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Original research article

Extensive research into the incidence of obstructive sleep apnea among people with thyroid disease

[1]Dr. Kushal Donkada, [2]Dr. Syed Nurulla Mohiuddin Quadri, [3]Dr. Sailaja Yella, [4]Dr. Syed Iffat Yasmeen

[1, 2, 4]Assistant Professor, Department of ENT and Head and Neck Surgery, DR.VRK Womens Medical College, Hyderabad, Telangana, India

[3]Associate Professor, Department of ENT and Head and Neck Surgery, Ayaan Institute of Medical Sciences, Hyderabad, Telangana, India

Corresponding Author:
Dr. Syed Iffat Yasmeen

Abstract

Background and Objective: According to studies, thyroid disease may be influenced by environmental factors as well as ethnicity. In this study, we set out to identify the characteristics and predictors of thyroid disease connected to OSA, as well as the prevalence of thyroid disease among individuals with laboratory-diagnosed obstructive sleep apnea (OSA).

Methods: For an overnight sleep study, serum levels of free thyroxine (FT4) and thyroid-stimulating hormone (TSH) were assessed in all patients sent to the sleep disorders centre. Four weeks after the sleep study, the levels were assessed. All 100 patients had Type I attended polysomnography (PSG) done.

Result: In addition to being heavier and more likely to have diabetes mellitus and hypertension, patients with hypothyroidism also had longer periods of time where their SaO2 was less than 90. Male patients with hypothyroidism tended to be heavier, to have longer periods of SaO2 > 90%, and to have a higher desaturation index (33.3 32.4 min vs. 13.5 24.4 min, p 0.05). Female OSA patients showed no differences between euthyroid and hypothyroid cases. Seven out of the 53 patients (13.2%) who did not have OSA were found to have clinical hypothyroidism and were already on thyroxine replacement therapy.

Conclusion: The proportion of newly detected clinical hypothyroidism in OSA patients was modest; however, subclinical hypothyroidism was widespread in OSA patients.

Keyword: Obstructive sleep apnea, thyroid, hypothyroidism, subclinical hypothyroidism, TSH, thyroxine

Introduction

Obstructive sleep apnea (OSA) and hypothyroidism have been linked because several symptoms of each condition are similar. The upper airway obstruction caused by mucoprotein buildup in the upper airway, neuropathy-related changes in the regulatory control of the pharyngeal dilator muscles, and the potential for respiratory centre depression are some of the proposed mechanisms for the association between OSA and hypothyroidism [1, 2, 3]. Sleep disordered breathing (SDB) is not always resolved by thyroxine replacement treatment, and treating SDB does not cure hypothyroidism. Therefore, it is crucial to identify both illnesses and treat them. The overlap between the two disorders could make it difficult for the treating doctor to distinguish between the two, which could lead to a misdiagnosis or under recognition of one of the disorders [4, 5].

SDB is a prevalent condition in hypothyroid people, however inconsistent findings from earlier research suggest that hypothyroidism is rather uncommon among OSA patients. According to various studies that used various diagnostic criteria, 10% of OSA patients had the condition. However, we discovered that the frequency of thyroid disease was higher among women (23.6%) compared to men (6.2%) in a prior study that examined gender differences in patients with OSA. While ignoring the level of thyroxine hormone, several earlier research characterised hypothyroidisms as the presence of a high serum thyroid-stimulating hormone (TSH) level. Because subclinical hypothyroidism has various therapeutic and prognosis implications, it may have affected some of the patients who were initially diagnosed with hypothyroidism [6, 7].

According to a number of studies, ethnicity and environmental factors both affect how common hypothyroidism is. As a result, racial and geographic differences in the frequency of hypothyroidism in OSA patients may exist. In order to ascertain the incidence of thyroid disease among patients with laboratory-diagnosed OSA and to try and pinpoint the traits and predictors of thyroid disease in OSA patients, this study was created to analyse TSH and thyroxine levels [7, 8].

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Material and Methods

All 100 patients referred for an overnight sleep study by Department of ENT and Head and Neck Surgery, DR.VRK Womens Medical College, Hyderabad, Telangana, India, from October 2021 to September 2022, included in this prospective descriptive study.

