased even from this plateau level in "11 year and older" age group (Figure). Gender assessment showed that HS prevalence peaked at "7 year old" age group, in both male and female groups (Figure).

The mean age of the students in the HS (+) group was lower than that of the HS (-) group. On the other hand, it was found that the mean weight of the students in the HS (+) group was higher than that of the HS (-) group. It was suggested that the mean height of the students in the HS (+) group was smaller than that of the HS (-) group (p=0.011, p=0.002, p=0.006, respectively). The present study revealed no statistically significant difference between the HS (+) group and HS (-) group in terms of the socio-economic level (educational background of parents, monthly average household income) and the number of siblings (p>0.05) (Table 1).Chronic health problems as asthma and allergic rhinitis were also assessed as probable risk factors for HS. The general asthma prevalence was 2.6% (n=54) in the sample. The rate of students, who described complaints of asthma, was significantly higher in the HS (+) group with 4.8% than the HS (-) group with 2.2% (p=0.007). General evaluation of all study students showed that the prevalence rate of chronic allergic diseases (allergic dermatological diseases, pollinosis, food allergy) was 16.8 % (n=351). In addition, the rate of chronic allergic diseases was significantly higher in the HS (+) group (21.5%) than the HS (-) group (16%) (p=0.017). As a result of the assessment, it was reported that the total rate of students with an operation history on upper airway obstruction (tonsillectomy, adenoidectomy, tonsilloadenoidectomy) was higher in the HS (+) group with 9.2% than the HA (-) group with 6.2% (p=0.044) (Table 1).

Parent-reported apnea assessment of all students produced a prevalence rate of 9.3% (n=195). An elaborated assessment revealed that this rate was 21.5% (n=67) in the HS (+) group and was 7.2% (n=128) in HS (-) group (p<0.001). Evaluation of the parent-reported apnea prevalence in study groups showed that the rate of students having this problem every night was 17.9 % in the HS (+) group and 1.6 % in the HS (-) group (p<0.001) (Table 2).

Evaluation of students in terms of recurrent URTI showed that the rate of having URTI 3-4 times a year or more was higher in the HS (+) group than the HS (-) group (p<0.001) (Table 3). Also, assessment of students in terms of recurrent AOM revealed that the rate of having AOM 1-2 time(s) a year or more was higher in the HS (+) group than the HS (-) group (p<0.001) (Table 4).

When the students were assessed in terms of difficulty in waking up in the morning, rate of difficulty was determined to be higher in the HS (+) group (31.7%) the HS (-) group (15.4%) (p<0.001). When daytime sleepiness was investigated, it was found that the rate of daytime sleepiness was higher in the HS (+) group (15.4 %) than the HS (-) group (p<0.001).

After adjustment for independent risk factors including age, parents educational level, household income, number of siblings by multiple logistic regression analysis, younger ages (p<0.001, OR=0.856; 95% CI [0.791-0.926]), higher BMI (p=< 0.001, adjusted OR=1.199; 95% CI [1.147-1.253]), having URTI 3-4 times per year (p=0.008, OR=2.084; 95% CI [1.210-3.588]) and 5-6 times per year (p=0.017, OR=2.239; 95% CI [1.156-4.339]), and having AOM>6 times per year (p=0.036, OR=14.980 [1.186-189.157]) remained associated with HS.

Table 2: Parent-reported apnea frequency among HS (+) and HS (-) group of students (n=2089)

	Parent-reported Apnea Frequency % (n)				p*
	Almost always	Frequently	Occasionally	Very rare	
HS (+)	17.9 (12)	6 (4)	10.4 (7)	65.7 (44)	<0.001
HS (-)	1.6 (2)	0.8 (1)	3.9 (5)	93.8 (120)	

*: Chi-Square test, **HS (+):** group of students with HS, **HS (-):** group of students without HS

Table 3: Evaluation of HS state of students due to recurrent URTI and AOM frequency (n=2089)

		None	1-2 times	3-4 times	5-6 times	>6 times	
HS (+)	URTI	6.4 (20)	38.1 (119)	36.9 (115)	12.5 (39)	6.1 (19)	
	AOM	59.6 (186)	29.8 (93)	7.4 (23)	2.6 (8)	0.6 (2)	p*
HS (-)	URTI	11.8 (210)	53.2 (945)	25.3 (450)	6.8 (121)	2.9 (51)	
	AOM	68.8 (1223)	26 (462)	4.6 (81)	0.6 (10)	0.1 (1)	

*: Chi-Square test **HS (+):** group of students with HS, **URTI:** upper respiratory tract infection, **HS (-):** group of students without HS, **AOM:** acute otitis media

DISCUSSION

HS prevalence, which was described as snoring loudly at least 3 times a week, was determined as 14.9% in the present study sample. Assessment results showed that the risk factors associated with HS could be as follows: being male, being younger, being shorter and being overweight and having URTI 3-4 times or more a year and AOM 1-2 times or more a year, having asthma and chronic allergic diseases and having adenoidectomy. However, after the adjustment for independent risk factors, only younger age, higher BMI, having URTI 3-4 and 5-6 times a year and AOM >6 times a year remained associated with HS.

