ORIGINAL ARTICLES

Adjuvant Temozolomide Therapy Tolerance in Geriatric Glioblastoma Multiforme Patients
Bediz Kurt İnci, İbrahim Karadağ, Gözde Duygu İşbilir, Veysel Baran Tomar, Fatih Gürler, Pınar Kubilay Tolunay, Osman Sütçüoğlu, İrem Öner, Nuriye Özdemir, Ahmet Özet, Ozan Yazıcı, Cengiz Karaçin; Ankara, Turkey

Determinants of Hospital Stay, Mortality, and Readmission in Aspiration Pneumonia Patients
Şehnaz Olgun Yıldızeli; İstanbul, Turkey

Impact of Sleep Quality on Disease Activity and Clinical Outcomes in Older Patients with Inflammatory Bowel Disease
Çağatay Çavuşoğlu, Tevhide Şahin, Arzu Okyar Baş, Merve Güner, İlker Boğa, Yelda Öztürk, Onur Keskin, Erkan Parlak, Bülent Sivri, Meltem Gülhan Halil, Mustafa Cankurtaran, Taylan Kav, Burcu Balam Doğu; Şanlıurfa, Konya, Ankara, Erzurum, Elazığ, Eskişehir, Turkey

Validation and Reliability Study of the Turkish Version of the Social Health Scale for the Elderly
Celalettin Cevik, Hakan Baydur, Raziye Ozdemir, Sait Sonmez; Balikesir, Manisa, Karabuk, Turkey

Malnutrition, Sarcopenia, and Dysphagia Awareness: We Still Below the Expected Point
Ekin Oktay Oğuz, Pelin Ünsal; Ankara, Turkey

Nocturnal Hypertension and its Relationship with Vitamin D in Older Hypertensive Adults
Deniz Mut Sürmeli, Tuğba Turgut, Remzi Bahsi, Hande Selvi Öztorun, Murat Varlı; Ankara, Antalya, Samsun, Turkey

Relationship of Phase Angle with Sarcopenia Components and Comprehensive Geriatric Assessment in Physically Independent Older Adults
Fatma Özge Kayhan Koçak, Sumru Savaş, Asli Kilavuz, Sibel Çavdar; İzmir, Turkey

CASE REPORTS

A Rare Geriatric Case: Omalizumab As a Rescue Therapy For Asthma-Chronic Obstructive Pulmonary Disease Overlap
Erdem Yalçınkaya, Yasin Yıldız, Büşra Can, Hüseyin Arıkan, Derya Kocakaya, Şehnaz Olgun Yıldızeli, Sait Karakurt; İstanbul, Turkey

Dural Arteriovenous Fistula as a Rare Cause to Dementia: a Case Report
Leise Elisabeth Hviid Korsager, Lene Wermuth; Slagelse, Denmark

REVIEWS

Paying Direct Care Workers is a Huge Financial Burden for the Older Population in South Korea
Jenny Hyosun Kwon, Kisang Kwon; Ohio, USA; Iksan, Korea

The Social Pandemic of Ageism: Exploring Ageism Toward Older Americans During COVID-19 Using Stereotype Embodiment Theory (SET)
Jenny Hyosun Kwon, Reese Moore; Ohio, USA

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Editorial Board

Advisory Board

Advisory Board

CONTENTS

Adjuvant Temozolomide Therapy Tolerance in Geriatric Glioblastoma Multiforme Patients

⦿ Bediz Kurt İnci[1], ⦿ İbrahim Karadağ[1], ⦿ Gözde Duygu İşbilir[2], ⦿ Veysel Baran Tomar[2], ⦿ Fatih Gürler[2], ⦿ Pınar Kubilay Tolunay[1], ⦿ Osman Sütçüoğlu[2], ⦿ İrem Öner[1], ⦿ Nuriye Özdemir[2], ⦿ Ahmet Özet[2], ⦿ Ozan Yazıcı[2], ⦿ Cengiz Karaçin[1]

[1]University of Health Sciences Turkey, Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital, Clinic of Medical Oncology, Ankara, Turkey
[2]Gazi University Hospital, Department of Medical Oncology, Ankara, Turkey

Abstract

Objective: Glioblastoma multiforme (GBM) is a significant health issue in older patients. In recent years, there has been an increase in the number of studies on radiotherapy and concomitant temozolomide administration. However, there is not enough research on the tolerance of adjuvant temozolomide after this intensive therapy procedure.

