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Relationship Between Coronaphobia, Cognitive Functions, Sleep Quality, and Diet Quality in Older Adults During COVID-19

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Abstract

Objective: The relationship between the quality of diet and sleep, cognitive function, and fear related to coronavirus disease-2019 (COVID-19) among older adults in Turkey during the pandemic remains unclear. This study aimed to investigate the correlation between diet quality, cognitive function, sleep quality, and levels of coronaphobia in individuals aged 65 and above, to understand the impact of COVID-19.

Materials and Methods: Sleep quality, diet quality, coronaphobia, and cognitive status of 72 older individuals were evaluated using the Pittsburgh sleep quality index, healthy eating index 2010, Montreal cognitive assessment scale, and coronavirus-19 phobia scale, respectively.

Results: The participants had poor diet quality (54.2%), poor sleep quality (62.5%), obesity (41.7%), higher levels of coronaphobia, and cognitive impairment. There was a moderate negative relationship between sleep quality and coronaphobia and between cognitive status and coronaphobia ($p \leq 0.00$); and a weak positive relationship between diet quality and cognitive status ($p < 0.05$). However, no relationship was found between sleep quality and diet quality, and between coronaphobia and diet quality ($p > 0.05$).

Conclusion: Our study highlights the significant challenges faced by older adults during the COVID-19 pandemic, including poor nutrition quality, sleep disturbances, coronaphobia, and cognitive impairment. Our findings suggest a potential interplay between nutrition quality, sleep patterns, and cognitive function among older adults, with those experiencing coronaphobia exhibiting additional cognitive and sleep-related concerns. We advocate the implementation of targeted interventions aimed at mitigating cognitive impairment, addressing nutritional deficiencies, and improving sleep quality among older adults, irrespective of COVID-19 infection status, to enhance overall well-being during these challenging times.

Keywords: Aging, cognitive, COVID-19, diet, phobia, sleep

Introduction

Coronavirus disease-2019 (COVID-19), a global pandemic, affected over 774 million people worldwide as of February 2024. In Turkey by March 2023, it had infected more than 17 million people and caused over 100,000 deaths (1). In addition to its physical effects, COVID-19, with measures like lockdowns, mandatory mask usage, and social isolation, has also led to poor sleep quality, depression, anxiety, cognitive decline, malnutrition, and mental health problems due to the fear it creates (2-5).

Although pandemic conditions may not persist, the ongoing cases of COVID-19 and the lasting impact of isolation, restrictions, and mental health issues during the pandemic continue to affect individuals. Coronaphobia, characterized by excessive fear of being infected with COVID-19, contributes to poor sleep, malnutrition, cognitive issues, and higher body mass index (BMI) (2,6-10). In addition, media-induced stress during the COVID-19 pandemic affected the cognitive function of individuals (11,12).

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In Turkey, the highest COVID-19 death rate, reaching 26.94%, was observed in individuals over the age of 80. Lockdowns targeting individuals aged 65 and above were implemented between February and March 2021 due to the heightened risk of death among older adults (13). Although these restrictions reduced mortality rates, they led to the loss of social support and decreased physical activity, which are crucial for older adults, resulting in increased risks of non-communicable diseases, depression, and diminished quality of life (14).

After the initial wave of COVID-19, older adults in nursing homes who did not contract the virus experienced declines in functional, cognitive, and nutritional status (15). Older individuals isolated at home because of COVID-19 restrictions experience sleep problems, including decreased night sleep duration, late falling asleep, and waking up in the middle of sleep (7). Strategies for coping with negative emotions, such as emotional eating behavior during the pandemic, have resulted in either consuming more food than usual or, conversely, reducing food intake (5). Reduced sleep quality and poor nutrition habits have been reported to be associated with sarcopenia, cardiovascular diseases, obesity, dementia, Alzheimer's disease, and cognitive impairment, which are frequently encountered in older adults, leading to increased morbidity and mortality (16-20). In addition, the recognition that COVID-19 has led to more severe outcomes in older adults has generated serious fear among older adults (21).

Mediterranean-type dietary patterns, regular sleep, and stress reduction play crucial roles in preventing cardiovascular diseases, cognitive disorders, and sarcopenia in older adults. Therefore, monitoring patients' nutritional status, cognitive skills, and sleep quality is essential for implementing preventive measures (22). According to 2023 data from the Turkish Statistical Institute, individuals over the age of 65 constitute 10.2% of Turkish society, with every 100 people of working age caring for 15 older adults (23). However, the relationship between diet quality, sleep quality, cognitive status, and coronaphobia among older adults living in Turkey during the pandemic remains unclear. Given these factors, our study aimed to determine the relationship between diet quality, cognitive function, sleep quality, and coronaphobia levels in individuals over the age of 65 years, comprehensively addressing the effects of COVID-19 in this population.

