Kocaeli Med J 2018; 7; 1:98-102

Obstrüktif Uyku Apnesi, Obezite, Yaş ve Cinsiyet İlişkisi: Retrospektif Bir Çalışma

Relation among obstructive sleep apnea, obesity, age and gender: A retrospective study

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ÖZ

GİRİŞ ve AMAÇ: *Obstrüktif uyku apnesinin (OSAS) risk faktörleri erkek cinsiyet, ileri yaş, obezite, anatomik anormallikler ve kalıtımdır. Uyku sırasında solunum kontrolünde bozulma ile karakterizedir. Bu çalışmanın amacı, uyku laboratuarımızda değerlendirilen hastalarda yaş, cinsiyet ve apne-hipopne indeksi (AHİ) ile obezite derecesi arasındaki ilişkiyi değerlendirmektir.*

YÖNTEM ve GEREÇLER: *292 hasta retrospektif olarak incelendi. Bunlardan, santral uyku apnesi tanısı alan 5 hasta çalışma dışı bırakıldı. Çalışmaya dahil edilen hastalar (n = 287) Beden Kitle İndeksi (BKİ)'ne göre alt gruplara ayrıldı: BKİ <25 kg/m2 grup 1 (normal); BKİ 25-29.99 kg / m2, grup 2 (kilolu); BKİ 30-39.99 kg / m2, grup 3 (obez); BKİ 40-49.99 kg/m2 grup 4 (morbid obez); ve BKİ ≥ 50 kg/m2, grup 5 (süper morbid obez). BKİ alt gruplarının AHİ ortalamaları, AHİ ve cinsiyet, AHİ ve yaş korelasyonları istatistiksel olarak değerlendirildi. İstatistiksel değerlendirmeler IBM statistical analysis package for the Social Sciences (SPSS) ile yapıldı.*

BULGULAR: *Hastaların ortalama yaşı 46,78 ± 11,44 yıl idi. Yüz doksan (66,2%) erkek ve doksan yedi (33,8%) kadındı. Ortalama BKİ 31,94 ± 6,61kg/m² ve ortalama AHİ 28,48 ± 30,27 bulundu. AHİ - BKİ değerleri ve AHİ-yaş arasında iki yönlü bir ilişki (p <0.001) vardı. AHİ'ye göre, BKİ alt grupları arasında istatistiksel olarak anlamlı fark bulundu (p <0.001). AHİ ortalaması kadınlara göre erkeklerde anlamlı olarak yüksek bulundu (p=0,005).*

TARTIŞMA ve SONUÇ: *Bu çalışmada, obezite derecesi arttıkça, OSAS'ın şiddetinin arttığı gözlenmiştir*

Anahtar Kelimeler: *Uyku apne sendromu, obezite, polisomnografi, apne-hipopne indeks*

ABSTRACT

INTRODUCTION: *The obstructive sleep apnea's main risk factors include the male gender, old age, obesity, anatomical abnormalities and heredity. This study's aim is to evaluate the relationship between age, gender and the severity of obesity with the apnea-hypopnea index (AHI).*

METHODS: *292 patients were studied retrospectively. Of these, 5 patients who were diagnosed with central sleep apnea were excluded from the study. Patients included in the study (n=287) were divided into subgroups according to Body Mass Index (BMI): BMI<25 kg/m² group 1 (regular); BMI 25-29.99 kg/m² group 2 (overweight); BMI 30-39.99 kg/m² group 3 (obese); BMI 40-49.99 kg/m² group 4 (morbid obese); and BMI≥50 kg/m² group 5 (super morbid obesity). BMI subgroups were compared in terms of AHI. Correlations between AHI, BMI subgroups, gender and age were evaluated statistically. Statistical analyses were carried out with the IBM statistical analysis package for the Social Sciences.*

RESULTS: *The mean age of patients was 46.78±11.44 years. One hundred and ninety (66.2%) were males and ninety seven (33.8%) were females. The mean BMI and the mean AHI were found to be 31.94±6.61kg/m² and 28.48±30.27kg/m², respectively. Mean AHI value was significantly higher in men than in women (p=0,005). A significant correlation was found (p <0.001) between AHI and the BMI values and between AHI and age. There were statistically significant differences (p <0.001) in the AHI between BMI subgroups.*

DISCUSSION AND CONCLUSION: *In this study, it was observed that the severity of OSAS increased as the obesity ranking based on the BMI increased.*

Keywords: *Sleep apnea syndroms, obesity, polysomnography, apnea-hypopnea index*

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Başvuru Tarihi: 17.072017
Kabul Tarihi: 03.06.2018

INTRODUCTION

Many factors play a role in the aetiology of obstructive sleep apnea (OSA), including the male gender, old age, obesity, anatomical abnormalities and heredity. It is lead to the deterioration in respiratory control during sleep [1,2]. OSA prevalence is reported to be 7% among adult men and 2-5% in adult women [2]. About 60-90% of patients with OSA are obese which has been shown to increase the upper airway closure tendency [3,4]. It was shown that OSA severity increased linearly with age [5]. Polysomnography (PSG) recording simultaneously multiple physiological parameters related to sleep is the gold standard for diagnosis of OSA [6,7].

