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Factors Affect the Quality of Sleep in Elderly People with Metabolic Syndrome

Bülent Yaprak[1], Nurgül Arslan[2], Hacer Alataş[3]

[1]Malatya Training and Research Hospital, Clinic of Internal Medicine, Malatya, Turkey
[2]Dicle University, Atatürk Faculty of Health Sciences, Department of Nutrition and Dietetic, Diyarbakır, Turkey
[3]Malatya Training and Research Hospital, Clinic of Nutrition and Dietetics, Malatya, Turkey

Abstract

Aim: As more studies are conducted on the effects of metabolic syndrome (MetS) on the elderly, it becomes clear that these individuals suffer from worse sleep. In this study, we examined the factors affecting sleep quality in the elderly diagnosed with MetS.

Materials and Methods: The study was conducted in the Internal Medicine Clinic of Malatya Training and Research Hospital. Elderly people over the age of 65 years, willing to cooperate, able to communicate, and scored 23 and above on the Standard Mini Mental Test were recruited. The individuals included in the study were individuals who met the criteria for MetS. A comprehensive geriatric evaluation form was applied to elderly individuals.

Results: The study's 378 participants had mean age of 72.05±6.56 years. People over the age of 60 who had high values for both their body mass index (BMI) and their waist-hip ratio also had high Pittsburgh Sleep Quality Index scores ($p<0.05$). The factors affecting sleep quality were examined by regression analysis. As a result of, having a BMI of 30 or higher [odds ratio (OR): 2.831, confidence interval (CI): 0.081-2.525], being 75 or older (OR: 2.021, CI: 0.081-2.525), being totally or partially dependent on others for the performance of daily activities (OR: 5.024, CI: 2.408-5.165), and using multiple drugs (OR: 2.831, 0.734-2.901), an increased likelihood of falling (OR: 4.871, CI: 1.056-6.146), an increased likelihood of depression (OR: 3.850, CI: 1.355-3.973) increases sleep quality index scores.

Conclusion: The elderly individuals who already have MetS are more likely to have poor sleep quality due to the accumulation of many detrimental factors that arise as a direct result of MetS.

Keywords: Elderly, metabolc syndrome, sleep quality index

Introduction

Sleep is one of the most crucial elements in maintaining good health. Similar to how there is a reversible state of unconsciousness, there is also an active state of regeneration that enables the body to get ready for new life while also allowing the body to rest (1). Sleep is a fundamental human need that supports not only productivity but also physical and psychological well-being as well as cognitive abilities like memory and concentration. The positive effects of sleep disorders and irregularities negatively impact people's ability to focus, memory loss, experience anxiety, depression, and psychosis, as well as their sensitivity to pain, irritability, appetite loss, and constipation (2,3). According to some studies, there is a direct correlation between a rise in HbA1c and a decline in sleep quality (4,5). In society, chronic sleep loss and the issues it causes are very prevalent. Long-term sleep loss and a decline in sleep quality have an impact on disease and death rates. Numerous studies have demonstrated that they reduce insulin sensitivity and glucose tolerance. Researchers have discovered that sleeping for fewer than six hours a night increases the risk of developing the metabolic syndrome (MetS) (6,7). Poor sleep quality is a significant contributor to the development of obesity and has been linked to studies of the MetS, sleep apnea, and obesity in men more frequently than in women (8,9). The last ten years have seen an increase in sleep-related issues and sleep disorders, and at the same time, global epidemic levels of MetS

Corresponding Author: Nurgül Arslan PhD, Dicle University, Atatürk Faculty of Health Sciences, Department of Nutrition and Dietetic, Diyarbakır, Turkey
Phone: +90 507 509 48 28 **E-mail:** nuracar_1986@hotmail.com **ORCID ID:** orcid.org/0000-0002-7618-0859

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and obesity have been reached. According to the most recent epidemiological study, 50-70 million Americans have chronic sleep disorders such as insufficient sleep, insomnia, and sleep apnea (8). Understanding the role of risk factors in metabolic diseases, such as MetS, is crucial for halting disease onset and progression. This study sought to determine how well patients with MetS slept across three provinces.

Materials and Methods

Design, Sampling, and Ethical Issues

To identify the variables influencing sleep in patients with MetS and to ascertain how and where they affect sleep issues associated with MetS, the research was designed as a descriptive study.

