

# Symptom Prevalence of Obstructive Sleep Apnea in Male and Female Population in Denizli

## Denizli İlinde Erkek ve Kadın Populasyonunda Obstrüktif Uyku Apne Semptom Prevalansı

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Geliş Tarihi/Received: 02.11.2011  
Kabul Tarihi/Accepted: 30.01.2012

This study was presented in 11<sup>th</sup> Annual  
Congress of Turkish Thoracic Society  
23-27 April 2008, Antalya, TURKEY

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**ABSTRACT Objective:** Obstructive sleep apnea syndrome (OSAS) is a syndrome that is characterized by repetitive upper airway obstruction, oxygen desaturation and arousals during night. OSAS effects 2-4% of males and 1-2% of females in middle age group. In our country, OSAS prevalence was found 0.9-1.9%. Symptom prevalence studies are necessary to expose polysomnography (PSG) demand. We aimed to determine OSAS symptom prevalence in male and female and confirm high risky group in Denizli provincial centre. **Material and Methods:** OSAS symptom prevalence questionnaire is composed of 10 multipl choice questions which was modified from Berlin questionnaire by excluding demographic questions. Moreover, Mallampati scores, neck circumference (NC) (in women above 38 cm, in men above 43 cm accepted as pathologic) and body mass index (BMI= weight/height, BMI above 30 kg/m<sup>2</sup> accepted as obesity) were evaluated in all person. Berlin questionnaire was inquired to 570 person. High and low risk grading was made according to Berlin questionnaire. **Results:** Totally 543 (95.3%) questionnaire were analysed. The mean age 47.1±11.9 year, BMI was 27.1 ± 4.2 kg/m<sup>2</sup> and, NC was 37.4±4.0 cm. The neck circumference was statistically significant (extensive) higher in men (p=0.001). Snoring, witnessed apneas, sleepiness while driving were all much more in men on the other hand, unrestless sleep, daytime fatigue and tiredness were all more in women (p<0.001, p=0.0006, p=0.001, p=0.002, p=0.005 respectively). 99 person (18.2%) had high risk according to the questionnaire. NC (p=0.01, OR:2.65), BMI (p=0.000, OR:0.51), Mallampati score (p=0.000, OR:3.72), hypertension (p=0.000, OR:2.72), smoking (p=0.000, OR:5.5) have effected OSAS development. **Conclusion:** This study shows that the symptom prevalence of OSAS patients is different in males and females. The factors predisposing OSAS were found similar with the literature. Larger epidemiological studies in male and female population would help to define OSAS prevalence.