Materials and Methods

Study Sample

This study was conducted in İstanbul from February 2021 to March 2021. Individuals aged 65 years and older, who tested negative for COVID-19, had no previous history of COVID-19, had no psychological disorders, and voluntarily agreed to participate were included in the study. The snowball sampling method was used to reach the participants. The sample size was determined using the Raosoft Sample Size Calculator software. The ratio of the Turkish population over the age of 65 (population number 7,550,727 million) to the total population (80 million) of Turkey was calculated to be 9%, and it was determined that the sample size of the study to achieve a 95% confidence interval and 80% power should be 54. Taking the 10% drop-out rate into consideration, we aimed to reach a minimum of 60 participants at the beginning of the study; ultimately, we had 72 participants who completed the study, with one person excluded due to a lack of data. This study was approved by Bahçeşehir University Scientific Research and Publication Ethics Committee (decision number: 2021/02/52, date: 10.02.2021). Patients were provided with comprehensive explanations about the study both verbally and in writing, and consent was obtained.

Data Collection

Sociodemographic information such as age, gender, marital status, educational status, living alone status, and presence of chronic illnesses was collected using a demographic information form prepared by the researchers. The participants' sleep quality was evaluated using the Pittsburgh sleep quality index (PSQI), their diet quality was assessed using the healthy eating index-2010 (HEI-10), and their cognitive functions were evaluated using the Montreal cognitive assessment scale (MOCA). Additionally, the COVID-19 phobia scale (C19P-S) was used to assess whether participants were experiencing coronaphobia.

PSQI: The PSQI was used to determine sleep quality and the type and severity of sleep disorders within the last month. This scale consists of 24 questions, 19 of which were answered by the participants, and 5 of which were answered by their partner. The 19 questions covering sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction were answered with statements ranging from "not during the past month" to "three or more times a week". Each item was evaluated on a scale of 0-3, and the sleep quality of those with a total PSQI score of 5 or higher was considered poor (24).

HEI-10: The HEI-10 is an index that evaluates the suitability of food consumption and measures diet quality. The HEI-10 includes 12 items, each of which is scored with a 0, 5, 10, or 20. The frequencies of participants' food consumption were recorded using the food consumption frequency form and were scored according to this scale. When individuals' diet quality was categorized according to their total HEI-10 scores, those below 51 were recorded as having "poor diet quality", those between 51-80 as "diet quality needs improvement", and those over 80 as "good diet quality" (25).

MOCA: The MOCA was used in the early detection of mild cognitive disorders, with the MOCA scale evaluating various

cognitive dimensions as follows: attention and concentration, executive function, memory, language, visual-spatial skills, abstract thinking, calculation, and orientation. The total score was calculated out of 30. The threshold value was taken as 21 (a score of 20 or under referred to as cognitive dysfunction) (26).

C19P-S: The C19P-S is a 20-item scale with psychological, psychosomatic, economic, and social subdimensions that was used to evaluate levels of coronaphobia. Items were scored from "strongly disagree (1)" to "strongly agree (5)", and answers were self-reported by participants. The total scores ranged between 20 and 100. Greater scores reflect increased coronaphobia levels (6).

Statistics

Statistical Package for the Social Sciences version 22 (SPSS 22.0, IBM) was used to perform the statistical analysis of the data obtained from the study. The obtained continuous variables are expressed as mean ($\overline{X}$), standard deviation, and minimum-maximum values, and discrete variables are expressed as numbers (n) and percentages (%). Whether the data were normally distributed was evaluated using the Kolmogorov-Smirnov test. Spearman's correlation analysis was used to determine the relationship between the participants' BMI, PSQI, MOCA score, CP19-S score, and HEI-10 score. The strength of the correlation was evaluated as poor (0-0.3), moderate (0.3-0.5), or strong (0.5-0.7). Statistical significance was accepted as $p<0.05$.

Results

Seventy-two older adults [(70.95±4.67 years/median: 70); 52 females and 20 males] participated in the study. The participants' PSQI, MOCA, and CP19-S mean scores were 5.51±2.79 (median: 5), 20.68±4.17, and 55.77±16.38, respectively. The calculated HEI-10 and BMI scores of the participants were 54.40±10.00 (median: 50) and 28.84±4.15 kg/m^{T}. Most participants had poor diet quality (54.2%), poor sleep quality (62.5%), and obesity (41.7%) (Table 1).

We found a moderate negative relationship between the PSQI and CP19-S scores and between the MOCA and CP19-S scores of the participants ($p\leq0.00$). There was a weak negative correlation between BMI and HEI-10 scores and a weak positive correlation between MOCA and HEI-10 scores of the participants ($p<0.05$). However, no significant relationship was observed between BMI and PSQI, BMI and MOCA, BMI and CP19-S, PSQI and HEI-10, and HEI-10 and CP19-S scores of the participants ($p>0.05$) (Table 2).

