

OBSTRÜKTİF UYKU APNE SENDROMLU ŞEHİRİÇİ OTOBÜS ŞOFÖRLERİNDE VÜCUT KİTLE İNDEKSİ, 25-HİDROKSİ VİTAMİN D VE PARATHORMON DÜZEYLERİ

Body Mass Index, 25- Hydroxy Vitamin D and Parathormone levels in City Bus Drivers with Obstructive Sleep Apnea Syndrome

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ÖZET

Amaç: Bu çalışmada; Obstrüktif Uyku Apne Sendromlu (OUAS) şehir içi otobüs şoförlerinin D vitamini ve Parathormon (PTH) serum düzeylerini incelemek ve herhangi bir tedavi almayan hastaların (normal ve hafif OUAS'lı) sonuçları ile karşılaştırmak planlandı.

Materyal ve Metod: Berlin Uyukuluk Anketi'ne göre yüksek risk grubundaki 162 erkek şehir içi otobüs şoförüne Eşrefpaşa Hastanesi'nin uyku laboratuvarında polisomnografi (PSG) uygulandı. Çalışmaya katılan tüm sürücüler için serum D Vitamini, PTH, kalsiyum ve fosfor düzeyleri ölçüldü. Boyları, ağırlıkları, vücut kitle indeksleri (VKİ), Apne Hipopne İndeksleri (AHI), oksijen desatürasyon indeksleri (ODI) belirlendi. Hasta grubu orta ve şiddetli OUAS ile tedavi gören 88 sürücüyü, kontrol grubu ise hafif OSAS'lı tedavi görmeyen veya OUAS olmayan sürücülerini içeren 74 sürücüyü içermekteydi.

Bulgular: Tedavi alan ve almayan grupların yaş, fosfor, kalsiyum, serum Vitamin D ve serum parathormon düzeyleri arasında yapılan analizler sonucunda istatistiksel olarak anlamlı bir fark saptanmadı. Ek olarak, VKİ, ODI ve AHI düzeyleri arasında istatistiksel olarak anlamlı bir fark tespit edildi.

Sonuç: VKİ [(30.45+3.85), (33.14+3.20), p<0.001], ODI [(4.55 (7), 28.90 (22,20) (p<0.001)] ve AHI [5.65 (9.88), 32.60 (32.18) (p <0.001)] değerleri arasında kontrol grubu ile OUAS'lı sürücüler karşılaştırıldığında istatistiksel olarak anlamlı bir fark tespit edildi. Öte yandan, tedavi alan ve almayan grupların yaş, fosfor, kalsiyum, D vitamini ve serum parathormon düzeyleri arasında istatistiksel olarak anlamlı bir fark bulunamamıştır. Çalışmamızda şehir içinde araç kullanan OUAS hastalarının yaş ortalaması 41 (8) idi. Yoğun trafik ve trafik ışıkları nedeniyle, hızlanma, fren hareketlerinin ve dur-kalkların şehir içi trafiğinde oldukça sık olduğu bilinmektedir. Bu nedenle kalça, bacak ve kol aktivitesi oldukça yüksektir. Bu tür fiziksel aktiviteler, düzenli egzersiz yapanlarda olduğu gibi, D vitamini eksikliğini ve yüksek parathormon seviyelerinin saptanmamasına sebep olabilecek düzenli egzersizlere eşdeğerdir.

Anahtar Sözcükler: *Obstrüktif uyku apne sendromu; Vitamin D; Parat hormon; Şehir içi otobüs şoförleri*

ABSTRACT

Objectives: In this study; it was planned to examine the Vitamin D and Parathormone (PTH) serum levels of city bus drivers with obstructive sleep apnea syndrome (OSAS) and to compare the results with those of patients who do not receive any treatment (normal and light OSAS).

Materials and Methods: Polysomnography (PSG) was applied at the sleep laboratory of Eşrefpaşa Hospital on 162 male city bus drivers who are in a high risk group according to Berlin Sleepiness Questionnaire. The serum Vitamin D, PTH, calcium and phosphor levels were measured for all drivers included in the study. Their heights, weights, body mass indexes (BMI), Apnea Hypopnea Indexes (AHI), oxygen desaturation indexes (ODI) were determined. The patient group was comprised of 88 drivers under treatment with moderate and severe OSAS whereas the control group was comprised of 74 drivers with light OSAS who are not under treatment or drivers with no OSAS.

Results: No statistically significant difference was determined as a result of statistical analysis carried out between the age, phosphor, calcium, serum Vitamin D and serum parathormone levels of groups that receive and do not receive treatment. In addition, a statistically significant difference was determined between the BMI, ODI and AHI levels.

