



Research Article

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THE ASSOCIATION BETWEEN SLEEP AND QUALITY OF LIFE IN PATIENTS DIAGNOSED WITH SUBCLINICAL HYPOTHYROIDISM

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Abstract

Objectives: Thyroid disorders are frequently associated with sleep problems, and quality of life is adversely affected at the same time. The purpose of this study was to determine the effect of sleep problems on quality of life in patients with subclinical hypothyroidism (SH).

Materials and Methods: This descriptive, cross-sectional study was performed with patients presenting on an outpatient basis to two separate clinics in the internal diseases department of a training and research hospital between February and July 2021. The study population consisted of 103 patients. p values <0.05 were considered significant.

Results: The mean age of the participants was 44.46 ± 14.12 years, and the mean duration of disease was 7.01 ± 4.90 years. The participants' total Rolls Royce Quality of Life score mean was 104.99 ± 18.48 , and the mean PSQI total score was 7.11 ± 3.75 . A moderate negative correlation was observed between the participants' mean Pittsburg Sleep Quality Index and mean cognitive function, social relationships and quality of life scores. According to the linear regression analysis performed to examine the effect of sleep quality on quality of life, 10% of the change in the quality of life is explained by sleep quality.

Conclusion: In this study, the quality of life of the participants was below moderate, and it was determined that the impairment of sleep quality adversely affected the quality of life. Since sleep quality affects the quality of life in patients followed up with subclinical hypothyroidism, sleep assessment is recommended. In addition, it is recommended to take initiatives to increase sleep quality and to investigate different factors affecting the quality of life.

Keywords: Quality of life, sleep, subclinical hypothyroidism.

Introduction

Subclinical hypothyroidism (SH) is defined as the presence of high levels of thyroid-stimulating hormone (TSH) together with normal free triiodothyronine (fT3) and free thyroxine (fT4) levels in serum.¹ It is more frequently seen in women and with advancing age, with a prevalence of 18% being reported in community studies.² SH has been linked to increased cardiovascular diseases.^{3,4} It can also involve non-specific symptoms such as fatigue, depression, malaise and cognitive impairment.^{5,6}

Thyroid disorders are frequently associated with sleep problems⁷ and sleep quality. Sleep can affect hormone secretion, and endocrine function disturbance can also have an impact on sleep. There are two processes that link sleep and endocrine functions. These are the circadian rhythm and sleep/wakefulness status, both of which affect hormone secretions. Adrenocorticotrophic hormone and cortisol are hormones regulated by the circadian rhythm, and the release of growth hormone is essentially regulated by sleep/wakefulness status.^{8,9}

Sleep problems adversely impact the quality of life and health behaviors.¹⁰ The cause of the impairment of quality of life in patients with a thyroid disorder and the effect of treatment on quality of life are unclear. While some population studies have reported no difference in the quality of life between patients with SH and healthy individuals,^{11,12} another study determined impairment of quality of life in patients with SH compared to healthy individuals.¹³

Quality of life has become an important concept and objective in research and practice in the fields of health and medicine. Understanding quality of life is important to the amelioration of patients' symptoms and to improving care and rehabilitation. Problems with the self-reported quality of life can lead to changes and improvements in treatment and care, and some treatments may be of very little benefit. In addition, quality of life is also employed to determine the presence and effects of problems capable of affecting patients.¹⁴

The purpose of this study was to determine the effect of sleep problems on quality of life in patients followed-up due to SH.

Materials and Methods

Approval for the research was granted before commencement by the Kirklareli University ethical committee, Turkey. The confidentiality and anonymity of findings were preserved (According to the Helsinki Declaration). The research was planned as a descriptive, cross-sectional study.

Study design and sampling

The study was performed with patients presenting on an outpatient basis to two separate clinics of the internal diseases of a teaching and research hospital in Turkey between February and July 2021. The population of the study consisted of 92 patients diagnosed with SH who applied to the internal medicine outpatient clinic of a training and research hospital in the previous year (January-December 2020). Accordingly, it was calculated that the study sample should consist of 75 patients with 95% confidence and a 5% margin of error using the formula $n = Nt2pq/d2 (N-1) + t2pq$. The sample of the study consisted of 103 patients.

Inclusion criteria were no levothyroxine use, voluntary participation, age 18 or over, the ability to communicate and cooperate, and questions being answered fully and completely. fT3, fT4 and TSH values were measured in all patients, and those with normal fT3 and fT4 values and high TSH values were included in the study. Patients who have subclinical hyperthyroidism, using sleeping medications, antidepressants, or anxiolytics, were excluded.