**Key Words:** Sleep apnea, obstructive; snoring

**ÖZET Amaç:** Obstrüktif uyku apne Sendromu (OUAS) geceleri tekrarlayan üst hava yolu tıkanmaları, oksijen desatürasyonu ve arousallar ile karakterize bir sendromdur. OUAS orta yaş erkeklerin %2-4'ünü, kadınların %1-2'sini etkiler. Ülkemizde OUAS prevalansı %0.9-1.9 arasında bulunmuştur. Polisomnografi (PSG) ihtiyacının ortaya konması için semptom prevalansı çalışmaları gereklidir. Bu çalışmada, Denizli il merkezinde yaşayan erkek ve kadınlarda OUAS semptom prevalansını saptamayı ve yüksek riskli grubu belirlemeyi amaçladık. **Gereç ve Yöntemler:** OUAS semptom prevalans anketi demografik sorular hariç Berlin anketinden modifiye edilmiş çoktan seçmeli 10 sorudan oluşur. Bundan başka Mallampati skoru, boyun çevresi (kadınlarda 38 cm, erkeklerde 43 cm'den büyük olması patolojik kabul edildi) ve beden kitle indeksi (BKİ: ağırlık/boy, BKİ 30 kg/m<sup>2</sup>den büyük ise obez olarak kabul edildi) tümünde değerlendirildi. Berlin anketi 570 kişiye uygulandı, buna göre düşük ve yüksek risk evrelemesi yapıldı. **Bulgular:** Toplam 543 (%95,3) anket değerlendirildi. Grubun yaş ortalaması 47,1±11,9 yıl, BKİ ortalaması 27,1 ± 4,2 kg/m<sup>2</sup>, boyun çevresi 37,4±4,0 cm idi. Boyun çevresi enişliği erkeklerde anlamlı düzeyde daha fazla idi (p=0,001). Horlama, tanıklı apne, araç kullanırken uyuklama erkeklerde daha fazla iken, uyukdan dinlenmemiş olarak kalkmak, gün boyu halsizlik ve yorgunluk kadınlarda daha fazla idi (sırasıyla; p<0,001, p=0,0006, p=0,000, p=0,002, p=0,005). Ankete göre toplamda 99 (%18,2) kişi yüksek risk taşımakta idi. Boyun çevresi (p=0,01, OR:2,65), BKİ (p=0,000, OR:0,51), Mallampati skoru (p=0,000, OR:3,72), hipertansiyon (p=0,000, OR:2,72), sigara içimi (p=0,000, OR:5,5) OUAS gelişimini etkilemişti. **Sonuç:** Bu çalışma, erkek ve kadınlardaki OUAS semptom prevalansının farklı olduğunu ortaya koymaktadır. OUAS gelişimini etkileyen faktörler literatürle uyumlu bulunmuştur. Erkek ve kadın populasyonlarında daha geniş epidemiyolojik çalışmaların yapılması OUAS prevalansını belirlemede yardımcı olacaktır.

**Anahtar Kelimeler:** Uyku apnesi, tıkaııcı; horlamak

Obstructive sleep apnea syndrome (OSAS) is a syndrome that is characterized by repetitive upper airway obstruction, oxygen desaturation and arousals during night.<sup>1,2</sup> Prevalence of OSAS that gained importance for public health in last years changes from population to population as it is effected from different genetic and environmental factors.<sup>3</sup>

OSAS effects 2-4% of males and 1-2% of females in middle aged population of western countries.<sup>4</sup> In our country the prevalence of OSAS was found as 0.9-1.9 % in a study.<sup>5</sup> Three major symptoms of the disease are snoring; witnessed apnea and excessive daytime sleepiness.<sup>6</sup> In a country, symptom prevalence studies are necessary to expose polysomnography (PSG) demand. Which is the gold standart for diagnosis. The studies about diseases prevalence are designed in order to show symptom prevalence and PSG demand.<sup>3,5</sup>

The epidemiologic studies of OSAS could in three classes.<sup>6,7</sup> 1. Studies including only questionnaire data, 2. Studies having PSG or respiratory monitorisation after questinonnaire application to a subgroup, 3. Studies having PSG or respiratory monitorisation after questionnaire application to all groups.

In this study, we aimed to determine OSAS symptom prevalence and find high risky group in central province of Denizli.

## MATERIAL AND METHODS

Our study was performed in Denizli centre, to the people above 30 years age, between November and December 2007, after legal permission. According to ministry of health Denizli centre was composed of 458.714 person with 245.006 person above 30 years of age in June 2007. Additional written informed consent was obtained from all participants. There is no ethical committee approval. The study was proper for the Helsinki Decleration 2008.

Probable OSAS prevalence was estimated as 3% and confidence interval was 95% error piece  $\pm 1.5$  and we planned 505 person as simple size. However, we performed the study to 555 person in order to have more statistically confident results.

In Denizli city center patient population registered to each general practitioner were determined as 3500 person. According to Simple Sampling Method, 30 separate addresses were selected. World Health Organisation (WHO) suggests to analyse in 30 different groups in such type prevalence studies. So, we divided our sample size of 555 to 30 in order to find our person number to be studies and we decided it as 19 person. Face to face interviews and OSAS symptom questionnaire application were performed by the interviewer in every address having above >30 years of age person who had accepted.

In our study, OSAS symptom prevalence questionnaire is composed of 10 multiple choice questions which was modified from Berlin questionnaire by excluding demographic questions. Moreover, Mallampati scores, Neck circumference (NC) (in women above 38 cm, in men above 43 cm as accepted pathologic) and body mass index (BMI=weight/height, BMI above 30 kg/m<sup>2</sup> as accepted as obesity) were evaluated in all person included in to the study.