The aim of this study was to investigate the relationship between severity of obesity and apnea-hypopnea index (AHI), age and gender in patients with OSA.

MATERIAL AND METHODS

The study was conducted in accordance with the recommendations of the Helsinki Declaration.

Subjects: We evaluated retrospectively the data on 292 patients examined in our hospital sleep laboratory. Since 5 patients diagnosed with central sleep apnea, were excluded from the study and a total 287 patients were included in the study.

Polysomnography: Polysomnography (PSG) was performed using a 58-channel polysomnography device (Compumedics E-Series) on all patients with 4-channel Electroencephalography (EEG), Chin electromyography (EMG), Leg EMG, electrocardiography (ECG), electrooculography (EOG), pulseoximetry, air flow, the combination of thoracic and abdominal respiratory inductance plethysmography (RIP) to provide an accurate representation of the respiratory effort, and snore detecting microphones. The PSG records were evaluated by the specialist doctors certified by the Health Ministry of Turkey, according to the AASM Manual for the Scoring of Sleep and Associated Events Version 2.0.

Body Mass Index (BMI): BMI was calculated according to the international criteria, as kg/m2 [8]. Patients included in the study were subgrouped as: group 1 (regular) with BMI <25 kg / m2; group 2 (overweight) with BMI 25-29.99 kg/m2; group 3 (obese) with BMI 30-39.99 kg/m2; group 4 (morbidly obese) with BMI 40-49.99 kg/m2; and group 5 (super morbidly obese) with BMI ≥ 50 kg/m2; and were also assessed for the mean AHI per subgroup.

Apnea Hipopnea Index (AHI): The AHI was calculated by adding together the number of apneas and hypopneas and dividing the sum by the total sleep time per hour. When the AHI was five or more events per hour, OSA was diagnosed. AHI was categorised as mild (5-15 events/hour), moderate (15-30 events/hr), and severe (> 30 events/hr) [9].

Statistical Analyses: Statistical analyses were done using the IBM statistical analysis package for the Social Sciences (SPSS) Version 23. Numerical values were expressed with the mean and standard deviation; categorical data were expressed in % values. The mean AHI of BMI subgroups was assessed with the two way ANOVA test, the correlation between AHI and BMI, age and gender with the Pearson correlation test. The mean AHI, age and BMI were compared in the two genders with the independent samples test. Multiple linear regression analysis was carried out to investigate the variation of AHI with age and BMI in the two genders. P<0.05 was considered statistically significantly different.

RESULTS

There were 190 (66,2%) males and 97 (33,8%) female. The mean age of our patients was 46.78±11.44. The mean BMI and the mean AHI were determined to be 31.94±6,61kg/m² and 28.48±30.27, respectively **(Figure 1).** According to the AHI results, 21.6% (n=63) of patients had simple snoring; 25% (n=73) had mild OSA; 18.2% (n=53) had moderate OSA and 35.3% (n=103) had severe OSA **(Figure 2).**