HS prevalence was defined as 12% in the study of Li et al., which included 20,152 elementary school students; as 6.9% in the study of Anuntaseree et al., which included 1008 students at the age of 7 year; and as 10.9% in the study of Ng et al. which involved 3047 elementary school students in "6-12 year" age group.[16,19,20] HS prevalence was stated to be 7% and the rate of rarely snoring was detected to be 34.6% in the study of Ersu et al. from Turkey, which included 2,147 elementary students in "5-13 year" age group living in Istanbul.[21] However, present study recorded the average HS prevalence rate as 14.9%, a value similar with but a little higher than the other studies. These differences in HS prevalence values are thought to possibly have resulted from differences in craniofacial and pharyngeal structures related to racial characteristics and from the homogenecity in the distribution of the age groups involved in these studies.

Varying results were obtained in these studies in terms of the gender gap in HS prevalence rate. Some studies emphasized that HS was more common among male students, whereas some other studies stated equal gender distribution.[21-24] The HS prevalence was found to be higher among male students in the study of Sahin et al., which was conducted on 1,605 students in "7-13 year" age group, in Isparta.[17] Similarly, an overwhelming HS prevalence rate was determined in the study of Li et al.[19] Present study also detected that HS prevalence was higher among male students than female students. The difference between gender groups may have resulted from the difference in pharynx structures of genders.

A close relationship between being younger and HS was determined in the study of Sahin et al. This association peaked at "7-8 years" age group.[17] However, the study of Li et al. suggested interesting age differences. HS prevalence increased significantly beginning from 5-6 years to 7 years and later on decreased gradually.[19] Evaluation of HS prevalence in terms of age showed that "7 year" age group had the highest rates and "12 year" age group had the lowest rates in the present study. It was evaluated that HS tended to decrease due to expansion of cross-sectional area in pharynx, in parallel with age.

Former studies specifically examined the relationship between HS and socio-economic criteria. The study of Li et al., suggested that low educational level of parents and low family income level were independent risk factors.[19] Similar relations between socio-economic parameters and HS were also determined in the study of Kuehni et al., and in the study of Corbo et al., (which included 6,811 preschool students "1-4 years" age group and 2,439 primary and secondary school students, respectively).[14,22] However, the present study determined no significant difference between groups in terms of HS (+) and socio-economic parameters (family income level, parental education level, the number of siblings. Nevertheless, income level (>2,000 TL) and educational level of parents were determined to be higher in HS (-) group.

The study of Corbo et al., which included 2,439 elementary and secondary school students, determined the association between allergic conjunctivitis or rhinitis

Table 4: Associated factors regarding HS by multivariate logistic regression model (n=2089)

	B	*p*	OR (95% CI)
Age	-0.156	< 0.001	0.856 (0.791-0.926
Gender (Female vs male)	-0.225	0.097	0.799 (0.612-1.042)
BMI	0.181	< 0.001	1.199 (1.147-1.253)
Mother education level			
Medium vs low	-0.109	0.497	0.896 (0.654-1.229)
High vs low	-0.125	0.617	0.882 (0.540-1.442)
Father education level			
Medium vs low	0.075	0.674	1.078 (0.761-1.526)
High vs low	-0.204	0.361	0.815 (0.526-1.263)
Household income			
Medium vs low	0.228	0.193	1.256 (0.891-1.772)
High vs low	-0.038	0.879	0.962 (0.587-1.579)
Number of sibling			
1 vs none	0.017	0.930	1.018 (0.689-1.503)
≥2 vs none	-0.039	0.860	0.962 (0.623-1.485)
Asthma (Yes vs No)	0.567	0.106	1.763 (0.886-3.509)
Allergic diseases (Yes vs No)	0.318	0.063	1.374 (0.983-1.921)
Operation history			
Tonsillectomy vs none	-0.345	0.659	0.708 (0.153-3.284)
Adenoidectomy vs none	0.590	0.102	1.803 (0.889-3.658)
Tonsilloadenoidectomy vs none	-0.256	0.448	0.774 (0.400-1.500)
URTI frequency			
1-2 times vs none	0.069	0.795	1.072 (0.634-1.812)
3-4 times vs none	0.734	0.008	2.084 (1.210-3.588)
5-6 times vs none	0.806	0.017	2.239 (1.156-4.339)
>6 times vs none	0.766	0.058	2.152 (0.975-4.746)
AOM frequency			
1-2 times vs none	0.173	0.262	1.189 (0.879-1.609)
3-4 times vs none	0.363	0.197	1.438 (0.828-2.498)
5-6 times vs none	1.014	0.057	2.757 (0.971-7.829)
>6 times vs none	2.707	0.036	14.980 (1.186-189.157)