The questionnaire was composed of three sections: 1. Snoring and witnessed apneas, 2. Unrestless sleep, daytime fatigue and tiredness, sleepiness while driving, 3. Hypertension (it was accepted as personal expression or physician diagnosed). Evaluation criteria of the questionnaire were given below.

### Section 1:

Question 1: answer A: '1' point, others '0' point

Question 2: answer C or D: '1' point, others '0' point

Question 3: answer A or B: '1' point, others '0' point

Question 4: answer A: '1' point, other '0' point

Question 5: answer A or B: '1' point, others '0' point

### Section 2:

Question 6: answer A or B: '1' point, others '0' point

Question 7: answer A or B: '1' point, others '0' point

Question 8: answer A: '1' point, other '0' point

Question 9: out of analyses

**Section 3:**

Question 10: answer A: '1' point others '0' point

If BMI: ≥ 30 '1' point, If BMI < 30 '0' point

The points of each section were calculated separately. If ≥ 2 sections had ≥ 2 points was accepted as high risk while if ≥ 2 sections had < 2 points was accepted as low risk.

Statistically analysis was performed by using SPSS.10 (Statistical Package for Social Sciences for Windows).  $\chi^2$  (chi-square) and t tests were used in the comparison of the two groups data and odds ratios and confidence intervals (95%) were calculated. Inclusion criteria were acceptance of questionnaire, to live in the region that was determined with sampling method ≥ 30 age.

Exclusion criteria were nonacceptance of questionnaire and missing data in any answer.

**RESULTS**

Our questionnaire study was performed to 570 person ≥ 30 years of age who accepted the study 543 questionnaire (95.3%) were evaluated as 27 questionnaires were excluded due to missing data. 258 (47.5%) were females while 285 (52.5%) were males. Mean age of the group was 47.1±11.9 years, mean BMI 27.1±4.2 kg/m<sup>2</sup> and mean NC 37.4±4.0 cm. As analysed according to gender there was no different in age and BMI between male and female but NC was significantly higher in men (p=0.001) (Table 1).

A significant difference was seen in NC between genders, when it was classified as normal and high (>38 cm in female, 43 cm in male). NC was higher in men than in women. When BMI was classified as normal (<30 kg/m<sup>2</sup>) and obesity (≥ 30 kg/m<sup>2</sup>) in both, obesity was higher in women than in men (Table 2).

**TABLE 1:** Comparison of mean age, BMI and neck circumference according the gender.

Characteristics	Male (mean± SD)	Female (mean± SD)	p
Age	47.61±11.86	46.40±11.93	0.24
BMI	26.98±3.74	27.14±4.79	0.66
Neck circumference	40.48±23.65	34.12±2.31	0.0001

BMI:Body mass index.

**TABLE 2:** Comparison of NC and BMI according to genders.

Characteristics	Total	Male		Female		p
	%	n	%	n	%	
<b>Neck circumference (cm)</b>						
Normal	93.2	254	89.1	252	97.7	0.0001
*Extensive	6.8	31	10.9	6	2.3	
<b>BMI</b>						
≤ 30	87.7	231	81.3	190	73.6	0.032
>30	22.3	53	18.7	68	26.4	

\*in female >38 cm, in male >43 cm

NC: Neck circumference. BMI: Body mass index.

**TABLE 3:** Comparison of Mallampati Scores and the others according to genders.

Mallampati scores	Total	Male		Female		p
		n	%	n	%	
Group 1	40.3	100	35.1	119	46.1	
Group 2	43.6	132	46.3	105	40.7	0.023
Group 3	16.1	53	18.6	34	13.2	
No smoking	66.1	127	44.7	231	89.5	0.0001
Current smoking	33.9	157	55.3	27	10.5	
Hypertension (+)	21.5	41	14.4	76	29.5	0.0001
Hypertension (-)	78.5	244	85.6	182	70.5	

Smoking rate was 33.9% and hypertension was 21.5%. Smoking and high Mallampati score were significantly higher in men while hypertension was significantly higher in women (Table 3). Comparison of Mallampati score, smoking, hypertension according to genders were given in (Table 3).