Materials and Methods: Patients with GBM who were followed up between 2010 and 2020 were included. Patients were retrospectively screened. Side effect grading of patients was performed using the common terminology criteria for adverse events version 5.0.

Results: In patients ≤65 years old, 79.1% (121) received adjuvant temozolomide treatment for six months or more, whereas this rate decreased to 48.4% (15) in patients >65 years old (p<0.001). In the comparison of hematological toxicities arising during adjuvant temozolomide treatment in the ≤65 years old and older patient groups, no significant differences were found. The rates of patients experiencing grade 2 and above hematologic toxicity (p=0.91) and treatment discontinuation due to hematologic toxicity (p=0.53) were found to be similar in both groups. The median progression-free survival (p=0.004) and the median overall survival were (p<0.001) determined longer in the younger group.

Conclusion: Cancer and aging are dynamic, multidimensional processes that pose challenges to older patients and require multidisciplinary evaluation. Our study showed that although age-related differences in treatment completion and survival outcomes were observed, it is necessary to approach especially older patients individually, considering a comprehensive assessment of their general health status, comorbidities, and treatment tolerance, emphasizing the importance of geriatric oncology.

Keywords: Glioblastoma, temozolomide, geriatrics, older patient, adverse events

Introduction

Glioblastoma multiforme (GBM) is the most common and letal brain tumor in adults. Approximately 50% of newly diagnosed cases occur in patients aged 65 and older (1). Therefore, GBM is a significant health issue in older patients. Despite the use of surgery, radiotherapy, and chemotherapy, the median survival, which is approximately 15 months in the general population, can decrease to 9 months in this older patient group (2,3). Age and the patient's performance status can be listed among the most important negative prognostic parameters (4). The incidence of GBM in patients aged 65 years and older is 2.63 times

higher than that in the general adult population (5). Moreover, the prognosis becomes less favorable than the patient's age increases (6). The current standard for GBM treatment is to continue adjuvant monotherapy with temozolomide for six months following adjuvant chemoradiotherapy after surgery. However, studies from population-based cancer registries have shown that older patients with glioblastoma (GBM) are less likely to undergo multiple types of treatment. Data from the surveillance, epidemiology, and end results cancer registry, including 4,137 GBM patients aged 65 years and older who were diagnosed between 1994 and 2002, revealed a median

Kurt İnci et al. Temozolomide Therapy and Geriatric Glioblastoma

Eur J Geriatr Gerontol 2024;6(3):165-170

overall survival (mOS) of 4 months. Among these patients, 61% underwent surgical resection, 65% received radiotherapy, but only 10% received chemotherapy within 3 months of their diagnosis (7). In recent years, there has been an increase in the number of studies on radiotherapy methods and concomitant temozolomide administration or temozolomide monotherapy for older patients (8). Although phase III randomized studies have shown improved survival in older patients with O6-methylguanine DNA methyltransferase (MGMT) promoter methylation treated with temozolomide, at present, there is insufficient evidence to recommend temozolomide as monotherapy in older patients with GBM who are fit for multimodality treatment as there have been no randomized trials comparing standard chemoradiotherapy to temozolomide monotherapy alone (9). However, there are not enough research available on the tolerance of adjuvant temozolomide treatment after adjuvant chemoradiotherapy intensive therapy procedure (10).

As of today, studies have yet to provide a definitive answer to the questions of whether there is a difference in the tolerance of older GBM patients who have tolerated and completed surgery and adjuvant chemoradiotherapy and whose performance status is between 0-2 to adjuvant temozolomide treatment compared with younger patients, and whether this difference affects survival.

Therefore, our study aimed to compare adjuvant temozolomide treatment tolerance in young and older patients with GBM who have undergone surgical treatment and completed adjuvant chemoradiotherapy and who have Eastern Cooperative Oncology Group (ECOG) performance scores of 0-2. We will evaluate parameters such as patients' completion of treatment, the most commonly observed hematological side effects, and treatment discontinuation due to side effects in this study. Additionally, the secondary objective of our study was to examine the impact of age on recurrence and survival in a similar patient group with comparable performance status.