Data Collection Tools

The study data were collected using a questionnaire for participants' descriptive characteristics developed by the authors, the Pittsburg Sleep Quality Index (PSQI), and the Rolls Royce Quality of Life Scale at face-to-face interviews, these being applied once for each patient. This process lasted approximately 15 min.

The form investigating participants' sociodemographic and clinical characteristics consisted of nine questions.

The PSQI was developed by Buysse et al. (1989) and adapted into Turkish by Agargun et al. (1996). This self-report scale evaluates sleep quality and sleep disturbances in the previous month. The scale consists of 24 items, five of which are answered by the individual's partner or roommate (if applicable). The 19 items scored on the scale generate seven components. Each component is evaluated between 0 and 3. The total possible scores of the seven components range between 1 and 21, and a total scale score is calculated. Higher scores indicate greater sleep quality impairment.

The Rolls Royce Quality of Life Scale has been used in numerous disease groups, such as chronic kidney failure, kidney transplantation, cardiological diseases, and cancer. The validity and reliability of the Turkish language version were confirmed by Ozyilan et al. (1995). The scale consists of 42 items and eight sub-dimensions. Higher scores indicate a greater quality of life.

Statistical Analysis

Data analysis was performed on SPSS 21.00 for Windows software. Descriptive statistics are expressed as mean (X) ± standard deviation (SD), number (n), and percentage (%). Correlation analysis was performed using Pearson's correlation test. Effects between scale scores were analyzed using the linear regression test. p values <0.05 were regarded as statistically significant.

Results

The distribution of participants' sociodemographic characteristics is shown in Table 1. Participants' mean age was 44.46±14.12 years, and the mean duration of disease was 7.01±4.90 years. In addition, 75.73% were men, 76.69% were married, 48.54% were elementary school graduates, 65.05% were not in employment, 56.31% had income equal to their outgoings, and 55.32% had no other chronic disease. The most common accompanying disease, with a prevalence of 42%, was hypertension.

Table 1. Participants' Sociodemographic Characteristic Distributions

| Characteristic | | X ± SD | Min-Max |
|------------------------|---------------------|-------------|----------|
| Age | | 44.46±14.12 | 19-73 |
| Time since diagnosis | | 7.01±4.90 | 1-30 |
| | | n | % |
| Gender | Female | 25 | 24.27 |
| | Male | 78 | 75.73 |
| Marital status | Married | 79 | 76.69 |
| | Single | 24 | 23.31 |
| Education | Elementary | 50 | 48.54 |
| | High school | 28 | 27.18 |
| | University | 25 | 24.28 |
| Employment status | Working | 36 | 34.95 |
| | Not working | 67 | 65.05 |
| Income | Less than outgoings | 45 | 43.69 |
| | Equal to outgoings | 58 | 56.31 |
| Other chronic diseases | Yes | 46 | 44.68 |
| | No | 57 | 55.32 |
| Chronic diseases* | Hypertension | 29 | 41.98 |
| | Diabetes Mellitus | 23 | 33.28 |
| | Asthma | 11 | 16.02 |
| | Heart diseases | 6 | 8.72 |

*n was folded

The distribution of participants' mean quality of life and sleep quality scores is shown in Table 2. It was found that participants' total Rolls Royce Quality of Life score mean was 104.99 ± 18.48 , and the mean PSQI total score was 7.11 ± 3.75 . The mean score of the participants' quality of life was below the moderate level, and sleep quality was at the moderate level.

Table 2. Participants' Mean Sleep Quality and Quality of Life Scale Scores

| Scale | | X ± SD | Min-Max |
|-----------------|----------------------------|--------------|---------|
| Quality of Life | General Well-Being | 19.83±4.59 | 9-33 |
| | Physical Symptom Activity | 24.13±4.66 | 12-36 |
| | Sleep Disturbances | 8.77±2.68 | 3-15 |
| | Appetite | 6.42±1.85 | 2-10 |
| | Sexual Dysfunction | 11.33±3.49 | 4-20 |
| | Cognitive Functions | 18.57±5.46 | 6-28 |
| | Medical Interactions | 11.98±2.79 | 6-19 |
| | Social Relationships | 23.19±4.81 | 11-37 |
| | Total Score | 104.99±18.48 | 52-159 |
| Sleep Quality | Subjective Sleep Quality | 1.37±0.78 | 0-3 |
| | Sleep Latency | 1.49±0.94 | 0-3 |
| | Duration Of Sleep | 0.87±1.09 | 0-3 |
| | Habitual Sleep Efficiency | 0.42±0.78 | 0-3 |
| | Sleep Disturbances | 1.58±0.68 | 0-3 |
| | Use Of Sleeping Medication | 0.27±0.67 | 0-3 |
| | Daytime Dysfunction | 1.09±0.96 | 0-3 |
| | Total PSQI | 7.11±3.75 | 0-17 |