Conclusion: A statistically significant difference was determined with regard to BMI [(30.45+3.85), (33.14+3.20), p<0.001], ODI [(4.55(7), 28.90 (22,20) (p<0.001)] and AHI [5.65 (9.88), 32.60 (32.18) (p<0.001)] levels between the control group and drivers with moderate and severe OSAS. On the other hand, a statistically significant difference could not be determined between the age, phosphor, calcium, serum Vitamin D and serum parathormone levels of groups that do and do not receive any treatment. The age average of OSAS patients in our study who drive a vehicle in local traffic was (41) and these patients spent all of their shifts in local traffic. It is known that speeding-braking movements and start-stops are quite frequent in local traffic due to intensive traffic, traffic lights and stops. Accordingly, hip, leg and arm activity is quite high. Indeed, such physical activities are equivalent to regular exercise which may have resulted in the failure to detect vitamin D deficiency and high levels of parathormone as is the case for patients who exercise regularly.

Keywords: *Obstructive sleep apnea syndrome; Vitamin D, Parathormone; City bus drivers*

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INTRODUCTION

Obstructive Sleep Apnea Syndrome (OSAS) is the most frequently observed sleep disorder which develops as a result of the full or partial obstruction of the upper respiratory tract (1). The prevalence of OSAS has been determined according to many studies in the world as 3-7% in men and as 2-5% in women (2). Studies related to its etiology are still ongoing, however the most important risk factors are male gender, advanced age, neck circumference and obesity (4).

The gold standard for OSAS diagnosis and treatment selection is the polysomnography (PSG) examination (5). According to the classification by American Academy of Sleep Medicine, OSAS can be classified into 3 groups as light OSAS (AHI = 5-15), moderate OSAS (AHI = 15-30) and severe OSAS (AHI > 30) (5). Continuous positive air pressure (CPAP) is the standard treatment for OSAS (6,7).

It has been reported in recent studies that one of two males with Body Mass Index (BMI)≥40 have vitamin D deficiency subject to obesity which is among the risk factors (4). The relationship between vitamin D serum concentrations and OSAS has been evaluated in a limited number of studies until now which have put forth various inconsistent results. On the other hand, there are also various studies which indicate that there is no relationship between OSAS and Vitamin D and Parathormone (PTH) serum levels but which also report confusing results due to comorbidity and primarily obesity (19,21).

PTH and Vitamin D is a steroid type molecule effective on bone metabolism and calcium homeostasis. It is known as a hormone due to the metabolic role it plays in many tissues. Vitamin D deficiency is closely related with certain diseases such as coronary artery disease, coronary failure, arrhythmia and diabetes mellitus (3,4).

In this study; it was planned to examine the Vitamin D and Parathormone (PTH) serum levels in city bus drivers undergoing treatment for moderate and severe obstructive sleep apnea syndrome (OSAS) and to compare the acquired results with normal and light

OSAS patients who are not undergoing any treatment. It was also planned to determine the relationship between Vitamin D and Parathormone serum levels on the disease diagnosis and severity in the city bus driver group comprised of drivers with OSAS who have to work in a physically active manner due to their profession.

MATERIALS AND METHODS

Our study was carried out retrospectively at the Eşrefpaşa Hospital Sleep Center.

A total of 162 city bus drivers currently working actively who were in the high risk group according to the Berlin Sleepiness Questionnaire result were included in the study.

Signed consent forms were obtained from all participants. The Berlin questionnaire comprised of a total of 10 questions and 3 categories was applied on all participants for evaluating the level of excessive daytime sleepiness. Those who responded as "yes" to two or more of the three categories were evaluated to have high OSAS risk and were subject to polysomnography (PSG) (19).

Other than OSAS, cases with sleep disorder, chronic liver disease, active infection, antibiotic – vitamin D – diuretic – calcium use, malignancy story, thyroid disease, osteoporosis were not included in the study.

Women patients were not included in the study thereby ensuring that the results are not affected from changes that may occur due to the physiological changes in the hormone profile during the postmenopausal period.

Demographic characteristics of each participant were recorded such as age, weight, height, alcohol and cigarette use, medical story and habits. Comparisons were made between two groups as those undergoing treatment (moderate and severe OSAS) and those who are not undergoing any treatment (normal and light OSAS) according to PSG scoring results. The group that is not undergoing any treatment was accepted as the control group. All patients who took part in our study were subject to monitoring by a trained sleep technician at our sleep center via PSG device. At least 6 hours of PSG records were acquired. PSG was carried

out in accordance with the American Academy of Sleep Medicine Classification criteria (1). Blood samples were taken into biochemistry tubes in the morning during 08.00-09.00 after full night fasting in order to measure the serum Vitamin D, PTH, calcium and phosphor levels. Vitamin D was measured via Roche Elecsys E411/2010 (Roche Diagnostics, Germany) autoanalyzer by ECLIA (electrochemiluminescence immunoassay) method; PTH was measured via Unicel Dxl 800 autoanalyzer Access (Beckman Coulter, Ireland) chemiluminescence method. Calcium and phosphor levels were measured via UniCel DxC 800 autoanalyzer using Calc (Selective Electrode and Phosphomolybdate methods). All test results were recorded.