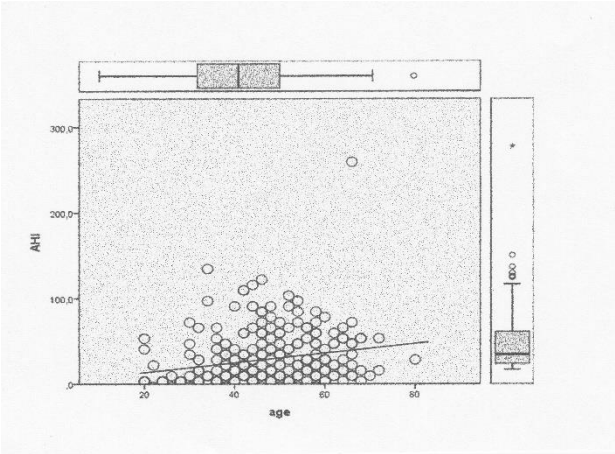

Figure 1. *Variation of AHI values with Age and BMI .*

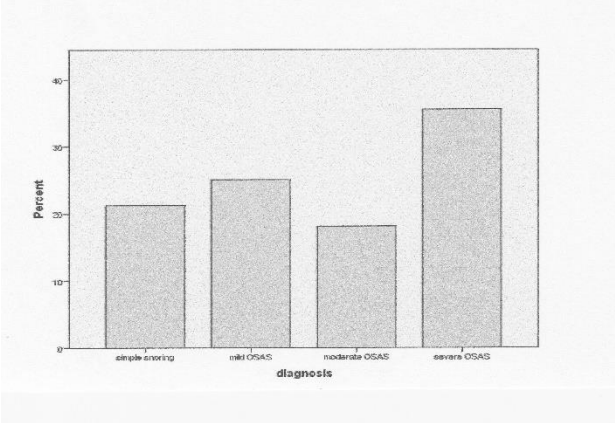

Figure 2. *Diagnoses in 287 Patients.*

It was found that 15.7% (n=45) of patients had REM and 15% (n=43) of them had positional OSA. It is showed values of age, gender and AHI of BMI subgroups in **Table 1.**

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Table 1: Age, gender and AHI in BMI subgroups

BMI	Regular (n=26)	Overweight (n=94)	Obese (n=134)	Morbidly Obese (n=25)	Super morbidly obese (n=8)
Gender (male %)	73.1	74.5	65.7	40	37.7
Age (mean)	38.5±14.5	44.4±11.5	49±10.4	51.5±8.2	49.2±6.7
AHI (mean)	9.3±15.1	20.9±22.2	33.5±32.7	39.6±35.1	61.3±35.2

AHI showed a two-way correlation with gender (p=0.002), with BMI (p <0.001) and with age (p<0.001) (Figures 3-5). The mean of AHI was significantly higher in men than in women (p=0.005). Mean age and mean BMI were significantly higher in women than in men, respectively (p=0.002 and p=0.001).