Snoring prevalence was found 50.6% and this prevalence was higher in men (62.1%) and this was statistically significant (p<0.0001). Witnessed apnea prevalence was found as 17.9% and this prevalence was 22.1% in men and 13.2% in women (p=0.0006). Unrestless sleep prevalence was 43.5% and that prevalence was statistically higher in women (p=0.002). Daytime fatigue was 40.5% and that prevalence was statistically higher in women (p=0.005).

Sleepiness while driving prevalence was 8.3% and that prevalence was statistically higher in men than in women (p=0.000) (Table 4).

**TABLE 4:** Comparison of snoring according to genders.

Category 1	Female		Male		p
	n	(%)	n	(%)	
1. Do you snore?					
A. Yes	98	38.0	177	62.1	p<0.0001
B. No	160	62.0	108	37.9	
C. Don't know					
2. If you snore: Your snoring is:					
A. Slightly louder than breathing*	3	3.1	1	0.6	p=0.0001
B. As loud as talking*	54	55.1	60	33.9	
C. Louder than talking	15	15.3	33	18.6	
D. Very loud-can be heard in adjacent rooms	9	9.2	14	7.9	
E. Very loud-(can be disturb to other)	17	17.3	69	39.0	
F. *The analyses were done combine by line					
3. How often do you snore?					
A. Nearly every day	43	43.9	83	46.9	p=0.32
B. 3-4 times a week	13	13.3	25	14.1	
C. 1-2 times a week	16	16,3	38	21.5	
D. 1-2 times a month*	23	23.5	28	15.8	
E. Never or nearly never*	3	3.1	3	1.7	
* The analyses were done combine by line					
4. Has your snoring ever bothered other people?					
A. Yes	77	78.6	145	81.9	p=0.50
B. No/Don't know	21	21.4	32	18.1	
5. Has anyone noticed that you quit breathing during your sleep?					
A. Yes	224	86.8	222	77.9	p=0.0006
B. No	34	13.2	63	22.1	
C. Nearly every day	10		13		
D. 3-4 times a week	3		16		
E. 1-2 times a week	6		14		
F. Never or nearly never	15		20		

In the whole group, the prevalence of symptoms; snoring, witnessed apnea, daytime fatigue, which were all typical for OSAS was 11%. OSAS symptom prevalence according to genders were given in Figure 1, Table 4.

High risk and low risk calculations were performed according to questionnaire data. Totally 99% had high risk (18.2%). There was no statistically significant difference between women and men (17.8% and 18.6%, respectively) (Figure 2).

Probability of being OSAS was higher in the person who were obese, having high Mallam-

pati score, hypertension and smoking (Figure 3, Table 5).

## DISCUSSION

In our study, we determined high risk group according to Berlin questionnaire application and found that risk of being OSAS was associated with high NC, obesity, hypertension, smoking and high Mallampati score.

In different studies snoring prevalence in adult population has been found between 22.7%-57.11%.<sup>8,9</sup> Snoring prevalence in our study was