Correlations between participants' mean total PSQI and quality of life scores are shown in Table 3. A low negative correlation was observed between mean total PSQI scores and mean physical symptom-activity, sleep disturbance and medical interactions. A moderate negative correlation was found between participants' mean total PSQI scores and mean cognitive function, social relationships scores and total quality of life scores. Mean physical symptom-activity, sleep disturbance, medical interactions, social relationships, cognitive function, and total quality of life scores decreased in line with participants' total PSQI scores.

Linear regression analysis was also performed (Table 4). The model constructed to examine that effect was significant ($p < 0.05$). The results showed that impairment of sleep quality adversely impacts the quality of life ($\beta = -0.316$, $p < 0.001$). Sleep quality explains 10% of the change in the quality of life.

Table 3. Correlation between Participants' Mean Quality of Life and Sleep Quality Scores*

| Scales Quality of Life | Total PSQI | |
|---------------------------|------------|--------------|
| | r | p |
| General Well-Being | 0.05 | 0.59 |
| Physical Symptom Activity | -0.19 | 0.047 |
| Sleep Disturbances | -0.25 | 0.009 |
| Appetite | -0.06 | 0.52 |
| Sexual Dysfunction | -0.18 | 0.06 |
| Cognitive Functions | -0.30 | 0.002 |
| Medical Interactions | -0.22 | 0.025 |
| Social Relationships | -0.34 | 0.026 |
| Total Score | -0.33 | 0.001 |

*Pearson correlation analysis

Table 4. The Effect of Sleep Quality on Quality of Life*

| Dependent Variable | Independent Variable | Unstandardized Coefficients | | Standardized Coefficients | t | p | R ² |
|--------------------|----------------------|-----------------------------|------------|---------------------------|--------|--------|----------------|
| | | B | Std. Error | Beta | | | |
| Quality of Life | Constant | 115.547 | 3.611 | | 31.995 | <0,001 | 0,10 |
| | Sleep Quality | -1.566 | 0.450 | -0.327 | -3.482 | 0,001 | |

* Linear regression analysis

Discussion

The findings of this study show that the sleep quality of the patients followed up for SH is at a moderate level, while the quality of life is below the moderate level. Impairment of sleep quality is adversely correlated with quality of life, the latter being adversely affected by impairment in the former. Sleep quality affects 10% of the quality of life.

Linlin et al. reported a significant association between poor sleep and SH in a study from China. Longer sleep latency, shorter duration of sleep, and greater sleep disturbance were observed in the SH group compared to the euthyroid group.¹⁵ In a previous study, Haruko Akatsu et al. reported higher PSQI scores in a group with SH compared to a euthyroid group, together with greater impairment of sleep quality. In addition, impairment of sleep quality increased in line with TSH levels in the euthyroid group.¹⁶ However, Benedetta Demartini et al. reported no significant difference in sleep disturbances between euthyroid individuals and those with SH.¹⁷

Quality of life is a highly important health objective, one that reflects the ultimate aim of all health interventions. At the same time, it is also measured as physical and social functioning and perceived well-being. Research into clinical and educational interventions emphasizes that patients' quality of life improves as a result of improving their health status and their perceptions of controlling their disease. In methodological terms, it is important to employ multidimensional evaluations of the quality of life and to include both general and disease-specific measures. Quality-of-life measures should be employed to manage and evaluate therapeutic interventions.