Materials and Methods

Patients with GBM who were followed up in the Clinic of Medical Oncology at University of Health Sciences Turkey, Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital and Gazi University Hospital between 2010 and 2020 were included in the study. Patients were retrospectively screened. Patients diagnosed with GBM who successfully completed post-surgical adjuvant chemoradiotherapy and continued adjuvant temozolomide treatment were included in the study. Patients with an ECOG performance score of 0-2 before starting adjuvant temozolamide treatment were included in the study. One hundred eighty-six patients were divided into two groups using a cut-off age of 65 years. Follow-up data

were obtained from the hospital medical records. Our study has received approval from the Ethics Committee of University of Health Sciences Turkey, Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital (approval number: 2024-04/45, dated: April 4, 2024).

Toxicities were classified according to the National Cancer Institute common terminology criteria for adverse events (CTCAE) version 5 as follows:

- Grade 1: Mild - Characterized by either no symptoms or mild symptoms that only require observation without any intervention.

- Grade 2: Moderate - Requires minimal or local treatment, which may slightly restrict daily activities and necessitate some help with instrumental activities.

- Grade 3: Severe or medically important but not immediately life-threatening; could lead to hospitalization or extended stay and may affect self-care activities.

- Grade 4: Life-threatening events that require urgent intervention.

- Grade 5: Death caused by adverse events.

According to CTCAE, leukopenia, thrombocytopenia, and anemia are defined as values that are below the lower limit of normal laboratory values.

Statistical Analysis

Statistical evaluations were performed using SPSS version 21.0. The chi-square method was used to examine the binary relationships of categorical variables. Kaplan-Meier survival analysis was employed for survival analyses. A p-value of <0.05 was considered statistically significant.

Results

Out of 186 patients, 154 were 65 years or younger while 32 were older than 65 years old. Both groups had similar distributions in terms of the gender of patients, tumor size, and the types of surgeries performed (Table 1). All patients in both groups successfully completed adjuvant chemoradiotherapy and subsequently started adjuvant temozolomide treatment.

In patients ≤65 years old, 79.1% (121) received adjuvant temozolomide treatment for six months or more, whereas this rate decreased to 48.4% (15) in patients >65 years old (p<0.001) (Table 2). Although 56.2% of patients under 65 could receive treatment after recurrence, only 40% of older patients could receive treatment. Although there is a numerical difference, no statistically significant difference was observed (Table 2). Of the 48 patients who could not complete the adjuvant temozolomide treatment, 32 (66%) were young, and 16 (33%) were older. It

Eur J Geriatr Gerontol 2024;6(3):165-170

Kurt İnci et al. Temozolomide Therapy and Geriatric Glioblastoma

was determined that 18 out of 48 patients could not complete their treatment due to disease progression or death. Although 11/16 (69%) of older patients could not complete the treatment due to hematological adverse events, it was found that 19/32 (59%) of the young patients had the same reason for treatment discontinuation.

The comparison of hematological toxicities arising during adjuvant temozolomide treatment in the ≤65 years old and older patient groups is provided in Table 3. No significant differences were found between the patient groups in terms of hematologic side effects, including anemia (p=0.72), leukopenia (p=0.82), and thrombocytopenia (p=0.34). The rates of patients experiencing grade 2 and above hematologic toxicity (p=0.91) and treatment discontinuation due to hematologic toxicity (p=0.53) were found to be similar in both ≤65 years old and older patients.

The median progression-free survival (mPFS) was determined to be 16 (min.-max.: 13.9-18) months in patients under 65 years old and 10 (min.-max.: 8.4-11.5) months in older patients (p=0.004) (Figure 1). The mOS was determined to be 22 (20-24) months in patients under 65 years old and 11 (6.8-15.1) months in older patients (p<0.001) (Figure 2).

Discussion

The Central Brain Tumor Registry of the United States statistical report showed that GBM is the most common malignant central nervous system tumor in adults. The incidence rates of GBM increase with age, and the median age at diagnosis is 65 years (11). The management of older GBM patients is challenging. This is primarily due to comorbidities, reduced bone marrow reserve, and the potential for decreased treatment tolerance due to worsening performance status, which can be concerning for clinicians. Therefore, the guidelines recommend that the standard STUPP (radiotherapy: total 60 Gy, 2 Gy per daily fraction (Monday to Friday) over 6 weeks and temozolomide: during radiotherapy: 75 mg per square meter of body-surface area per day, 7 days per week, post-radiotherapy (adjuvant) 6 cycles consisting of 150-200 mg per square meter for 5 days during each 28-day cycle) protocol be accessible to older patients with good physical condition. In general, there is no consensus on treatment plans for older patients with glioma and little is known about the standardization of diagnosis and treatment guidelines for older GBM (12).