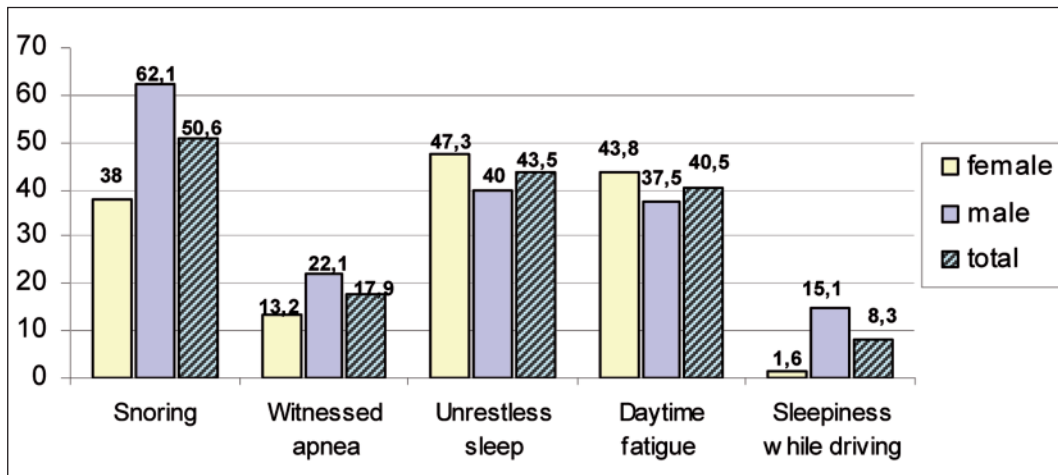


FIGURE 1: OSAS symptom prevalence according to genders.

(See for colored form <http://akcigerarsivi.turkiyeklinikleri.com/>)

found similar as with the study of Kara et al. which was performed in Denizli before.<sup>10</sup> Having different results of snoring could be due to different risk factors in different populations.

However, the last point is that snoring is a frequent symptom in population. Snoring was found of high frequency in advanced age and male population in different studies.<sup>6,7,11</sup> This could be related to different disturbance adipose tissue in both gender and protective effect of female hormones.<sup>12,13</sup> In advanced ages, snoring prevalence increases more significantly in male due to the diminished muscle tonus during rest.<sup>14,15</sup> We found snoring prevalence higher in men and above 50 years of age. Unrestless sleep and daytime fatigue were found 36% in the study of Mirici et al. and 20% in the study of Özdemir.<sup>3,16</sup> Witnessed apnea prevalence was found 2.2%-10.4% in different studies while that prevalence was 2.6% in UK and USA.<sup>17,18</sup> We found witnessed apnea prevalence higher in male as same with the study of Doğan et al.<sup>6</sup>

In our study, these prevalences were found more higher. This high prevalences could be caused by absence of other comorbidities (except hypertension) in our questionnaire.

Sleepiness prevalence during driving which is a very important complication of OSAS was 8.3% and it was higher in male group in our study.

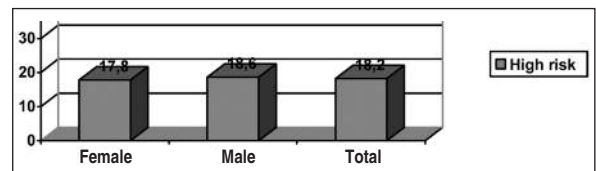


FIGURE 2: OSAS high risk group percentages according to the genders.

We might explain that low rate in females by the low frequency of driving among women. So, high way drivers should be evaluated for OSAS in which traffic accidents are very important.

We think that OSAS prevalence should be higher than we know in whole world. In our country, Köktürk et al. found that prevalence as 0.9%-1.9%.<sup>19</sup> Questionnaire studies are very important in order to find cases to be sent to sleep laboratories in countries like Turkey having small number of laboratories.

In the study from our country cumulative prevalence of OSAS was found as 4.6% in men, 4% in women and 8.8% in people >50 years of age, 8.7% in people having BMI >28.<sup>9</sup> In Spain OSAS was found as 2.2% and 0.8% in male and female respectively.<sup>2</sup>

In our study we found that prevalence of three symptoms all together was found similar to the literature.