During the initial evaluation in the SDC, a sleep medicine specialist collected demographic and clinical data (history and physical exam) by asking patients to complete the Wisconsin Sleep Cohort Study questionnaire, which includes questions about sleep complaints, medical diagnoses, and response scales that focus on presenting symptoms, sleep symptoms, medical symptoms, and other medical conditions. For an introspective look at how drowsy you feel during the day, we turned to the ESS (Epworth Sleepiness Scale). Patients with neuromuscular diseases, acutely ill patients, and those taking medication that might affect thyroid testing were excluded. Hypoventilation was defined as a difference of 10 mmHg in EtCO2 (endtidal CO2) during sleep compared to the awake supine value associated with sustained oxygen desaturation that was not associated with obstructive apneas, hypopneas, or periodic breathing. When the study was conducted, none of the patients being followed were under the influence of any hypnotics or narcotics. The study was approved by an institutional review board, and all participants gave their informed consent. Thyroid evaluation and polysomnography was done [8, 9].

Data were mean and standard deviation (SD). Student t-tests compared continuous data means. Mann-Whitney was used if normality failed. Chi-square was used for categorical data. $p< 0.05$ indicated statistical significance. A preliminary analysis used a univariate logistic regression model with one explanatory variable to examine independent factors and clinical and subclinical hypothyroidism.

A multivariate logistic regression model assessed variables with significant p-values. Analyses used SPSS (version 17; Chicago, IL, USA).

Results

Table 1: Demographic and PSG data of OSA patients with and without clinical hypothyroidism

Characteristics	Clinical Hypothyroidism		*p*-value
	Yes (*n* Z 27)	No (*n* Z100)	
BMI	42.5 7.5	35.8 8.9	0.0003*
ESS	9.8 7.3	9.5 6.1	0.8085
Sleep Efficiency	20 (75.8)	66 (31.1)	0.000*
ESS ≥ 10	10 (39.5)	93 (44.1)	0.653
AHI	72.7 20.9	75.9 18.2	0.4390
Desaturation Index Time (min) SaO_2 < 90Average O_2	62.7 41.1	52.9 35.9	0.1785
Arousal Index	58.2 36.7	55.9 32.8	0.1199
Smoking history	2 (6.3)	27 (11.6)	0.0181*
Hypertension	18 (62)	91 (41.4)	0.1789
Ischemic Heart Disease	7 (21.6)	26 (11.9)	
Diabetes Mellitus Bronchial			

*$p < 0.05$; BMI: body mass index; ESS: Epworth Sleepiness Scale; AHI: apnea -hypopnea index; CAI: central apnea index.

Table 2: Within-gender comparison between euthyroid and clinical hypothyroid OSA patients

Characteristics	Female		Male	
	Euthyroidism (*n* Z 22)	Clinical hypothyroidism (*n* Z 8)	Euthyroidism (*n* Z 53)	Clinical hypothyroidism (*n* Z 2)
Age (years)	53.7 14.1	53.9 14.2	43.7 12.9	49.6 14.7
BMI	42.8 9.6	43.9 7.6	33.1 7.8*	44 10.5
ESS	8.9 5.8	8.9 6.7	12.2 6.5	11.9 7.8
Sleep Efficiency	71.5 18	77.7 15.9	77.6 15.9*	59.5 30.2
AHI	51.2 37.8	58.9 43.6	53.4 34.2	76.3 28
Desaturation Index	32.4 33.2	35.3 25.2	31.7 28.1*	56.8 32.3
Time (min) SaO_2 < 90%	29.9 36.9	31.9 32.9	12.5 23.4*	33.3 37.9
Minimum O_2	72.9 16.4	73.1 12.8	81.5 13.8*	67.8 19
Arousal Index	54 35.8	52.9 38.5	55.2 31.9	76.3 32.1

*$p < 0.05$; BMI: body mass index; ESS: Epworth Sleepiness Scale; AHI: apnea-hypopnea index.

Table 3: Gender differences in euthyroid, clinically hypothyroid and subclinically hypothyroid OSA patients

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Characteristics	Euthyroid		Clinical hypothyroidism		Sub Clinical hypothyroidism	
	Male (*n* Z 53)	Female (*n* Z 22)	Male (*n* Z 8)	Female (*n* Z 2)	Male (*n* Z 5)	Female (*n* Z 10)
Age	33.1 7.6*	42.2 9.6	43.0 12.5	43.6 7.7	31.8 6.5*	44.1 12.6
BMI	9.2 6.3	8.7 5.8	11.2 7.8	9.6 6.8	8.6 5.8	8.6 5.5
ESS	78.6 16.4*	71.5 18	59.5 30.2	76.8 16.5	72.7 20.5	68.7 19.6
Sleep Efficiency	33.3 34.2	51.2 37.8	76.3 28	58.9 41.6	59 32.1	58.6 47.3
AHI		32.4 32.2	56.8 32.3	35.3 25.2	28.5 25.9	39.7 42.6
Desaturation Index	30.7 29.1		33.3 34.9	32.5 33.8	16.3 28.4	28.9 39.8
Time (min) SaO_2<90	11.9 22.5*	29.8 38.5	67.8 19.0	73.1 11.5	81.1 7.5	80.5 12
Minimum O_2	79.5 11.8*	72.4 15.6				

*p < 0.05; BMI: body mass index; ESS: Epworth Sleepiness Scale; AHI: apnea-hypopnea index.

