

ARAŞTIRMA / RESEARCH ARTICLE

Effect of aging in snoring prevalence

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Yaşlanmanın horlama prevalansına etkisi

Amaç: Yaşlanmanın horlama prevalansına etkisinin incelenmesi.

Yöntem: Kesitsel epidemiyolojik bir araştırma planlandı. Çalışma grupları Denizli il merkezinde randomize seçilen üç bölgeden oluşturuldu. Demografik bilgileri (yaş ve cinsiyet) ve horluyor horlamadığını (hiç, ara sıra, sık sık [haftada 4-5 gün] ve her gün) ve horlama nedeniyle herhangi bir tedavi görüp görmediğini sorgulayan bir anket formu oluşturuldu. Anket her bölgeden eşit sayıda gönüllüye uygulandı. Bütün gönüllülerle evlerinde görüşüldü.

Bulgular: Sonuçta 2959 anket değerlendirmeye alındı. Habitüel horlama prevalansı şu oranlarda saptandı; Küçük çocuklarda (okul öncesi, 0-6 yaş) %3.6 (erkek: %5.3, kadın: %2.0), çocuklarda (okul çağı, 7-12) %3.9 (erkek: %3.8, kadın: %4.1), gençlerde (13-18 yaş) %2.9 (erkek: %5.0, kadın: 0.6) ve erişkinlerde %10 (erkek: %27.1, kadın: %7.4). 0-6 yaş ve 7-12 yaş gruplarında iki cinsiyet arasında horlama sıklığı yönünden istatistiksel fark saptanmadı. Genç ve erişkin gruplarda horlama prevalansı erkeklerde kadınlara göre istatistiksel anlamlı olarak daha sıktı (gençler için $p=0.02$, $p<0.05$, erişkinler için $p=0.0001$, $p<0.05$). Horlama istatistiksel olarak erkeklerde 30 yaşından itibaren, kadınlarda da 40 yaşından itibaren artmaktadır.

Sonuç: İnsanlarda horlama hayatın ilk yıllarından itibaren başlar ve yaşam boyunca giderek artar. Horlama prevalansındaki bu artış erkeklerde 3. dekatta, kadınlarda da 4. dekatta istatistiksel farklılık gösterecek kadar fazladır. Horlama adölesanlardan itibaren de erkeklerde kadınlara göre daha sık görülür.

Anahtar Sözcükler: Horlama, prevalans, epidemiyoloji.

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Abstract

Objectives: To determine the effect of aging in snoring prevalence. Cross-sectional epidemiological study.

Methods: Three different districts of Denizli, Turkey were randomly chosen to constitute the study group. Demographic information (age, gender) and whether snoring was present (classified as "never", "sometimes", "often" [4-5 days a week], and "everyday"), and information on any treatment they received for snoring was asked through a questionnaire. The questionnaire was applied to equal numbers of volunteers from each district. All respondents were interviewed at their homes.

Results: A total of 2959 questionnaires were evaluated. The prevalence of habitual snoring was found to be as follows: 3.6% in children between ages 0-6 (males: 5.3%, females: 2.0%), 3.9% between ages 7-12 (males: 3.8%, females: 4.1%), 2.9% between ages 13-18, (males: 5.0%, females: 0.6%), 10% in adults (males: 27.1, females: 7.4). Even though snoring is encountered more often in males than females regardless of age, no statistical significance was found between sex in age groups 0-6 and 7-12. But snoring prevalence is statistically more frequent in males than females in age groups 13-18 and 18 above (for adolescent group $p=0.02$, $p<0.05$, for adults $p=0.0001$, $p<0.05$). Snoring statistically increases above 30 years in males and above 40 years in females.

Conclusion: Human being begins snoring at the first years of life and snoring prevalence increases along the life. Snoring prevalence significantly increases in third decade in men and in forth decade in women. Beginning from the adolescence snoring is significantly more frequent in men than women.

Key Words: Snoring, prevalence, epidemiology.