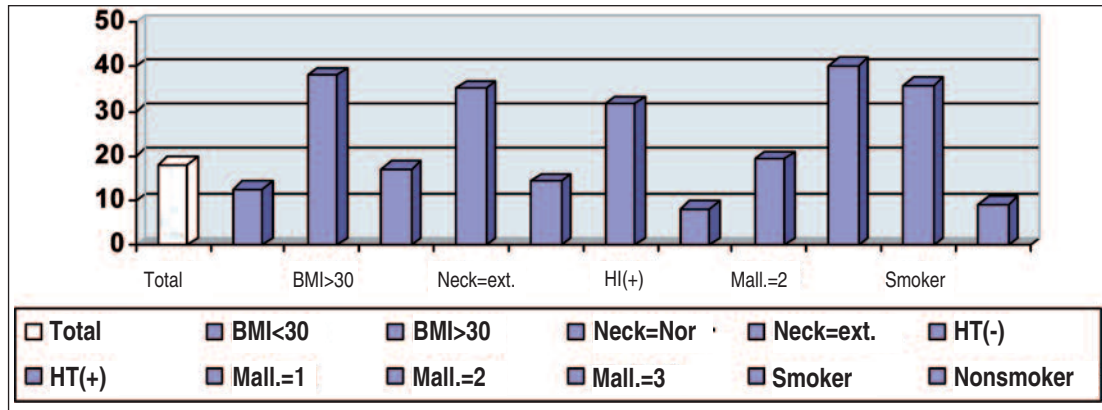


FIGURE 3: OSAS high risk group percentage according to some characteristics.

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TABLE 5: The risk of high probability of being OSAS according to some characteristics.

	Risk (+)		Risk (-)		p value	Odds ratio (OR) CI (95%)
	n	%	n	%		
Female	46	17.8	212	82.2	0.74	1.05
Male	53	18.6	232	81.4		(0.67-1.67)
Neck circumference normal	86	17.0	420	83.0	0.01	2.65
Neck circumference >normal	13	35.1	24	64.9		(1.22-5.68)
BMI ≤30	53	12.6	368	87.4	0.0001	0.51
BMI >30	46	38.0	75	62.0		(0.14-0.78)
Mallampati score=1	18	8.2	201	91.8	0.0001	3.72*
Mallampati score=2	46	19.4	191	80.6		(2.42-7.03)
Mallampati score=3	35	40.2	52	59.8		
Age 30-39	23	13.1	153	86.9	0.11	
Age 40-49	35	23.0	117	77.0		
Age 50-59	26	20.5	101	79.5		
Age 60+	15	17.3	72	82.7		
Hypertension (-)	62	14.5	364	85.5	0.0001	2.72
Hypertension (+)	37	31.6	80	68.4		(1.652-4.48)
Current smoking	66	35.9	118	64.1	0.0001	5.5
No smoking	33	9.2	325	90.8		(3.37-9.04)

\*converted to two groups in OR calculated. OSAS: Obstructive sleep apnea syndrome.

Obesity, high NC, smoking as well as advanced age and male gender are main risk factors for OSAS.<sup>3,20,21</sup>

Male gender, high BMI, high NC, smoking are related to snoring.<sup>2</sup> NC is an important marker for OSAS and being >38 cm in female and >43 cm in male is very important for OSAS.<sup>10,20,22</sup> In our study, high NC, high BMI (>30 kg/m<sup>2</sup>), smo-

king were all found as important risk factors in OSAS development.

OSAS is 2-3 times more frequent in the people above middle age than young people. However, that prevalence becomes equal with the young adults in advanced ages. Because pharyngeal anatomy of men has a tendency to collapse in middle age.<sup>23</sup> In our study, OSAS prevalence was

found significantly higher in 50-65 years of age than the other ages groups like other studies.

Nicolaus et al. found high risk group as 36% in their study which were performed by using Berlin questionnaire.<sup>24</sup> In our study high risk group was found 18.2% according to Berlin Questionnaire. We explain this low rate with our face to face questionnaire method and high hypertension ratio is a criteria for high risk in our study group.

Nowadays, OSAS is accepted as identifiable reason of hypertension.<sup>25</sup> In our study, we found that hypertension increases 2.7 times of OSAS development.

In our study, we found these risks Mallampati score 3.72, NC 2.65, smoking 5.5 times. These variable risk factors to being OSAS are important as single risk factors as well as multiple factors, like in the literature.

## CONCLUSION

This study shows that the symptom prevalence of OSAS patients is different in males and females. The factors predisposing OSAS were found similar with the literature. Larger epidemiological studies in male and female population would help to define OSAS prevalence.

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