



Body-Mass Index, 25- Hydroxy Vitamin D and Parathormone levels in Geriatric Male Patients with Obstructive Sleep Apnea Syndrome

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Abstract

Objectives: In this study, It was aimed to examine the levels of vitamin D and Parathormone (PTH) serum levels in geriatric male patients with Obstructive Sleep Apnea Syndrome (OSAS) and to compare the results of geriatric men without OSAS to evaluate the possibility of vitamin D deficiency as a predisposing factor for OSAS in the geriatric men.

Materials and Methods: Polysomnography (PSG) was applied to 162 geriatric men (aged 65 to 79 years) in the sleep laboratory. Serum Vitamin D, PTH, calcium and phosphorus levels were measured for all elderly people who participated in the study. Their height, weight, body mass index (BMI), Apnea Hypopnea Index (AHI), oxygen desaturation index (ODI) were determined. The patient group consisted of moderate and severe OSAS and 88 elderly men who had not yet begun treatment, and the control group consisted of 74 elderly men without OSAS.

Results: No statistically significant difference was found between the age, phosphorus, calcium and serum parathormone levels of elderly men who had OSAS and constituted the control group. However, a statistically significant difference was found between serum vitamin D level, BMI, ODI and AHI levels. In our study, the mean age of elderly male patients with OSAS was 70.72 ± 4.60 .

Conclusion: A statistically significant difference was detected between BMI, ODI, AHI and Serum Vitamin D values when the control group and geriatric patients with OSAS were compared. On the other hand, no statistically significant difference was found between the age, phosphorus, calcium and serum parathormone levels of the treated and non-treated groups.

Keywords: Obstructive Sleep Apnea Syndrome; Vitamin D; Parathormone; Geriatric Men

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 [3,4].

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].

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 [8,9].

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 [10,11].

In this study; it was planned to examine the Vitamin D and Parathormone (PTH) serum levels in geriatric patients undergoing treatment for moderate and severe obstructive sleep apnea syndrome (OSAS) and to compare the acquired results with geriatric males who are not OSAS.

Materials and Methods

162 geriatric male patients aged 65 to 79 years, who were diagnosed with OSAS for the first time between May 2018 and

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December 2019, were included in the study. The study was approved by the local ethics committee and informed consent was obtained from the study participants.

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.

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 moderate and severe OSAS and those who are not OSAS according to PSG scoring results. The group that is not OSAS 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 and serum parathormone levels of the OSAS and non-OSAS groups. However, there was a statistically significant difference between the serum Vitamin D, BMI, ODI and AHI levels (Table 1).

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 diagnosis (Table 2).

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 Parathormone levels and OSAS; there was a statistically significant difference between the BMI, ODI, AHI and vitamin D 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 [12-14]. 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 [16]. The patients in our study are moderate and severe OSAS

Table 1: Evaluation of the Studied Parameters for geriatric OSAS and Non-OSAS patients.

Treatment	OSAS	Non-OSAS	p
Age	70.72 ± 4.60	71.81 ± 5.58	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	11.87±4.50	22.38 ± 4.29	0.002
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

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



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

OSAS	N/A	Moderate	Severe	p
Age	42.26±5.90	42.26±6.05	42.32±4.98	0.87
Calcium	9.43±0.72	9.72±0.67	9.60±0.69	0.32
Phosphor	3.65±0.57	3.43±0.56	3.65±0.63	0.21
BMI*	29.82±2.80	31.90±3.23	33.97±2.92	<0.001
ODI**	2 (1.20)	18 (8.80)	41.20(25.70)	<0.001
AHI***	2.30 (2)	21.00 (7.40)	50.90 (28.45)	<0.001
Vitamin D	23.76±4.28	11.10±3.96	10.90±4.46	0.002
Parathormone	56.40 (13.80)	56.70 (11.43)	59.50(13.20)	0.59

*: Body Mass Index, **: Oxygen Desaturation Index, ***Apnea-hypopnea Index.

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 [17]. 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 [18]. Indeed, the osteoporosis age for males was determined on average as 60.15 in our country [19,20].

Bertisch et al. [21,22], examined the relationship between 25 (OH) D concentrations including AHI and various sleep measurements in the cohort study of geriatric male patients with an average age of 71.26 + 6.85 years. The authors reported that those with low 25 (OH) D vitamin levels had a statistically higher average AHI than those with high 25 (OH) vitamin D. Similar to our findings, those with a low 25 (OH) D vitamin concentrations were more obese.

Our participants were not pre-selected especially for the presence of any condition such as vitamin D deficiency, OSAS or obesity, thus minimizing selection bias. Additional strengths of our study include performing 25 (OH) D tests, carefully reviewing and clearing sleep study data, and accurate measurement of potential contradictions of 25 (OH) D and OSAS in an experienced, high-quality reference laboratory. Our study also has some limitations. Our study participants were largely white, older men, so we cannot generalize these findings to non-white individuals, women, and young patients. This was also a cross-sectional analysis with a single night sleep measurement and a single 25 (OH) D measurement. Although our data does not suggest the possibility of low 25 (OH) D predicting future development of OSA, a longitudinal study design will be required to specifically test such a hypothesis. In addition, although OSA measurements typically show high night-to-night reliability, 25 (OH) D levels vary depending on season, latitude, skin tone, sunscreen use, and outdoor time.