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Introduction

Snoring is a vibratory sound produced during sleep which results of some degree of upper airway obstruction. Snoring is a symptom which can be seen in all age groups. Habitual snoring can be a manifestation of obstructive sleep apnea syndrome. On the other hand severe snoring may be a social problem among adults.¹ For this reason every alternatives treatment modalities are to be applied by ENT surgeons are on due.

Even though snoring is a commonly seen disorder, data on snoring prevalence is limited. Data in the literature belongs to epidemiological studies that are done through different age groups and populations.^{1,7} In our study we aimed to evaluate the snoring prevalence between ages 0-70, and the change in prevalence by aging.

Materials and Methods

A cross-sectional epidemiological study was planned to determine the prevalence of snoring between ages of 0-70 (mean ages 31.5 ± 17.1). Demographic information (age, gender), whether snoring was present (classified as “never”, “sometimes”, “often” [4-5 days a week], and “everyday”), and information on any treatment they received for snoring was asked through a questionnaire (appendix 1). Three different districts (upper, middle and lower socioeconomic classes) were chosen and equal numbers of volunteers were decided to be covered from each district. All respondents were interviewed at their homes. Information about children was taken from parents. 3000 persons were intended to be reached. In the process of evaluating, “sometimes” and “never” snorers were classified as non-snorers, and “often” and “everyday” snorers were classified as habitual snorers. Those who received treatment for snoring (one male) and who had undergone tonsillectomy and/or adenoidectomy (6 children) in age group 0-12, were excluded from the study. The results were evaluated by means of chi-square and $p < 0.05$ was accepted to be significant. In order to calculate at which ages habitual snoring statistically increased, ages 0-5 was accepted as the reference and logistic regression analysis was done to calculate odds ratios (OR) and 95% confidence intervals.

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Results

Poorly responded questionnaires were excluded from the study. During the statistical analysis, minors were divided into three age groups. 0-6, 7-12, and 13-18. The rational for this grouping is based on the evidence that the nasopharyngeal space is narrower between ages 0-6, an increment occurs between ages 7-12, and a slower increment happens until age 19.⁸ Eighteen and above were grouped as adults. At the end, 1394 female (0-6 ages $n=101$, 7-12 ages $n=155$, 13-18 ages $n=197$, adults $n=1041$), 1565 male (0-6 ages $n=94$, 7-12 ages $n=131$, 13-18 ages $n=159$, adults $n=1565$), a total of 2959 questionnaires were evaluated. Answers were summarized in Table 1. Snoring prevalence in four age groups are shown in Table 2. Habitual snoring is more frequent among adult population, than children and teenagers ($p < 0.05$, $p = 0.0001$). When age groups under 18 are compared, no statistical difference between groups were found ($p > 0.05$, $p = 468$). According to gender habitual snoring were statistically more frequent among male adults ($p < 0.05$, $p = 0.0001$). Considering children and teenagers no significance between genders were found in age groups 0-6 ($p > 0.05$, $p = 0.194$) and 7-12 ($p > 0.05$, $p = 0.583$), but in age group 13-18 as in adults ($p < 0.05$, $p = 0.020$). As all data were evaluated in age 5 year intervals, it was seen that habitual snoring increased with age (Figure 1). By means of regression analysis, a significant increment was detected after 30 years in males and after 40 years in females (Table 3).

Discussion

Snoring is a symptom that can appear at all ages. In previous studies, habitual snoring has been reported in 3.2-34.5% of children.^{2,3,7-12} Our results were 3.9% in ages 0-5 and 3.3% in ages 6-10 (Table 2). The most frequent cause of snoring in children is adenotonsillar hypertrophy.^{3,12,13} But in puberty nasopharyngeal passage enlarges, adenotonsillar tissue regress and habitual snoring decreases.¹⁴ Contrary to the childhood, septal deviations, allergic rhinitis and obesity more frequently appear as causes of snoring in adolescent.³ Similarly previous studies, we found that snoring prevalence in puberty was lower than childhood (Table 2). Unlike ages 0-5 and 6-12, snoring was more prominent in males at adolescent (Table 2). The reason might be the arousal of morphologic differences between genders due to the increase in sex hormones after age 13.