Due to the G-power analysis showing that the "critical χ^2" value for this study was 22.07 with a margin of error of 0.05, 90% power, and an effect size of 0.3, it was decided that 350 participants were needed for the study. After accounting for dropouts, the final sample size was 378 participants.

The study was conducted on 378 patients with MetS being treated at the Internal Medicine Clinic of Malatya Training and Research Hospital who met the inclusion criteria and provided voluntary oral and written consent between October and November 2022.

The study was conducted according to the criteria of the Declaration of Helsinki and approved by the Malatya Turgut Özal University Local Ethics Committee. All the study participants provided their informed consent.

Data Collection

A sociodemographic form with 33 questions on sociodemographic characteristics and sleep problems was applied to the m MetS patients, along with the Pittsburgh Sleep Quality Index (PSQI), developed in 1989 by Buysse et al. (5) and tested for validity and reliability in Turkey by Ağargün et al. (6) in 1996.

PSQI

The questionnaire's objectives are to evaluate sleep quality and determine who has and does not have sleep problems. Subjective sleep quality, sleep latency (SL), sleep duration, habitual sleep efficiency (HSE), sleep disorders, use of sleeping pills, and daytime dysfunction are the seven subscales that make up this scale. Answers are graded on a scale of 0 to 3 with a maximum score of 21. If you receive a six or higher, you are not getting enough sleep.

To assess the quality of sleep in psychiatry and clinical research, Buysse et al. (5) created the PSQI in 1989. The PSQI's clinical follow-up process of 18 months, other sleep quality scales found in the literature, and clinical observations of patients with sleep disorders were all used to create the items in the questionnaire. On PSQI, a global score of more than 5 denotes poor sleep quality. Ağargün et al. (6) evaluated the validity and reliability of the scale in Turkey, and they discovered that it had a Cronbach's alpha reliability coefficient of 0.804.

Anthropometric Measurements, Body Mass Index, and Blood Pressure

Anthropometric measurements were measured by well-trained examiners while subjects wore only their underwear and no shoes. Weight and height were measured to the nearest 0.1 kg and 1 cm while the participant stood, respectively, using a strain gauge scale and a stadiometer (Seca 769, Hamburg, Germany). The following formula was used to calculate body mass index (BMI): weight in kilograms divided by height in square meters (m). The waist and hip circumferences were measured to the nearest 0.1 cm with a flexible metric measuring tape while the subject was standing upright. The circumference of the waist was measured around the abdomen at the umbilicus. Hip circumference was measured in a horizontal plane at the buttocks' maximum posterior extension. Waist/hip ratio (WHR) was determined by dividing waist circumference by hip circumference, and waist/height ratio was determined by dividing waist circumference by height (cm).

Each participant, including blood pressure, was collected. After a 5-min rest, systolic and diastolic blood pressures was measured twice with validated and calibrated electronic sphygmomanometers.

Diagnostic Criteria for Metabolic Syndrome

A modified NCEP MetS-according to ATP III, was defined as the presence of three or more of the following conditions: (1) hypertension: systolic blood pressure ≥130 mm High or diastolic blood pressure ≥85 mm High or use of antihypertensive agents; (2) hyperglycemia: fasting blood glucose level ≥100 mg/dL; (3) low serum HDL-C for men ≤40 mg/dL for women and ≤50 mg/dL; (4) hypertriglyceridemia: triglycerides levels ≥150 mg/dL; and (5) abdominal obesity: men BC ≥90 cm for women and ≥80 cm (6).

Daily Living Activities (IADL)

In 1969, Lawton and Brody (10,11) created the IADL index to assess people's instrumental daily living activities. The IADL index consists of eight questions about phone use, cooking, shopping, doing daily housework, washing clothes, driving, drug use, and money management. The IADL index assigns a score of 0 to dependent relationships, 9 to semi-dependent relationships, and 17 to independent relationships. These evaluations of

people's daily lives and instrumental activities are widely used both internationally and in our country.

Yesavage Geriatric Depression Scale

Validity and reliability research was conducted after it was created by Yesavage et al. (12). It is a self-reporting questionnaire with 30 simple questions designed for the elderly. The cutoff point for making a depression diagnosis was set at 13. Factors such as mood swings, emotional volatility, irritability, social withdrawal, intrusive thoughts, and pessimistic assessments of the past, present, and future are measured. Avoiding questions about somatic symptoms such as sleep problems, sexual dysfunction, and aches and pains in the body, which are common in the elderly due to physical diseases, and providing only "yes" or "no" answers simplifies the scale and makes it more manageable for those with limited health literacy. Each affirmative response earns one point, while each negative response earns no points. The severity of a person's depression is proportional to how high they score on this scale.