A decline in performance scores in older patients is an expected outcome. However, as far as we know from the literature, there is no information regarding whether there is a difference

Table 1. General characteristics of the patients			
Age (years)	**<65**	**≥65**	**p**
Gender % (n) Female Male	37.7% (58) 62.3% (96)	40.6% (13) 59.4% (19)	0.75
Type of surgery % (n) GTR STR Bx	82.5% (127) 13% (20) 4.5% (7)	84.4% (27) 15.6% (5) 0%	0.45
Patients who completed adjuvant CRT % (n)	100% (154)	100% (32)	
Patients who received adjuvant temozolamide % (n)	100% (154)	100% (32)	
Tumor size % (n) <5 cm 5-10 cm Undefined	65.6% (101) 27.3% (42) 7.1% (11)	58.1% (18) 35.5% (11) 6.5% (2)	0.65
GTR: Gross total resection, STR: Subtotal resection, Bx: Biopsy, CRT: Chemoradiotherapy			

Table 2. Patients' survival outcomes			
Age (years)	**<65**	**≥65**	**p**
Adjuvant treatment duration (temozolamide) % (n) Treatment for 6 months and above Incomplete treatment	79.1% (121) 20.9% (32)	48.4% (15) 51.6% (16)	<0.001*
Chemotherapy after relapse % (n) Yes No	56.2% (68) 43.8% (53)	40% (10) 60% (15)	0.139
PFS (median month) - (95% CI)	16 (13.9-18)	10 (8.4-11.5)	0.004 (logrank)*
OS (median month) - (95% CI)	22 (20-24)	11 (6.8-15.1)	<0.001 (logrank)*
*Statistically significant. PFS: Progression-free survival, CI: Confidence interval, OS: Overall survival			

Kurt İnci et al. Temozolomide Therapy and Geriatric Glioblastoma

Eur J Geriatr Gerontol 2024;6(3):165-170

in treatment tolerance between older patients with good performance status and younger patients. Therefore, in our study, we attempted to standardize the impact of the pre-adjuvant treatment performance score on treatment selection and continuation in both groups by comparing older and young patients with good ECOG performance status. Our study found that although older patients tolerated and completed surgery

and adjuvant chemoradiotherapy, their completion rates for adjuvant temozolomide treatment were lower than those of younger individuals. One of the key findings of our study was the notable disparity in the duration of adjuvant temozolomide treatment between the two age groups. In most older patients, discontinuation of adjuvant temozolomide treatment was attributed to performance status hematological toxicities (9).
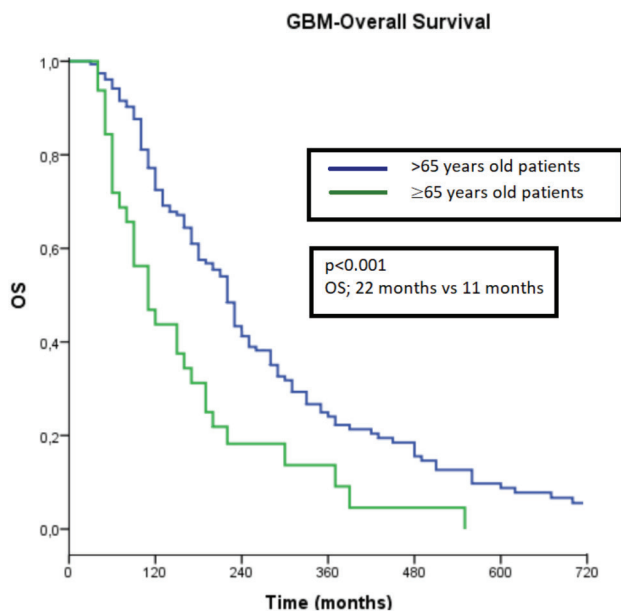
Figure 1. GBM and overall survival (OS)