STATISTICAL ANALYSIS

Statistical analyses were carried out via SPSS version 22 software. The accordance of the variables with normal distribution was examined by way of visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). Descriptive analyses were provided by using average+standard deviation for normal distributions, median and interquartile range (*and using frequency tables for ordinal variables) for all other distributions. Independent sample t-test or Mann-Whitney-u test was used for comparisons between treated and untreated groups. ANOVA or Kruskal-Wallis tests were used for comparisons between OSAS stages. Binary comparisons were evaluated using Bonferroni correction. Cases for which the value of p was below 0.05 were evaluated as statistically significant. Values of $p < 0.00125$ were accepted to be statistically significant in cases subject to Bonferroni correction.

RESULTS

A statistically significant difference could not be determined as a result of the statistical analysis carried out between the age, phosphor, calcium, serum Vitamin D and serum parathormone levels of the treated and untreated groups. However, there was a statistically significant difference between the BMI, ODI and AHI levels (Table 1). The serum Vitamin D levels between the two groups are given in Figure 1.

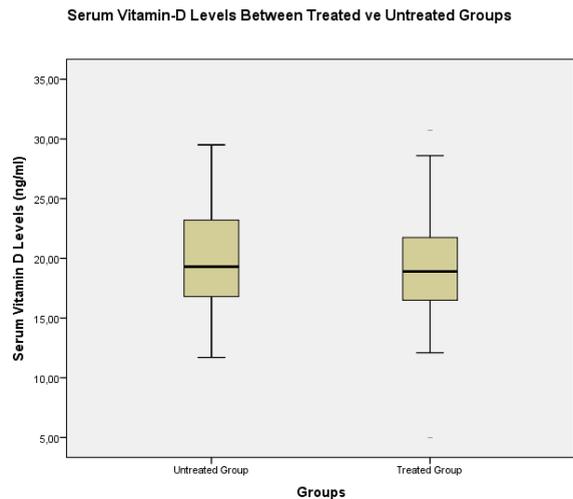
Table.1: Evaluation of the Studied Parameters for Treated and Untreated Individuals

Treatment	Treated	Untreated	*p
Age	41 (9)	41 (21)	0.49
BMI	30.45+3.85	33.14+3.20	<0.001
Phosphor	3.55+0.61	3.56+0.61	0.89
Calcium	9.56+0.76	9.64+0.8	0.46
Serum Vitamin D	22.87+4.50	22.38+4.29	0.48
Serum PTH	56.90 (13.08)	57.60 (11.70)	0.93
ODI	4.55 (7)	28.90 (22.20)	<0.001
AHI	5.65 (9.88)	32.60 (32.18)	<0.001

AHI Apnea-hypopnea Index, ODI: Oxygen Desaturation Index, BMI: Body Mass Index

The data were presented as median (interquartile range) and average +standard deviation (Independent Sample t-Test and Mann-Whitney U Test).

*According to statistical significance level of $P < 0.05$.



A statistically significant difference could not be determined between severity of the disease and parameters other than BMI, ODI and AHI as a result of the analysis carried out for the examined parameters of patients included in the study with OSAS pre-diagnosis (Table.2). Intergroup analyses are given in Table 3.

Table.2: Examination of the Studied Parameters According to OSAS Classification

OSAS	N/A	Light	Moderate	Severe	p
Age	42.26+5.90	41.41+5.64	42.26+6.05	42.32+4.98	0.87
Calcium	9.43+0.72	9.68+0.77	9.72+0.67	9.60+0.69	0.32
Phosphor	3.65+0.57	3.45+0.64	3.43+0.56	3.65+0.63	0.21
BMI	29.82+2.80	31.03+4.56	31.90+3.23	33.97+2.92	<0.001
ODI	2 (1.20)	7.40(5.70)	18 (8.80)	41.20(25.70)	<0.001
AHI	2.30 (2)	11.90 (7.20)	21.00 (7.40)	50.90 (28.45)	<0.001
Vitamin D	23.76+4.28	22.07+4.60	23.10+3.96	21.90+4.46	0.19
Parathormone	56.40 (13.80)	60.00 (13.65)	56.70 (11.43)	59.50(13.20)	0.59