The Timed Get-up-and-Go

The functional abilities of the elderly were measured using the Timed Get-up-and-Go test. Podsiadlo and Richardson (13,14) devised test monitors the tempo of the elderly in three different motions: standing, walking, and turning. The elderly were given the order to stand up from their seats, walk three meters in a straight line, make a right or left turn, and return to their original chairs. A timer recorded how many seconds had passed between when the person got up and sat back down. During the time of examination, the use of canes, crutches, and other similar devices was forbidden. The exam is taken twice with the top score kept. The time taken to complete the walk was significantly longer than normal, indicating that the person's walking ability was impaired.

Statistical Analysis

Statistical Package for the Social Sciences 22.0 was used for data analysis. Using the collected data, a descriptive study was created in which the quantitative variables were expressed as mean±standard deviation and the qualitative variables as an absolute value with confidence intervals (CIs). To compare measurements, Student's t-test and the Mann-Whitney U test were used. The Spearman r-value was used to calculate the quantitative variable correlation, while two statistics were used to calculate the qualitative variable correlation. Multiple logistic regression analysis was used to determine which variables influenced a dichotomic dependent variable, with the dichotomic variable serving as the dependent variable and the other variables included in the model serving as covariables.

Results

The study included 378 people with a mean age of 72.05±6.56 years old. Table 1 shows the distribution of the elderly's PSQI mean scores based on their characteristics. PSQI mean scores increased as individuals' ages increased, according to the age groups of the elderly. The average PSQI score of women was higher than that of men ($p<0.05$). Individuals with a primary school education or higher, married people, and people who live with their children had lower PSQI scores than the other groups ($p<0.05$). Individuals' PSQI scores have risen when they smoke. PSQI scores of the elderly with high BMI and WHR values were also found to be high ($p<0.05$). The elderly with malnutrition and people who used 10 or more drugs per day had a higher PSQI score.

Table 2 shows the correlation analysis between elderly PSQI scores and BMI, daily drug use, daily life activity scale score, elderly depression scale score, and Timed Get-up-and-Go test. PSQI was found to have a positive correlation with BMI, number of drugs taken daily, Yesavage Geriatric Depression Scale, and Timed Get-up-and-Go, but a negative correlation with IADL.

The PSQI score was used as a dependent variable in a linear regression analysis of all independent variables showing statistically significant differences. Therefore, having a BMI of 30 or higher [odds ratio (OR): 2.831, CI: 0.081-2.525], being 75 or older (OR: 2.021, CI: 0.081-2.525), being totally or partially dependent on others for the performance of daily activities (OR: 5.024, CI: 2.408-5.165), and using multiple drugs (OR: 2.831, 0.734-2.901), an increased likelihood of falling (OR: 4.871, CI: 1.056-6.146), an increased likelihood of depression (OR: 3.850, CI: 1.355-3.973). One of the factors found to improve people's sleep quality index scores was having an albumin concentration of less than 4 mg/dL (OR: 2.107, CI: 0.235-3.538) (Table 3).

Discussion

Sleep is an essential part of our bodies and lives (15). The elderly population has a higher prevalence of sleep disorders, which can have negative effects on both their physical and mental health. Recommendations for treating sleep disorders in the elderly can't be made until the underlying causes are identified (16).

According to the research conducted by Chaput et al. (17), those who get less than six hours of sleep per night are more likely to develop MetS, while those who get nine hours or more of sleep per night do not face an increased risk of developing MetS. For example, Kobayashi et al. (18) MetS was found to be more prevalent in people who slept less than 6 hours per night, according to his study. Najafian et al. (19) While shorter sleep