It is well known that unlike children, snoring is more frequent among men in adulthood. For this reason, snoring prevalence in adults are usually reported separately for males and females in the literature. Lugaresi et al. reported that among adults, snoring prevalence was 40% in males and 28% in females.⁵ Ohayon et al. reported 47.7% and 33.6% respectively based on a telephone interview survey.⁶ On the other hand, Kayukawa et al. reported 16% in males and 6.5% in females.⁴ In an Istanbul-Turkey based study, snoring prevalence found to be 24.6% in males and 12.8% in females.¹⁵ Our results above 18 reveal 27.1% in males and 10% in females, which are in harmony with other results from Turkey (Table 1).^{1,15} Some hypotheses were proposed to explain this raised tendency of snoring in male. As a result of hormonal stimulation, the male develops more bulk to the muscles than a woman. The male pattern of the fat deposition does favor the neck as opposed to the thighs and hips women. The female hormones may impart a higher resting muscle tone.¹⁴

Table 1. Frequency of snoring in age groups and sex was shown.

Sex	Frequency of snoring	Age groups				total
		0-6	7-12	13-18	Older than 18	
Female	Never	95	92	144	711	1042
	Sometimes	4	1	10	226	241
	Often	-	1	1	29	31
	Every day	2	3	-	75	80
Male	Never	84	116	133	569	902
	Sometimes	5	10	18	292	325
	Often	-	-	1	68	69
	Every day	5	5	7	252	269

Table 2. Habitual snoring prevalence in age groups.

Age groups	Male	Female	General population
0-6	5.3%	2.0%	3.6%
7-12	3.8%	4.1%	3.9%
13-18*	5.0%	0.6%	2.9%
18-70*	27.1%	7.4%	10.0%

*Snoring was statistically more frequent in male adolescents and men [adolescents (13-18 ages), p=0.020, p<0.005 and adults p=0.0001, p<0.005]

Table 3. Results of multivariate logistic regression analysis shows statistically snoring increments at 3rd decade in males, at 4rd decade in females.

Ages	Female OR (95% CI)	Male OR (95% CI)
0-5	--	--
6-10	2.13 (0.18-23.98)	0.40 (0.09-1.76)
11-15	3.30 (0.36-30.16)	1.01 (0.31-3.32)
16-20	1.10 (0.09-12.33)	0.53 (0.15-1.82)
21-25	0.92 (0.08-10.35)	1.29 (0.45-3.63)
26-30	1.61 (0.16-15.82)	1.84(0.65-5.20)
31-35	4.37 (0.51-37.07)	*3.35 (1.23-9.14)
36-40	7.21 (0.89-58.14)	6.76 (2.54-18.04)
41-45	*8.03 (1.02-62.97)	7.40 (2.74-19.91)
46-50	15.18 (1.98-116.23)	9.46 (3.57-25.09)
51-55	22.94 (2.9-177.22)	11.31 (4.25-30.10)
56-60	48.59 (6.11-386.37)	16.17 (5.88-44.46)
61-65	35.99 (4.23-306.14)	14.20 (4.32-46.62)
66-70	40.49 (5.00-327.47)	14.81 (5.07-43.29)

*0-5 age group was accepted as baseline.

Studies on snoring reveal a broad range of prevalence both in children and in adults.^{1-5,8-11,16-19} One of the main reasons for that is focusing on different