Discussion

Subclinical hypothyroidism was found to be relatively common among Saudi patients with OSA, especially among female patients. This confirms the results of our previous report on gender differences in OSA patients, which found that hypothyroidism is more common in female patients. However, no distinction was made between overt and covert hypothyroidism in that study. Studies in Western societies generally find a lower prevalence of thyroid disease than what was found in this study [9, 10]. Newly diagnosed cases of clinical hypothyroidism were not more common than in other studies, but the prevalence of subclinical hypothyroidism was higher than in other studies. The prevalence of subclinical hypothyroidism was 11.5% in 78 Italian patients with OSA, which is consistent with the findings of Resta *et al*. Factors such as race, environment, and socioeconomic status are likely at play in the discrepancies between reported prevalence rates [10].

Referral bias, or a difference in the referral population, is another possible explanation for this discrepancy in prevalence. Thyroid stimulating hormone (TSH) levels were measured in some of the earlier studies that looked into thyroid disease among OSA patients, and patients with high TSH levels were labeled as hypothyroid. This did not allow for differentiation between overt and subclinical hypothyroidism. Using FT4 levels, we classified a large group of OSA patients with elevated TSH levels into those with clinical and subclinical hypothyroidism. This study's prevalence of newly diagnosed clinical hypothyroidism is consistent with the vast majority of previous studies. However, when compared to both previously published studies and non-OSA patients, the prevalence of subclinical hypothyroidism was higher than expected. Comparatively, Kapur *et al*. found a low prevalence of subclinical hypothyroidism (1.4% in their series) when compared to our findings. Subclinical hypothyroidism has been found to have racial disparities, with the prevalence being one-third that of whites in the United States and being triple that of blacks. In addition, the radioimmunoassay employed by Kapur *et al*. was replaced with an alternative and more sensitive assay (ECLIA) in this investigation [11, 12].

The results of this study showed that hypothyroidism affects men and women differently. Male hypothyroid OSA patients had significantly higher AHI, desaturation index, and time with SaO2 90% compared to euthyroid OSA patients, despite no differences in age, BMI, respiratory parameters, arousal index, or comorbid conditions. The euthyroid males and females clearly exhibited different characteristics. When compared to males with OSA, euthyroid females with OSA were older, heavier, and spent more time with a SaO2 90%. On the other hand, the differences were less pronounced in the clinically hypothyroid OSA group [13, 14, 15]. This data suggests that OSA severity may be similar in women with clinical hypothyroidism and euthyroid women. These results are consistent with those found by Miller *et al*., who studied 118 women diagnosed with OSA and found no difference in age, BMI, respiratory disturbance index, or arousal index between euthyroid and hypothyroid women. There is currently no evidence that replacement therapy improves survival or reduces cardiovascular morbidity in patients with subclinical hypothyroidism. Nonetheless, the data we have suggest that thyroxine replacement may be helpful in some circumstances, including leading to enhancements in certain parameters of lipid profiles and left ventricular function [16, 17].

Clinical hypothyroidism in OSA patients has been studied extensively, and the results show clear benefits from replacement therapy in nonobese patients. Those who were overweight saw less of an improvement. However, it has not yet been determined how effectively treating subclinical hypothyroidism in OSA patients can improve their quality of life. No changes in PSG parameters were found in a small study that looked at the effects of treating subclinical hypothyroidism in patients with OSA. In this analysis, a significant proportion of OSA patients also suffered from bronchial asthma. Although asthma is not uncommon in, a previous study estimated that 35.1% of OSA patients also suffered from asthma. The high diagnostic yield of PSG in patients with clinical suspicion of OSA is another intriguing finding of this study. Nearly eighty percent of patients with clinical suspicions of OSA were confirmed to have OSA using PSG. This result is in accord with what has been found in the past,

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but it has not been highlighted or discussed much [18, 19].
Studies that looked at the frequency of subclinical hypothyroidism in OSA patients may have been flawed because they failed to consider the possibility that the condition might be temporary. Some patients with transient hypothyroidism may be ruled out and the number of patients initially considered to have subclinical hypothyroidism reduced if TSH and FT4 measurements are repeated after 12 weeks. Thyroid function tests have been re-measured for the vast majority (20 patients) but not all patients [19, 20].