Table 1. The distribution of the elderly according to their characteristics PSQI score means					
Variables	**n (378)**	**%**	**X±SD**	**Test value**	**p**
The age group (y)					
65-69	41	10.85	4,76±3.15	10.321	**0.001**
70-74	67	17.72	5.47±2.81		
75-79	78	20.63	5.74±3.11		
80-84	89	23.54	7.06±3.28		
85+	103	27.25	8.23±2.69		
Sex					
Female	221	58.47	6.21±3.18	11.650	**0.001**
Male	157	41.53	5.33±3.11		
Educational status					
Illiterate/barely literate	294	77.88	6.23±3.25	28.331	0.001
Elementary school and above	84	22.22	5.96±3.67		
Marital status					
Married	88	23.26	4.18±3.41	15.896	**0.001**
Widowed/divorced	290	76.74	6.25±3.44		
Cohabitation					
Spouse	73	19.31	5.07±2.71	13.525	**0.001**
Living alone	112	29.63	6.37±3.21		
Families of their children	105	27.78	4.21±2.13		
Nursing home	88	23.28	4.56±2.21		
Smoking status					
Not smoking or quitting/smoking	306/72	80.95/19.05	4.57±2.28-7.96±3.76	2.224	0.348
Regular physical activity status					
yes/nor or not regularly	201/177	53.17/46.82	3.21±1.08-5.06±2.56	3.981	0.023
BMI (kg/cm^2)				18.901	0.029
20-25 normal	36	9.52	4.34±2.19		
25-30 pre-obesity	112	29.63	5.26±2.89		
30-35 I. obesity	87	23.02	7.37±4.08		
35-40 II. obesity	65	17.20	7.57±2.91		
40 and upper III. obesity	41	10.85	8.67±4.18		
Waist/hip ratio			p=0.004		
Female					
0.85 and under	56	25,34	5.33±2.91		
Upper >0.85	165	74,66	7.61±3.69		
Male					
0.90 and under	44	28,03	5.91±2.63		
Upper >0.90	113	71,97	7.28±2.88		
MNA-SF					
12-14 good feeding	189	50.00	6.21±2.91	2.990	0.043
8-11 under the risk of malnutrition	145	38.36	4.21±1.72		
0-7 malnutrition	44	11.64	7.21±3.74		
Daily regular drug use					
Daily 3 drugs and under	21	5.56	5.88±2.96	16.389	0.011
Daily 4-6 drug	223	58.99	5.06±2.28		
Daily 7-9 drug	101	26.72	4.45±1.74		
Daily 10 and upper drug	33	8.73	6.21±3.65		

MNA-sf: Mini nutritional assessment-short form, SD: Standard deviation, PSQI: Pittsburgh Sleep Quality Index, BMI: Body mass index

Table 2. Correlations between PSQI score and BMI, daily drug use, daily life activity scale score, elderly depression scale score, and Timed Get-up-and-Go test score

	PSQI	BMI	The number of drugs used regularly per day	IADL	YGDS	TGUG
PSQI	1.00	0.455**	0.244*	-0.446**	0.429**	0.275*
BMI		1	0.351**	-0.267**	0.079	0.645**
The number of drugs used regularly per day			1	-0.282**	0.247*	0.424**
IADL				1	-0.249*	-0.524**
YGDS					1	0.353**
TGUG						1

Spearman correlation, *p<0.05,**p<0.005.
PSQI: Pittsburgh Sleep Quality Index, BMI: Body mass index, IADL: Instrumental activities of daily living, YGDS: Yesavage geriatric depression scale, TGUG: Timed Get-up-and-Go

Table 3. Results of linear regression analysis involving the factors affecting the PSQI

Independent variables		B	SE	Wald	Odds ratio	95% CI	p
Age (y)	Advanced old age	0.274	0.125	0.113	**2.021**	0.081-2.525	0.007
	Under 75				Reference		
IADL	Dependent or semi-dependent	1.674	0.309	0.454	**5.024**	2.408-5.165	0.001
	Independent				Reference		
The number of drugs used regularly per day	5 and under	1.283	0.533	0.306	**2.831**	0.734-2.901	0.003
	Upper >5				Reference		
YGDS	Yes	2.014	0.401	0.249	**3.850**	1.355-3.973	0.004
	No				Reference		
TGUG	20 seconds and upper	1.068	0.319	0.192	**4.871**	1.056-6.146	0.001
	<20 seconds				Reference		
Albumin (mg/dL)	4 mg/dL and under	0.784	0.365	0.081	**2.107**	0.235-3.538	0.022
	>4 mg/dL				Reference		

PSQI: Pittsburgh Sleep Quality Index, IADL: Instrumental activities of daily living, YGDS: Yesavage Geriatric Depression Scale, TGUG: Timed Get-up-and-Go, CI: Confidence interval

duration has been linked to an increased risk of developing MetS, longer sleep duration has been linked to a decreased risk. It has been shown that both insufficient and excessive sleep duration contribute to the development of MetS (19-21). MetS becomes more prevalent in older people, and so do sleep disorders.