history and snoring.[22] Strong association between snoring and students' atopic structures was determined in the study of Zhang et al., which was conducted on 996 elementary school students.[25] Assessment of snoring in terms of allergic illnesses (food allergy, allergic dermatological diseases, pollinosis) showed that HS (+) group had more illnesses, even if the statistical difference between groups was not significant. This could be resulted from the failure of filling in the form properly and ignoring undiagnosed allergic diseases.

The study of Ersu et al., on elementary school students evaluated asthma as a risk factor in terms of HS.[21] The highest rate values in the HS (+) group concerning respiratory symptoms and asthma diseases were obtained in the study of Zhang.[25] In accordance with those literatures, the present study detected that asthma prevalence was higher in HS (+) group. This difference between the HS (+) and HS (-) groups could be detected from increased respiratory tract reactivity in bronchia, which affected upper airways and prevented air flow due to obstruction. Moreover, asthma and allergic diseases frequently accompanied to snoring could have similar or common etiological pathways together. Thus, appropriate treatment of these diseases could lead a decrease in snoring prevalence.

The study of Corbo et al. determined that snoring prevalence was higher in children, who had an adenoidectomy, however, tonsillectomy operation did not significantly affect snoring prevalence.[22] The study of Kaditis et al., included 3,680 children, produced a habitual snoring prevalence rate of 6.1%.[26] The number of adenoidectomy history was significantly more in HS (+) group than in HS (-) group. However, there was no significant difference between groups in terms of tonsillectomy / adenotonsillectomy. Higher HS prevalence, especially in children with adenoidectomy history, could depend on not being able to keep anatomical structure or recurrent adenoids.

Some studies have stated that there is a positive relationship between overweight and HS. Study of Lu et al., which included 974 children from "2-5 years" age group and aimed to investigate the relationship between nighttime cough and asthma, suggested that obesity could be accepted as an etiologic factor, even a minor one.[27] The study of Chng et al., which included 11,114 preschool and elementary school students, suggested that obese children were at high risk in terms of HS, compared to the others.[28] Taking into consideration the mean weight, the present study revealed that HS (+) group had more weight than HS (-) group.

Some previous studies ascertained that recurrent otitis attacks could be associated with HS. Study of Kuehni et al., carried out on preschool children, determined that recurrent AOM prevalence was distinctly lower in children without snoring problem than in children with habitual snoring.[14] Same study produced a positive relation between common cold prevalence and HS. The study of Goldbart et al. suggested that neuro-immunomodulatory changes could occur in adenotonsillar structure, and a quick proliferative response could develop as a result of encountering Respiratory Syncytial Virus (RSV) in the early period.[29] Similarly, the present study determined a significant increase in URTI and AOM prevalence in HS (+) group,

compared to HS (-) group. One of the most important hypotheses concerning this issue has been that chronic snoring in children activates some inflammatory mechanisms, which affect upper airway resistance and compliance.

Study Limitations

A limitation of the study was that the results were based on parental reports. Parents could have given inaccurate answers due to recall bias. In addition, due to the cross-sectional design, causality cannot be established between risk factors and HS. Moreover, the questionnaire did not include questions about environmental exposure factors (home environment, allergens, parental smoking, having a pet, etc.) which could affect HS prevalence.

CONCLUSION

The present study obtained HS prevalence rates higher than expectations. Parents should not consider snoring just as the sound of respiratory distress during sleep; but as a problem, which may result in severe health problems, if it becomes chronic. Study results showed that children, who were short, overweight, younger and male; and frequently had recurrent URTI and AOM attacks, asthma and allergic diseases, should be followed up more closely in terms of HS presence. Therefore, family physicians should ask parents to give information about their children's snoring habit, while taking medical history, when they visit family health centers for routine examinations or other reasons.

* The authors declare that there are no conflicts of interest.

CORRESPONDING AUTHOR: Yusuf Çetin DOĞANER Mayo Clinic, Department of Family Medicine, Rochester, MN, USA doganer.yusuf@mayo.edu - ycetindoganer@hotmail.com

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