Conclusion

The relationship between vitamin D levels and OSAS was examined in our study on geriatric male patients with OSAS. The acquired results indicate that vitamin D levels may be low in 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.

References

1. American Academy of Sleep Medicine. International Classification of Sleep Disorders, 3 rd Ed. IL: American Academy of Sleep Medicine, 2014.
2. Punjabi NM. The epidemiology of adult obstructive sleep apnea. Proc Am Thorac Soc 2008; 5: 136-143.
3. Peker Y, Hedner J, Norum J, Kraiczi H, Carlson J. Increased incidence of cardiovascular disease in middle-aged men with obstructive sleep apnea: a 7-year follow-up. Am J Respir Crit Care Med 2002; 166: 159-165.
4. Young T, Skatrud J, Peppard PE. Risk factors for obstructive sleep apnea in adults. JAMA 2004; 291: 2013-2016.
5. Iber C, Ancoli-Israel S, Chesson AL, Quan SF. The AASM manual for the scoring of sleep and associated events. Rules, terminology and technical specifications. 1st ed: Wenchester, Illinois: American Academy of Sleep Medicine, 2007.
6. Peter G, Terri W, Daniel L, Conrad I. Evaluation of positive airway pressure treatment for sleep related breathing disorders in adults. A review by the Positive Airway Pressure Task Force of the Standards of Practice Committee of the American Academy of Sleep Medicine. Sleep 2006; 29: 381-401.
7. Nigel M, Graham D, Hassan H, Heather M, Thomas W, Neil J. Long-term use of CPAP therapy for sleep apnea/ hypopnea syndrome. Am J Crit Care Med 1999; 159: 1108-1114.
8. Mete T, Yalcin Y, Berker D, Ciftci B, Guven SF, Topaloglu O, et al. Obstructive sleep apnea syndrome and its association with Vitamin D deficiency. J Endocrinol Invest 2013; 36: 681-685
9. Barceló A, Esquinas C, Piérola J, De la Peña M, Sánchez-de-la-Torre M, Montserrat JM, et al. Vitamin D status and parathyroid hormone levels in patients with obstructive sleep apnea. Respiration 2013; 86: 295-301.
10. McCarty DE, Chesson AL, Jain SK, Marino AA. The link between Vitamin D metabolism and sleep medicine. Sleep Med Rev 2014; 18: 311-319.
11. Snijder MB, van Dam RM, Visser M, Deeg DJH, Dekker JM, Bouter LM, et al. Adiposity in relation to Vitamin D status and parathyroid hormone levels: a population-based study in older men and women. J Clin Endocrinol Metab 2005; 90: 4119-4123.



12. Liguori C, Romigi A, IZZI F, Mercuri NB, Cordella A, Tarquini E, et al. Continuous Positive Airway Pressure Treatment Increases Serum Vitamin D Levels in Male Patients with Obstructive Sleep Apnea. *J Clin Sleep Med* 2015; 11: 603-607.
13. Young T, Skatrud J, Peppard PE. Risk factors for obstructive sleep apnea in adults. *JAMA* 2004; 291: 2013-2016.
14. Erden ES, Genc S, Motor S, Ustun I, Ulutas KT, Bilgic HK, et al. Investigation of serum bisphenol A, Vitamin D, and parathyroid hormone levels in patients with obstructive sleep apnea syndrome. *Endocrine* 2014; 45: 311-318.
15. Bozkurt NC, Çakal E, ŞAHİN M, Özkaya AK, Fırat H, Delibaşı T. Serum 25-hidroksivitamin-D düzeylerinin obstrüktif uyku apnesi ve glukoz metabolizması anormallikleri ile ilişkisi. *Endokrin*. 2012; 41: 518-525.
16. Mete T, Yalçın Y, Berker D et al. Obstrüktif uyku apne sendromu ve D vitamini eksikliği ile ilişkisi. *J Endocrinol Invest*. 2013; 36: 681-685.
17. Fernandes MR, Barreto Junior WdRJRdAMB. Association between physical activity and vitamin D: A narrative literature review. 2017; 63: 550-556.
18. Nikolaus C, Riccardo A, Cordula M, Kathryn C, Kingman P. Using the Berlin Questionnaire To Identify Patients at Risk for the Sleep Apnea Syndrome. *Ann Intern Med* 1999; 131: 485-491
19. Randell A, Sambrook PN, Nguyen TV, Lapsley H, Jones G, Kelly PJ, et al. Direct clinical and welfare costs of osteoporotic fractures in elderly men and women. *Osteoporosis Int* 1995; 5: 427-432
20. Duman AE, Güven GS, Gürlek A. Erkek osteoporozu. *Hacettepe Tıp Dergisi* 2005; 36: 175-183.
21. Archontogeorgis K, Nena E, Papanas N, Steiropoulos PJB. The role of vitamin D in obstructive sleep apnoea syndrome. 2018; 14: 206-215.
22. Bertisch SM, Sillau S, DeBoer IH, Szklo M, Redline SJS. 25-hydroxyvitamin D concentration and sleep duration and continuity: multi-ethnic study of atherosclerosis. 2015; 38: 1305-1311.