Discussion

In this study, the diet quality, cognitive function, sleep quality, and coronaphobia levels of older individuals were examined to determine the effects of COVID-19. We demonstrated that older adults had poor diet quality, poor sleep quality and moderately high coronaphobia levels during the COVID-19 pandemic in Turkey. We observed that there might be a relationship between diet quality, sleep quality, and cognitive function in older

Table 1. Descriptive characteristics and measurements results

Characteristics (n=72)			n (%)
Gender	Female Male		52 (72.2%) 20 (27.8%)
Education	Primary school Secondary school High school University		43 (59.7%) 10 (13.9%) 10 (13.9%) 9 (12.5%)
BMI	Underweight Normal Overweight Obese		1 (1.4%) 14 (19.4%) 27 (37.5%) 30 (41.7%)
Living status	Family Alone		57 (79.2%) 15 (20.8%)
Chronic disorders	Yes No		55 (76.4%) 17 (23.6%)
Sleep quality	Poor Good		45 (62.5) 27 (37.5)
Nutrition quality	Poor Needs improvement		39 (54.2) 33 (45.8)
	x̄ (SD)	**Median**	**Min-max**
Age (years)	70.95 (4.67)	70	65-83
Height (cm)	164.05 (7.93)	-	150-182
Weight (kg)	77.47 (11.24)	-	50-108
BMI (kg/m^2)	28.84 (4.15)	-	18.3-40
PSQI	5.51 (2.79)	5	1-14
HEI-10	54.40 (10.00)	50	35-76
MOCA	20.68 (4.17)	20.5	13-29
CP19-S	55.77 (16.38)	58.5	20-85

SD: Standard deviation, BMI: Body mass index, PSQI: Pittsburgh sleep quality index, HEI-10: Healthy eating index, MOCA: Montreal cognitive assessment, CP19-S: Coronavirus-19 phobia scale, x̄: Mean, Min-max: Minimum-maximum

Table 2. The relationship between the BMI, PSQI, MOCA, HEI-10, and CP19-S scores

Variables (n=72)	r*	p**
BMI-PSQI	0.194	0.103
BMI-HEI-10	**-0.291***	**0.013**
BMI-MOCA	-0.197	0.097
BMI- CP19-S	0.150	0.210
PSQI-MOCA	-0.233*	0.049
PSQI-HEI-10	-0.156	0.192
PSQI-CP19-S	**0.431****	**0.000**
MOCA-HEI-10	**0.254***	**0.032**
MOCA-CP19-S	**-0.393****	**0.001**
HEI-10-CP19-S	0.180	0.883

*r: Spearman correlation coefficient
**p<0.05
BMI: Body mass index, PSQI: Pittsburgh sleep quality index, HEI-10: Healthy eating index, MOCA: Montreal cognitive assessment, CP19-S: Coronavirus-19 phobia scale

individuals during the COVID-19 pandemic. We also found that the cognitive function and sleep quality of individuals with high coronaphobia levels could be impaired.

Stressors can lead to impairment of cognitive functions, including attention, comprehension, retention, and judgment (27). Our study revealed that older adults who faced social isolation during the COVID-19 pandemic experienced moderate levels of coronaphobia and cognitive impairment. Previous studies have stated that social isolation exacerbates cognitive functions and might weaken memory in patients with dementia (28). Furthermore, the duration of isolation is correlated with a heightened severity of neuropsychiatric symptoms (29). Additionally, COVID-19-induced anxiety or fear is linked to regional brain atrophy in individuals with cognitive impairment (21). In their study conducted on individuals aged 18-66, Karwowski et al. (11) noted that thinking about COVID-19 and the stress caused by related news affected analytical thinking performance. Similarly, Favieri et al. (2) found that among individuals aged 18-40 in the Italian population who were not infected with COVID-19, there was a decline in performance on both the Stroop task and the go/no-go task, which are commonly employed to assess cognitive functions. Cognitive functions of individuals over the age of 65 who experienced coronaphobia were found to be low in our study, which is consistent with previous findings.

Sleep quality may deteriorate because of the effects of emotional conditions and stress, or that deterioration in sleep quality may affect emotional states during the COVID-19 pandemic (7). In addition, anxiety has been associated with COVID-19 and decreased sleep quality (4). In this study, we found that 62.5% of participants and those with high coronaphobia scores had inadequate sleep quality. As people age, cortical thinning and amyloid accumulation in regions of the brain with high neuronal activity, such as the prefrontal cortex, angular gyrus, and hippocampus, negatively affect the depth of sleep and disturb the restorative effects of sleep. These problems may lead to the loss of cognitive function and the onset of Alzheimer's disease (19). These findings support the relationship between the deterioration of sleep quality and cognitive dysfunction detected in the present study.