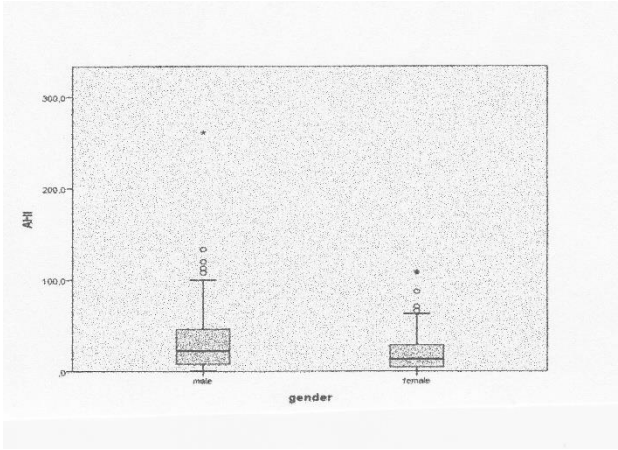

Figure 3. *AHI and gender correlation.*

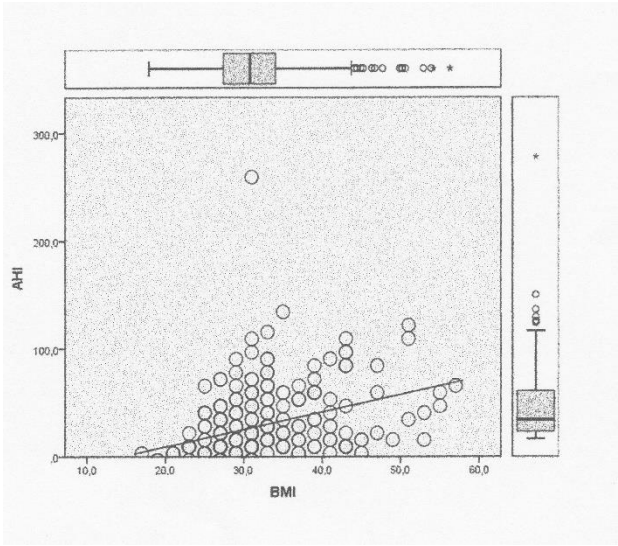

Figure 4. *AHI and BMI relationship*

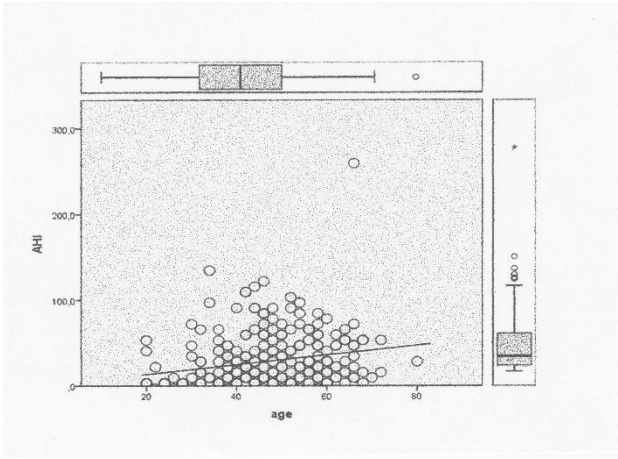

Figure 5. AHI and age relationship.

According to the multiple linear regression analysis test results, regression constant for the mean AHI was -21 (p=0.025). The regression co-efficient was 0.417 for age, 17.1 for gender and 1.654 for BMI, respectively (p=0.025, p=0.005 and

p<0.001). In males, the regression constant for AHI was -59,402 (p<0.001); and the regression co-efficient was 0.331 for age and 2.468 for BMI (p<0.001 and p=0.88, respectively). In females, regression constant for AHI was -30.25 (p=0.013), the regression co-efficient was 0.625 for age and 0.610 for BMI (p=0.003 and p=0.046, respectively). In this case, the regression formulae used for the calculations were as follows:

For men,AHI=(59.402)+(0.331xAge)+(2.468xBMI)
For women, AHI= (30.25)+(0.625xAge) + (0.610xBMI)

According to the BMI , 26 (9.1%) patients were in group 1; 94 patients (32.8%) were in group 2; 134 patients (46.7%) were in group 3; 25 patients (8.7%) were in group 4 and 8 patients (2.8%) were in group 5. In group 1, 10 (% 38.43) patients; in group 2, 22 (23.4%) patients; in group 3, 16 (11.2%) patients; in group 4, 3(12%) patients had AHI < 5. When the BMI subgroups were compared on the basis of AHI values, there were statistically significant differences (p<0.001). The mean AHI was significantly lower in group 1 than the other groups (p=0.011, p<0.001, p=0.001, p=0.037 for groups 2-5, respectively). In group 2, the mean AHI was also significantly different than in group 3 (p=0.005). The mean AHI value of group 2 was not significantly different than those of group 4 and group 5 (p=0.82 and p=0.131, respectively). There were no significant differences among the mean AHI values of group 3, group 4 and group 5 (p=0.971, p=0.475 and p=0.88, respectively).

DISCUSSION

In this study, it was observed that of the investigated parameters gender showed the highest regression coefficient with AHI. AHI was significantly higher in the males. This was followed by BMI and age, in that order. The severity of OSAincreased with the severity of obesity, one of the most important causes of OSA. Partinen et al. determined that obesity was the most important risk factor for OSA, followed by the male gender and age between 40-65 years of age [10].

According to our results, the relation of AHI with BMI was more powerful than that with age in the males, while age and BMI were found to be equally effective on AHI in women. Tsai et al found that men had higher AHI than women [11]. Ernst showed an association between AHI and BMI only in the male gender [12]. Katz et al. and Oztura et al. also reported a relationship between BMI and AHI [13,14]. According to the Oztura et al., the mean of age, AHI and BMI were significantly different regardless of gender [13]. The mean age and BMI values were higher in our female patients than those of men.

On the basis of the BMI, AHI was lower with statistical significance in patients with normal body weight. Over BMI of 30 kg/m2, there were no significant differences in the mean value of AHI. There was no significant differences between groups 2, 5and 6, although AHI of group 2 significantly differed from that of group 3. We consider that this situation may have resulted from the least number of patients in groups 4 and 5. Ernst et al. have reported a relation between AHI and the severity of obesity [12]. In a study of Redy et al, the male gender and a BMI of 25 kg/m2 were associated with the presence of OSA [15]. Our study supports these findings. However, Sreedharan et al. showed that BMI did not have a statistically significant association with the severity of OSA [16]. In their study, the number of patients (n=152) is less than our patients and 12% of them had insomnia.

It was obtained that AHI is <5 in 38.43% of BMI<25kg/m² patients. Borsini et al. reported that it was 48.95% (17). This study and our data support each other.

In our study, a two-way correlation existed between AHI and age. Gabbay et al found that AHI increased with age [5], while Oztura et al did not find a correlation between age and AHI [14]. However, this study has not given the mean age of male and female patients. We have thought that this result may be due to the inclusion of young men in the study.