Gender differences may also be present in a variety of other sleep-related factors, such as quality, duration, latency, and efficiency. Despite the fact that women have been shown in some studies to report more sleep-related complaints than men, despite having better sleep quality, shorter sleep duration, and longer SL (22). Some research has found no significant differences between the sexes when it comes to sleep, while other research has found that women report poorer sleep quality (23). The majority of this study's participants were women, and across all age ranges, participants scored higher on the PSQI on average the longer they had lived. The decline in sleep quality that comes with getting older is a major issue in and of itself (24). Being 75 or older was found to significantly increase the risk of developing a sleep disorder in this investigation.

People's standard of living improves along with their level of education. Health literacy improves with education, leading to greater personal accountability for health and better disease and symptom management (25). It is well established that married and cohabiting individuals report higher levels of social support and happiness (26). The majority of the study's participants could not read or write. Most patients are either single or have been divorced and are now living independently or in a care facility. It is hypothesized that this circumstance worsens patients' quality of life and raises their levels of depression and anxiety. Patients' poor quality of sleep was linked to their low quality of life and the presence of depression.

It has been shown through cohort studies that compared to non-smokers, smokers experience a greater number of insomnia-like

symptoms and poorer quality of sleep overall. Cigarette smoking has been linked to insomnia and other sleep disturbances in both sexes (27,28). Among the participants in this analysis, 80.95% had never smoked before.

It's common knowledge that the elderly have a higher drug consumption rate due to the prevalence of chronic diseases. Overall sleep quality and sleep-related components like subjective quality, sleep delay, sleep duration, external disturbances, and sleeping pill consumption significantly decline with increasing polysubstance use (13). The results of this study showed that 58.9% of patients were taking four or more medications on a daily basis. Multiple drug use was associated positively with lower PSQI scores, suggesting that it is a significant contributor to poor sleep.

The degree to which an elderly person is mobile is a significant indicator of their quality of life. Because of his limited mobility, the person becomes more reliant on others and has difficulty engaging in regular activities or retaining his sense of self (29). As we age, we walk slower and our strides become shorter (30). Insomnia in the elderly can lead to instability and an increased chance of falling (31). Results from the Timed Get-up-and-Go test, risk of falling, and sleep disorder score were positively correlated with levels of independence in ADL performance.

There is evidence that shows how being overweight makes the elderly more likely to experience a sleep disorder (32,33). Short sleep duration was associated with higher BMI and waist circumference in middle-income individuals in a study examining the association of sleep duration and quality with the risk of obesity in people over the age of 50 (34). According to Jennings et al. (35) increases in PSQI score were associated with elevations in BMI. Most of the participants in this study were classified as being of advanced age, and the results showed that there was a significant positive correlation between body mass index and PSQI score, indicating better overall sleep.

Moderate to severe insomnia has been linked to an increased risk of malnutrition (36). Sleep disorders have been linked to an increased risk of malnutrition in a number of studies that have evaluated the association between nutritional status and its correlates (37,38). However, another study found that regardless of age or gender, poor sleep quality was strongly linked to an increased risk of malnutrition (39). Similarly to other research, this one found that half of the elderly population was either malnourished or at risk for malnutrition. Having a low albumin value, an indicator of malnutrition, has also been shown to significantly raise the sleep quality index score.

Study Limitations

In this study, we look into a pressing problem in public health. In our study, we employed tried-and-true techniques and evaluation criteria that have been proven effective in numerous other studies both internationally and in Turkey. One researcher oversaw the entirety of our study to ensure consistency and reliability.

Our study is limited in its applicability to the general elderly population due to the fact that it was conducted on patients at a tertiary care hospital. Our study's limited generalizability can also be attributed to its participants' lack of formal education. Because ours is a cross-sectional, in-person survey, there is always the chance of researcher bias.

Conclusion

In order to increase the quality of sleep in the elderly and to have a quality aging process, it is necessary to take measures to improve these factors.

Ethics

Ethics Committee Approval: The study was conducted with the approval of Malatya Turgut Özal University Ethics Commission dated 17/11/2022 number 362. The study were carried out in accordance with the Helsinki Declaration 2013.

Informed Consent: Written informed consent was obtained from all individuals participating in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: B.Y., H.A., Concept: B.Y., H.A., Design: B.Y., N.A., H.A., Data Collection or Processing: N.A., Analysis or Interpretation: B.Y., H.A., Literature Search: H.A., Writing: B.Y., H.A.

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