Suwalska observed an adverse impact of hyperthyroidism on quality of life. Depressive symptoms were detected in 40% of cases of hyperthyroidism, and a positive correlation was determined between anxiety and quality of life.¹⁸ Martin reported that thyroid hormone use was not associated with improvement in either general quality of life or thyroid-related symptoms in non-pregnant adults with SH and that these findings did not support the routine use of thyroid hormone therapy in adults with SH.¹⁹ In the same way, Parle et al. found no evidence that T4 replacement therapy improved cognitive functions in patients with SH.²⁰

The majority of cross-sectional studies have determined mild functional learning impairment and recall problems in young subjects with hypothyroidism.²¹ In addition, a community-based study reported an association between Alzheimer's disease and SH.²² Quijano et al. performed a survey study involving 15 individuals with SH and 15 with clinically mild hypothyroidism. The clinically mild hypothyroidism cases exhibited poorer cognitive status during recording compared to the SH group, while normal cognitive status was determined in both groups after treatment.²¹

Various other studies have observed an improvement in memory performance, frontal executive functions, and some aspects of cognitive performance in individuals diagnosed with SH following levothyroxine therapy.²³

A prospective community-based study involving participants aged between 85 and 89 showed that initially increasing TSH levels were associated with significant slowing in daily living activities.²⁴ One study using data from the Korean Study on Health and Aging involving Korean individuals aged over 65 reported an association between cognitive impairment, depression, or poor quality of life in elderly individuals with SH.²⁵

The findings of this study show that the total sleep quality score mean of the participants was moderate, and the quality of life decreased in parallel with the deterioration in sleep quality. In terms of the quality of life subdimensions, physical symptoms-activity, medical interactions, social relationships, and cognitive functions, in particular, were affected by sleep quality. Since sleep quality affects the quality of life in patients followed up with subclinical hypothyroidism, sleep assessment is recommended. In addition, it is recommended to take initiatives to increase sleep quality and to investigate different factors affecting the quality of life.

Limitations

The principal limitations of this study are its single-center nature and the fact that it involved only a single diagnosis.

Ethical Considerations: Approval for the research was granted before commencement by the Kırklareli University ethical committee, Turkey (no. E-69456409-199-1835 dated January 2021). Institutional permission was granted by the center where the research was conducted and written, and verbal informed consent was obtained from individuals agreeing to take part. Written permission for the use of the scales employed was also obtained beforehand.

Conflict of Interest: The authors declare no conflict of interest. No funding was obtained for this study.

References

1. Peeters RP, Solomon CG. Subclinical hypothyroidism. *N Engl J Med*. 2017;376(26):2556-65. (doi:10.1056/NEJMcp1611144).
2. Biondi B, Cappola AR, Cooper DS. Subclinical hypothyroidism: a review. *JAMA*. 2019;322(2):153-60. (doi:10.1001/jama.2019.9052).
3. Nicolas R, Wendy PJ, Douglas CB, et al. Subclinical hypothyroidism and the risk of coronary heart disease and mortality. *JAMA*. 2010;304(12):1365-74. (doi:10.1001/jama.2010.1361).
4. Weiss IA, Bloomgarden N, Frishman WH. Subclinical hypothyroidism and cardiovascular risk: recommendations for treatment. *Cardiol Rev*. 2011;19(6):291-99. (doi:10.1097/CRD.0b013e318227df87).
5. Salman R, Lorna I, Gill K, Crispian O, Carolyn MM, Weaver JU. The beneficial effect of L-thyroxine on cardiovascular risk factors, endothelial function, and quality of life in subclinical hypothyroidism: randomized, crossover trial. *J Clin Endocrinol Metab*. 2007;92(5):1715-23. (doi:10.1210/jc.2006-1869).
6. Giuseppe P, Gennaro P, Giuseppe R, Nicola F, Fabio M. Subclinical hypothyroidism and cognitive impairment: systematic review and meta-analysis. *J Clin Endocrinol Metab*. 2015;100(11):4240-48. (doi:10.1210/jc.2015-2046).
7. Bahammam SA, Sharif MM, Jammah AA, Bahammam AS. Prevalence of thyroid disease in patients with obstructive sleep apnea. *Respir Med*. 2011;105(11):1755-60. (doi:10.1016/j.rmed.2011.07.007).
8. José Carlos P, Andersen, ML. The role of thyroid hormone in sleep deprivation. *Med Hypotheses*. 2014;82(3):350-55. (doi:10.1016/j.mehy.2014.01.003).
9. Kim W, Lee J, Ha J, et al. Association between sleep duration and subclinical thyroid dysfunction based on nationally representative data. *Journal of clinical medicine*. 2019;8(11):2010. (doi: 10.3390/jcm8112010).
10. Irwin MR. Why sleep is important for health: a psychoneuroimmunology perspective. *Annu Rev Psychol*. 2015;66(1):143. (doi:10.1146/annurev-psych-010213-115205).
11. Bianchi GP, Zaccheroni V, Solaroli E, et al. Health-related quality of life in patients with thyroid disorders. *Qual Life Res*. 2004;13(1):45-54. (doi: 10.1023/B:QURE.0000015315.35184.66).
12. Bell RJ, Rivera-Woll L, Davison SL, Topliss DJ, Donath S, Davis SR. Well-being, health-related quality of life and cardiovascular disease risk profile in women with subclinical thyroid disease-a community-based study. *Clin Endocrinol (Oxf)*. 2007;66(4):548-56. (doi: 10.1111/j.1365-2265.2007.02771.x).
13. Gulseren S, Gulseren L, Hekimsoy Z, Certinary P, Ozen C, Tokatlioglu B. Depression, anxiety, health-related quality of life, and disability in patients with overt and subclinical thyroid function. *Arch Med Res*. 2006;37(1):133-9. (doi: 10.1016/j.arcmed.2005.05.008).