AHI Apnea-hypopnea Index, ODI: Oxygen Desaturation Index, BMI: Body Mass Index
 The data were presented as median (interquartile range) and average +standard deviation
 *According to statistical significance level of P<0.05. (ANOVA and Kruskal Wallis)

Table.3: Inter-group Comparison for the Studied Parameters

Groups	1.2	1.3	1.4	2.3	2.4	3.4
BMI	0.82	0.07	<0.001	1	<0.001	0.04
ODI	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
AHI	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

AHI Apnea-hypopnea Index, ODI: Oxygen Desaturation Index, BMI: Body Mass Index
 Group 1: Normal, Group 2: Light OSAS patients, Group 3: Moderate OSAS patients, Group 4: Severe OSAS patients
 According to statistical significance level of P<0.00125 (with Bonferroni correction)

DISCUSSION

While no statistically significant could be determined in our study between the moderate and severe OSAS patients and the control group with regard to vitamin D, Parathormone levels and OSAS; there was a statistically significant difference between the BMI, ODI and AHI values. This difference makes it a requirement to evaluate the factors affecting vitamin D levels.

Vitamin D is a fat soluble, steroid structure hormone and plays a role in bone formation by stimulating mineralization as a result of increasing the intestinal absorption of calcium and phosphate. It is helpful in establishing the calcium and phosphor balance required for the growing bone tissue in children and for providing bone reformation and mineralization in adults (10, 17, 18). Vitamin D plays an important role

in calcium absorption at the intestinal level in addition to its effectiveness on the immune, cardiovascular and bone-skeletal systems. Thus, lack of vitamin D may contribute to OSAS development by way of immune system modulation, myopathy and inflammation (15). However, studies that evaluate the serum vitamin D concentrations of OSAS patients yield conflicting results under the impact of various factors such as the effect of CPAP treatment and obesity (19). The patients in our study are moderate and severe OSAS patients for whom treatments have been planned but who are not yet undergoing any treatment. It is known that vitamin D is mostly synthesized by exposure to sun (10). However, it is a well-known scientific fact that many factors such as ethnic origin, lack of physical activity, nutrition, smoking, obesity and genetic factors are effective on vitamin D metabolism (16,17). The fact that the age

average in our study was 41 with a maximum age of 54 as well as the fact that all subjects were actively working individuals may explain the different results in comparison with relatively similar studies. Indeed, the osteoporosis age for males was determined on average as 60,15 in our country (20, 21). Moreover, local city bus drivers emerge as a rarely encountered study group in similar studies. On the other hand, while it was observed that BMI \geq 40 in studies carried out with OSAS patients with low vitamin D levels, it was observed in our study that BMI=31,8+3,52. When similar studies carried out with truck drivers, highway truck drivers, commercial intercity bus drivers were compared with regard to patient group, various differences were observed especially with regard to the effort spent as physical activity throughout the day and during working hours. The physical differences between the roads inside and outside of the city may be an important factor. The fact that intercity bus drivers drive straight for longer periods of time with minimum steering wheel movement as well as the lack of continuous car horns and similar stimulants may result in less physical activity on the part of intercity bus drivers. However, the differences in stimulants as well as the frequent stops and traffic lights inside the city, higher demand for physical activity due to more winding roads and intense traffic are striking factors for driving in the city in comparison with intercity roads. Leg and hip muscles are subject to muscular activity and pressure on the locomotor system due to irregular speeding and changes in speed. The physical activity levels of city bus drivers are actually almost close to regular exercise due to reasons such as continuous gear shifting and wheel rotation. This may explain why lack of vitamin D and excessive parathormone levels have not been observed as is supported by many other studies carried out on OSAS patients. Hence, it can be stated that the data acquired from OSAS patients included in our study actually do not conflict with similar studies and that they emphasize a different point by putting forth the importance of age, gender, physical activity and regular exercise. This opinion is also supported by studies carried out on vitamin D levels and exercise/physical activity regardless of interior-exterior space differences (18). As was the case in our study, the fact that acquired

results change when details of parameters related with vitamin D in OSAS change indicate the necessity that more proofs and further studies are required to reach definitive judgments.

CONCLUSION

The relationship between vitamin D levels and OSAS was examined in our study on bus drivers with OSAS. The acquired results indicate that vitamin D levels may not be low in some OSAS patients. We are of the opinion that our study will shed light on future studies by showing that different results may be obtained due to the impact of the selected variables in studies carried out with parameters such as profession, age, physical activity, gender, weight which in turn will contribute to the advancement of sleep medicine.

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