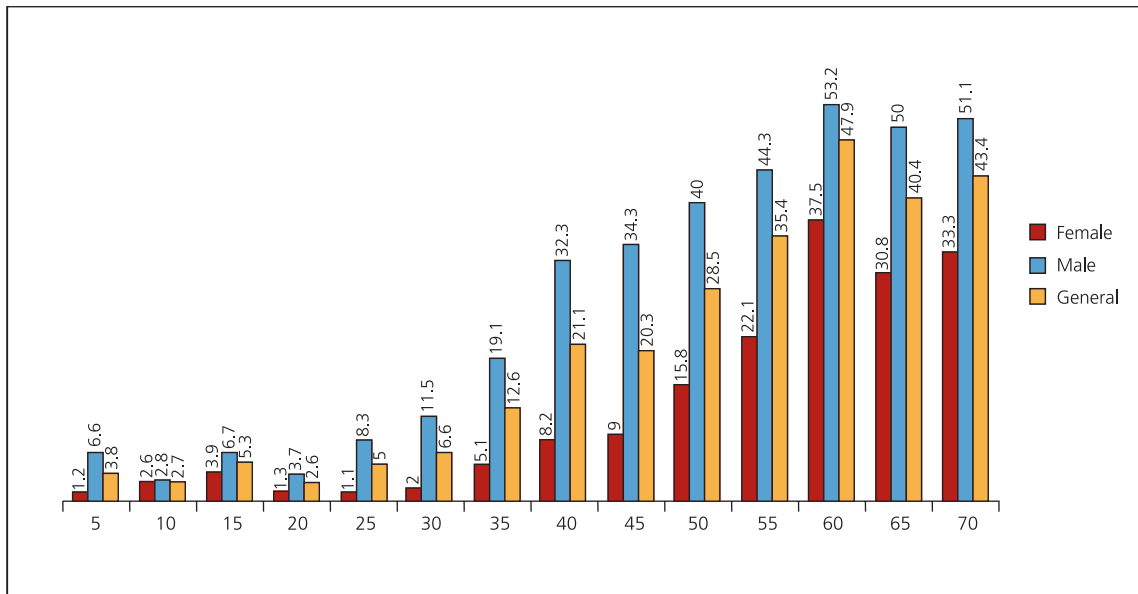


Figure 1. Snoring prevalences by five-year intervals. [Color figure can be viewed in the online issue, which is available at www.turkarchotolaryngol.org]

age groups in each study. Another reason is the used questionnaires which are not standardized. While some researchers focused on the frequency of snoring, others focused on the severity of snoring. The most frequent definitions used for classifying snoring frequency is “never”, “sometimes”, “often” (several nights a week), and “everyday”. People who snore “often” and “everyday” are classified as “habitual snoring”. Some authors used the definitions never, rarely or occasionally, sometimes or often and most nights or very often and always.^{8,16} The term “habitual snoring” is a commonly used quantitative parameter for snoring in the literature. On the other side, only asking “Do you snore?” and not questioning the frequency inevitably may lead to a higher prevalence than presence. On the other side when comparing the snoring prevalence from different countries, international differences that can origin from risk factors for snoring (obesity, regular alcohol consumption, and smoking) and ethnic differences may not be ignored.²⁰

Snoring increases with ages as seen in our results (Figure 1). Similar results were reported in previous studies, too. As one gets older, the soft tissues in the throat tend to thicken, the palate elongates, and the muscle tone at rest decreases.¹⁶ At what age does snoring become statistically different? When we evaluated our study in 5 year age steps, habitual snoring significantly increased after 30 years in males, and after 40 years in females (Table 3). Also, weight gain, alcohol consumption and smoking are considered as other risk factors for snoring in adults.^{5,16}

Conclusion

Human being begins snoring at the first years of life and snoring prevalence increases by aging. Snoring prevalence significantly increases in third decade in men and in fourth decade in women. Beginning from the adolescence snoring is significantly more frequent in men than women.

Questionnaire	
Name:	
Age:	
Sex:	
Have you ever had your tonsils removed?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Did you have any treatment for snoring?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you snore?	
• Never	<input type="checkbox"/>
• Sometimes	<input type="checkbox"/>
• Often	<input type="checkbox"/>
• Every day	<input type="checkbox"/>

Appendix 1. Questionnaire.