14. Haraldstad K, Wahl A, Andenæs R, et al. A systematic review of quality of life research in medicine and health sciences. *Quality of life Research*, 2019;28(10), 2641-50. (doi: 10.1007/s11136-019-02214-9).
15. Linlin S, Jianyong L, Ke J, et al. The Association Between Subclinical Hypothyroidism and Sleep Quality: A Population-Based Study. *Risk Manag Healthc Policy*. 2019; 12: 369-74. (doi: 10.2147/RMHP.S234552).
16. Akatsu H, Ewing SK, Stefanick, et al. Association between thyroid function and objective and subjective sleep quality in older men: the osteoporotic fractures in men (MrOS) study. *Endocr Pract* 2014;20(6):576-86. (doi:10.4158/EP13282.OR).
17. Demartini B, Ranieri R, Masu A, Selle V, Scarone S, Gambini O. Depressive symptoms and major depressive disorder in patients affected by subclinical hypothyroidism: a cross-sectional study. *J Nerv Ment Dis*. 2014;202(8):603-7. (doi:10.1097/NMD.000000000000168).
18. Suwalska A, Lacka K, Lojko D, Rybakowski JK. Quality of life, depressive symptoms and anxiety in hyperthyroid patients. *Rocz Akad Med Bialymst*. 2005;50 Suppl 1:61-3.
19. Martin F, Marieke S, Ellisavet M, et al. Association of Thyroid Hormone Therapy with Quality of Life and Thyroid-Related Symptoms in Patients with Subclinical Hypothyroidism: A Systematic Review and Meta-analysis. *JAMA*. 2018 Oct 2;320(13):1349-59. (doi: 10.1001/jama.2018.13770).
20. Parle J, Roberts L, Wilson S, et al. A randomized controlled trial of the effect of thyroxine replacement on cognitive function in community-living elderly subjects with subclinical hypothyroidism: the Birmingham Elderly Thyroid study. *J Clin Endocrinol Metab* 2010;95:3623-32. (doi: 10.1210/jc.2009-2571).
21. delSerQuijano T, Delgado C, Martínez Espinosa S, Vázquez C. Cognitive deficiency in mild hypothyroidism. *Neurologia*. 2000;15(5):193-8.
22. Tan ZS, Beiser A, Vasan, et al. Thyroid function and the risk of Alzheimer Disease. *Arch Intern Med*. 2008;168:1514-20. (doi: 10.1001/archinte.168.14.1514).
23. Baldini M, Colasanti A, Orsatti A, Airaghi L, Mauri MC, Cappellini MD. Neuropsychological functions and metabolic aspects in subclinical hypothyroidism: the effects of L-thyroxin. *Prog Neuropsychopharmacol Biol Psychiatry*. 2009;33:854-59. (doi: 10.1016/j.pnpbp.2009.04.009).
24. Gussekloo J, van Exel E, de Craen AJ, Meinders AE, Frolich M, Westendorp RG. Thyroid status, disability and cognitive function, and survival in old age. *JAMA*. 2004;292:2591-9. (doi: 10.1001/jama.292.21.2591).
25. Park YJ, Lee EJ, Lee Y, et al. Subclinical hypothyroidism (SCH) is not associated with metabolic derangement, cognitive impairment, depression or poor quality of life (QoL) in elderly subjects. *Arch Gerontol Geriatr*. 2010;50:e68. (doi: 10.1016/j.archger.2009.05.015).