The limitation to this work was the small number of patients in the subgroups and groups studied. However, this is due to our laboratory being recently established and our results were the data of the first 6 months.

In conclusion, OSA risk is increasing, particularly in older males. In OSA, obesity is interchangeable and important risk factor. Obesity control should be considered in the management of the OSA patients.

REFERENCES

1. Erdamar B, Suoglu Y, Cuhadaroglu C, Katircioglu S, Guven M. Evaluation of clinical parameters in patients with obstructive sleep apnea and possible correlation with the severity of the disease. Eur Arch Otorhinolaryngol 2001; 258: 492–5

2. Young T, Skatrud J, Peppard PE. Risk factors for obstructive sleep apnea in adults. JAMA 2004;291:2013-6.

3. Pillar G, Shehadeh N. Abdominal fat and sleep apnea: the chicken or the egg? Diabetes Care 2008;2:303-9

4. Schwartz AR, Gold AR, Schubert N, Stryzak A, Wise RA, Permutt S, et al. Effect of weight loss on upper airway collapsibility in obstructive sleep apnea. Am Rev Respir Dis 1991;144:494-8

5. Gabbay IE, Peretz L. Age-and gender-related characteristics of obstructive sleep apnea. Sleep Breath 2012;16(2):453-60.

6. Tavasoli A, Jalilolghadr S, Lotfi S. Sleep symptoms and polysomnographic patterns of obstructive sleep apnea in obese children. Iran J Child Neurol 2016; 10(1): 14–20.

7. Chazan R, Jakubowska-Najniger M, Chazan-Polanowska E, Przybyłowski T, Liszewska-Pfeifer D, Droszcz W. Influence of continuous positive airway pressure (CPAP) on left ventricular function, in patients with obstructive sleep apnoea syndrome (OSAS). Med Sci Monit, 1998; 4(2): 250-4.

8. Gudnadóttir TA, Bateman BT, Hernádez-Díaz S, Luque-Fernandez MA, Valdimarsdottir U Zoega H. Body mass index, smoking and hypertensive disorders during pregnancy: A Population Based Case-Control Study. PLoS One 2016; 11(3).

9. Epstein LJ, Kristo D, Strollo PJ Jr, Friedman N, Malhotra A, Patil SP, et al. Clinical Guideline for the Evaluation, Management and Long-term Care of Obstructive Sleep Apnea in Adults. Adult Obstructive Sleep Apnea Task Force of the American Academy of Sleep Medicine. J Clin Sleep Med. 2009 Jun 15;5(3):263-76

10. Partinen M, Telakivi T. Epidemiology of obstructive sleep apnea syndrome. Sleep;1992 Dec;15(6):1-4.

11. Tsai WH, Flemons WW, Whitelaw WA, Remmers JE. A Comparison of Apnea–Hypopnea Indices Derived from Different Definitions of Hypopnea. Am J Respir Crit Care Med 1999; 159:43–8

12. Ernst G, Bosio M, Salvado A, Dibur E, Nigro C, Borsini E. Difference between apnea-hypopnea index (AHI) and oxygen desaturation index (ODI): proportional increase associated with degree of obesity. Sleep Breath 2016; 20 (4): 1175-83.

13. Katz I, Stradling J, Slutsky AS, Zamel N, Hoffstein V. Do patients with obstructive sleep apnea have thick necks? Am Rev Respir Dis. 1990;141(5 Pt 1):1228-31.

14. Oztura I, Akdogan O, Yener GG, Baklan B. Influence of Gender, Obesity and Neck Circumference on Sleep-Disordered Breathing in A Sleep Referral Center. Journal of Neurological Sciences 2013; 30(1): 040-7,

15. Reddy EV, Kadhiravan T, Mishra HK, Sreenivas V, Handa KK, Sinha S, et al. Prevalence and risk factors of obstructive sleep apnea among middle-aged urban Indians: a community-based study.Sleep Med. 2009;10(8):913-8

16. Sreedharan SE, Agrawal P, Rajith RS, Nair S, Sarma SP, Radhakrishnan A. Clinical and polysomnographic predictors of severe obstructive sleep apnea in the South Indian population. Ann Indian Acad Neurol. 2016; 19(2): 216–20.

17. Borsini E, Ernst G, Bosio M, Blanco M, Blasco M, Salvado A. Role of sex and age as predictors of an apnea and hypopnea index higher than 5/hour in patients with normal body mass index using respiratory polygraphy. Med Clin (Barc). 2016;147(7):293-6.