References

- Kara CO, Zencir M, Topuz B, Ardıç FN, Kocagözoğlu B.** The prevalence of snoring in adult population. *Kulak Burun Bogaz İhtis Derg* 2005; 14: 18-24.
- Ferreira AM, Clemente V, Gozal D, et al.** Snoring in Portuguese primary school children. *Pediatrics* 2000; 106: E64.
- Gislason T, Benediktsdottir B.** Snoring, apneic episodes, and nocturnal hypoxemia among children 6 months to 6 years old. An epidemiologic study of lower limit of prevalence. *Chest* 1995; 107: 963-6.
- Kayukawa Y, Shirakawa S, Hayakawa T, et al.** Habitual snoring in an outpatient population in Japan. *Psychiatry Clin Neurosci* 2000; 54: 385-91.
- Lugaresi E, Cirignotta F, Coccagna G, Piana C.** Some epidemiological data on snoring and cardiocirculatory disturbances. *Sleep* 1980; 3: 221-4.
- Ohayon MM, Guilleminault C, Priest RG, Caulet M.** Snoring and breathing pauses during sleep: telephone interview survey of a United Kingdom population sample. *BMJ* 1997; 22: 860-3.
- Teculescu DB, Caillier I, Perrin P, Rebstock E, Rauch A.** Snoring in French preschool children. *Pediatr Pulmonol* 1992; 13: 239-44.
- Ali NJ, Pitson D, Stradling JR.** Natural history of snoring and related behaviour problems between the ages of 4 and 7 years. *Arch Dis Child* 1994; 71: 74-6.
- Ersu R, Arman AR, Save D, et al.** Prevalence of snoring and symptoms of sleep-disordered breathing in primary school children in İstanbul. *Chest* 2004; 126: 19-24.
- Kaditis AG, Finder J, Alexopoulos EI, et al.** Sleep-disordered breathing in 3,680 Greek children. *Pediatr Pulmonol* 2004; 37: 499-509.
- Kara CO, Ergin H, Koçak G, Kılıç I, Yurdakul M.** Prevalence of tonsillar hypertrophy and associated oropharyngeal symptoms in primary school children in Denizli, Turkey. *Int J Pediatr Otorhinolaryngol* 2002; 66: 175-9.
- Owen GO, Canter RJ, Robinson A.** Snoring, apnoea and ENT symptoms in the paediatric community. *Clin Otolaryngol Allied Sci* 1996; 21: 130-4.
- Haapaniemi JJ.** Adenoids in school-aged children. *J Laryngol Otol* 1995; 109: 196-202.
- Jeans WD, Fernando DC, Maw AR, Leighton BC.** A longitudinal study of the growth of the nasopharynx and its contents in normal children. *Br J Radiol* 1981; 54: 117-21.
- Kaynak H, Gözükırmızı E, Damcı D, Akıncı T, Denктаş H.** The prevalence of insomnia and excessive sleepiness in Turkey. In: Kırbaş D, Leonardi M, editors. Reports of a WHO meeting: neurology and public health. 1st ed. İstanbul: Bitam publications; 1999. p. 164-9.
- Coleman JA.** Pathophysiology of snoring and obstructive sleep apnea (airway dynamics) (2003): In: Fairbanks DNF, Mickelson SA, Woodson BT, editors. Snoring and obstructive sleep apnea. 3rd ed. Philadelphia: LWW; p. 19-24.
- Corbo GM, Forastiere F, Agabiti N, et al.** Snoring in 9- to 15-year-old children: risk factors and clinical relevance. *Pediatrics* 2001; 108: 1149-54.
- Netzer NC, Hoegel JJ, Loubé D, et al.** Sleep in Primary Care International Study Group. Prevalence of symptoms and risk of sleep apnea in primary care. *Chest* 2003; 124: 1406-14.
- Norton PG, Dunn EV.** Snoring as a risk factor for disease: an epidemiological survey. *Br Med J (Clin Res Ed)* 1985; 291: 630-2.
- Ng TP, Seow A, Tan WC.** Prevalence of snoring and sleep breathing-related disorders in Chinese, Malay and Indian adults in Singapore. *Eur Respir J* 1998; 12: 198-203.

Conflict of interest statement:

No conflicts declared.

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