Conclusion

In conclusion, our findings imply that routine testing for thyroid function is not warranted in OSA patients due to the low prevalence of newly diagnosed cases of clinical hypothyroidism. Subclinical hypothyroidism was prevalent in OSA patients, but whether or not doing anything about it would improve their health is unclear. Unless hypothyroidism is suspected on the basis of symptoms and physical signs, we do not advise routine thyroid function testing in OSA patients.

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References

1. Attal P, Chanson P. Endocrine aspects of obstructive sleep apnea. J Clin Endocrinol Metab 2010 Feb;95(2):483e95.
2. Grunstein RR, Sullivan CE. Sleep apnea and hypothyroidism: mechanisms and management. Am J Med. 1988 Dec;85(6):775e9.
3. Lin CC, Tsan KW, Chen PJ. The relationship between sleep apnea syndrome and hypothyroidism. Chest. 1992 Dec;102(6):1663e7.
4. Domm BM, Vassallo CL. Myxedema coma with respiratory failure. Am Rev Respir Dis. 1973 May;107(5):842e5.
5. Rajagopal KR, Abbrecht PH, Derderian SS, Pickett C, Hofeldt F, Tellis CJ, *et al*. Obstructive sleep apnea in hypothyroidism. Ann Intern Med. 1984 Oct;101(4):491e4.
6. Meslier N, Giraud P, Person C, Badatcheff A, Racineux JL. Prevalence of hypothyroidism in sleep apnoea syndrome. Eur J Med. 1992 Nov;1(7):437e8.
7. Pelttari L, Rauhala E, Polo O, Hyyppa MT, Kronholm E, Viikari J, *et al*. Upper airway obstruction in hypothyroidism. J Intern Med. 1994 Aug;236(2):177e81.
8. Winkelman JW, Goldman H, Piscatelli N, Lukas SE, Dorsey CM, Cunningham S. Are thyroid function tests necessary in patients with suspected sleep apnea? Sleep. 1996 Dec;19(10):790e3.
9. Resta O, Pannacciulli N, Di Gioia G, Stefano A, Barbaro MP, De Pergola G. High prevalence of previously unknown subclinical hypothyroidism in obese patients referred to a sleep clinic for sleep disordered breathing. Nutr Metab Cardiovasc Dis. 2004 Oct;14(5):248e53.
10. Grunstein R. Obstructive sleep apnea syndrome and hypothy- roidism. Chest. 1994 Apr;105(4):1296e7.
11. Kapur VK, Koepsell TD, deMaine J, Hert R, Sandblom RE, Psaty BM. Association of hypothyroidism and obstructive sleep apnea. Am J Respir Crit Care Med. 1998 Nov;158(5 Pt 1): 1379e83.
12. Miller CM, Husain AM. Should women with obstructive sleep apnea syndrome be screened for hypothyroidism? Sleep Breath. 2003 Dec;7(4):185e8.
13. Skjodt NM, Atkar R, Easton PA. Screening for hypothyroidism in sleep apnea. Am J Respir Crit Care Med. 1999 Aug;160(2):732e5.
14. Alotair H, Bahammam A. Gender differences in Saudi patients with obstructive sleep apnea. Sleep Breath. 2008 Nov;12(4): 323e9.
15. Pham CB, Shaughnessy AF. Should we treat subclinical hypo- thyroidism? BMJ. 2008;337:290e1.
16. Brix TH, Hansen PS, Kyvik KO, Hegedus L. Cigarette smoking and risk of clinically overt thyroid disease: a population-based twin case-control study. Arch Intern Med. 2000 Mar 13;160(5):661e6.
17. Sichieri R, Baima J, Marante T, de Vasconcellos MT, Moura AS, Vaisman M. Low prevalence of hypothyroidism among black and Mulatto people in a population-based study of Brazilian women. Clin Endocrinol (Oxf). 2007 Jun;66(6):803e7.
18. Hollowell JG, Staehling NW, Flanders WD, Hannon WH, Gunter EW, Spencer CA, *et al*. Serum TSH, T(4), and thyroid antibodies in the United states population (1988 to 1994): National Health and Nutrition examination Survey (NHANES III). J Clin Endocrinol Metab. 2002 Feb;87(2):489e99.
19. Young T, Evans L, Finn L, Palta M. Estimation of the clinically diagnosed proportion of sleep apnea syndrome in middle-aged men and women. Sleep. 1997 Sep;20(9):705e6.
20. Johns MW. Reliability and factor analysis of the Epworth Sleepiness Scale. Sleep. 1992 Aug;15(4):376e81.