Adequate nutrition is a cornerstone of healthy aging. Healthy eating habits might help preserve the structure and function of the brain and increase cognitive function in older individuals. This result was attributed to the fact that such habits have been demonstrated to promote synaptogenesis, exert antioxidant and anti-inflammatory effects, regulate blood pressure and lipid levels, and enhance cerebral blood flow (16,17,22). On the contrary, malnutrition reduces physical and cognitive functions and increases the risk of cardiovascular disease in older individuals (16). Our study revealed that overall, participants' diet quality was poor or needed to be improved, and a decline in diet quality was correlated with a decrease in cognitive skills. In addition, it was found that individuals who did not have healthy eating habits had a high BMI. In accordance with the literature, our study indicated that BMI increased as the diet quality decreased (30). According to the BMI values in our study, 41.7% of the participants were obese. Studies have reported that there is a U-shaped relationship between BMI, cognitive function, and sleep quality (31,32). In this context, it is understood that too much or too little sleep can lead to obesity (32). In addition, although it has been argued that there is a relationship between obesity and cognitive impairment in middle-aged people, being overweight at an advanced age has protective effects in individuals with cognitive impairment (31). Although no relationship was found between BMI, quality of sleep, and cognitive status in our study, we believe that BMI control should be considered in older individuals, as being overweight and obese is associated with cardiovascular disease. Additionally, previous studies support that weight loss has a positive effect on cognitive function in individuals with obesity (31). In the present study, there was no relationship between BMI, diet quality, and CP19-S scores. In line with our findings, Sutin et al. (33) found that despite an increase in obesity-related COVID-19 complications, individuals with high BMIs did not report being more concerned about the virus than those with low BMIs and did not take more precautions against the virus than those with low BMIs (34). In contrast, Kaufman-Shriqui et al. (10) revealed that a decrease in diet quality and an increase in BMI may be associated with COVID-19-related anxiety. However, the average age of the participants was approximately 30 years (10). Therefore, it has been argued that diet quality and fear associated with COVID-19 may vary among different age groups. Previous studies exploring the correlation between sleep quality and nutritional habits have suggested several trends: extended periods of wakefulness may result in increased food intake; late waking and bedtime may lead to nighttime eating; and inadequate sleep may affect hormones such as leptin, ghrelin, and insulin. During the pandemic, researchers found that increased anxiety about COVID-19, disrupted sleep patterns, and a higher BMI were associated with a tendency to indulge in emotional eating (5,34). However, no significant association was found between diet and sleep quality, and existing research being largely deemed insufficient (34). Similarly, our study found no relationship between sleep quality and diet quality.

Study Limitations

The strengths of our study are the inclusion of older individuals' cognitive status and fears related to COVID-19, as well as their daily life patterns, nutrition levels, and sleep quality during the pandemic. However, despite these strengths, our study did not

provide information about the participants according to their social status, and the age distribution was not homogeneous, limiting its application to the general population.

Conclusion

Our research highlights the multifaceted impact of the COVID-19 pandemic on older adults, shedding light on distinct disabilities such as nutritional deficiencies, disrupted sleep patterns, coronaphobia, and cognitive decline. Moreover, our study revealed the relationship between nutrition, sleep, and cognitive health in this demographic group and highlighted the complex challenges faced by those struggling with the fear of COVID-19. For older adults who are already negatively affected by social isolation, fear, and restrictions, we recommend implementing interventions to alleviate their cognitive impairments, nutritional deficiencies, and declines in sleep quality they experienced during the pandemic, even if they have not contracted COVID-19.

Ethics

Ethics Committee Approval: This study was approved by Bahçeşehir University Scientific Research and Publication Ethics Committee (decision number: 2021/02/52, date: 10.02.2021).

Informed Consent: Patients were provided with comprehensive explanations about the study both verbally and in writing, and consent was obtained.

Authorship Contributions

Concept: L.A.B., S.P., D.K.C., İ.A., B.M.K., E.Ö., Design: L.A.B., S.P., D.K.C., İ.A., B.M.K., E.Ö., Data Collection or Processing: L.A.B., S.P., D.K.C., İ.A., B.M.K., E.Ö., Analysis or Interpretation: L.A.B., S.P., D.K.C., İ.A., B.M.K., E.Ö., Literature Search: L.A.B., S.P., D.K.C., İ.A., B.M.K., E.Ö., Writing: L.A.B., S.P., D.K.C., İ.A., B.M.K., E.Ö.

Conflict of Interest: No conflict of interest was declared by the authors.

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