GBM: Glioblastoma multiforme
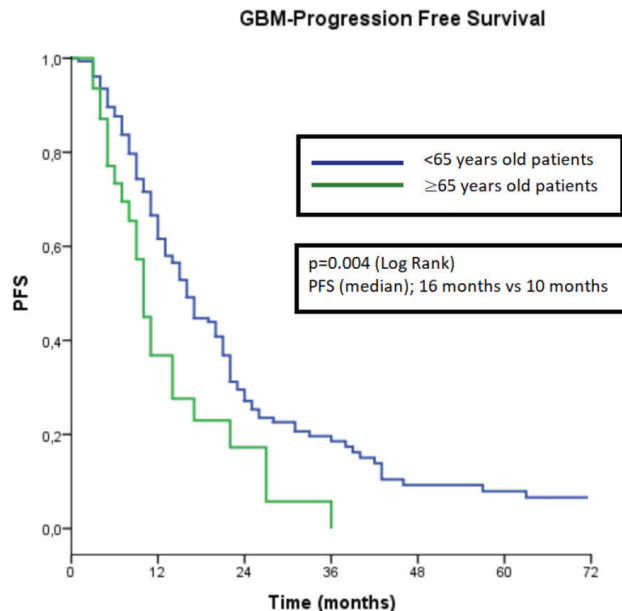
Figure 2. GBM and progression free survival (PFS)

GBM: Glioblastoma multiforme

Table 3. Temozolamide–related hematologic toxicity			
Age (years)	**<65**	**≥65**	**p**
Anemia % (n) No Grade 1 Grade 2 Grade 3 Grade 4	 71.4% (110) 22.1% (34) 2.6% (4) 3.9% (6) 0%	 75% (24) 21.9% (7) 3.1% (1) 0% 0%	 0.72
Leukopenia % (n) No Grade 1 Grade 2 Grade 3 Grade 4	 64.5% (98) 19.1% (29) 8.6% (13) 5.3% (8) 2.6% (4)	 62.5% (20) 25% (8) 6.3% (2) 6.3% (2) 0%	 0.82
Thrombocytopenia % (n) No Grade 1 Grade 2 Grade 3 Grade 4	 64.4% (96) 23.5% (35) 4.7% (7) 2.7% (4) 4.7% (7)	 64.5% (20) 19.4% (6) 12.9% (4) 3.2% (1) 0%	 0.34
≥ Grade 2 hematological adverse events % (n)	19.6% (30)	18.8% (6)	0.91
Patients who cannot complete adjuvant treatment due to hematological adverse events	59.4% (19)	68.8% (11)	0.53

Regarding hematological toxicities arising from adjuvant temozolomide treatment, our analysis revealed no significant differences between the two age groups in terms of anemia, leukopenia, and thrombocytopenia. Additionally, the rates of grade 2 and above hematologic toxicity, as well as treatment discontinuation due to hematologic toxicity, were similar in both age groups. The rates of grade 3-4 hematologic toxicity in older patients with GBM are between 10% and 25% in the literature, and in our study, a rate of 19.6% was found for grade 2 or higher hematologic toxicity (13,14). However, although some studies have defined a difference in hematologic toxicity between older and young patients, no statistically significant difference was found in our analysis (15). These conflicting results suggest that age alone may not be a definitive predictor of susceptibility to hematologic side effects and that other individual patient factors, such as performance status, may also play an important role. Although there was no significant difference in hematologic toxicity rates, the percentage of treatment discontinuation due to hematologic toxicity was higher in the older patient group, albeit statistically insignificant. The main reason for this may be that older patients are more fragile and tend to terminate their treatment earlier according to the physician's choice due to treatment-related side effects, and the return of hematologic toxicity takes longer.

Although we did not observe a statistically significant difference, we found that the ability to receive treatment for recurrence was 16.2% higher in the young patient group than in the older group. Similar results have been obtained in studies conducted in the literature on this subject (16). In this result, it has been observed that the performance score at the time of recurrence is influential (16). After adjuvant temozolomide, although the ability to receive treatment after recurrence is statistically equivalent, these numerical differences are reflected in the OS data.

In two key phase studies published in 2012 on older patients with GBM, PFS and OS were found to be shorter than in our study (17,18). The reason for this is that the STUPP protocol was used in the treatment of the patients we analyzed, which is different from the two studies. The evaluation of mPFS and mOS yielded significant distinctions between the two age groups, and these findings are consistent with the literature (19). The mPFS was notably longer in patients under 65 years old (16 months) than in older patients (10 months) (p=0.004). Similarly, the mOS was substantially higher in the younger cohort (22 months) than in the older group (11 months) (p<0.001). This result was already expected, given that in many studies, a negative impact of age on PFS has been observed (20,21). These findings underscore the potential impact of age on glioblastoma prognosis. One of the main reasons leading to this result is particularly the lower treatment tolerance of older patients after first-line treatment compared with young patients. In addition, publications indicate that the changing tumor microenvironment with increasing age can also impact these outcomes (19,22).

Study Limitations

The present study has multiple limitations. The data collection was conducted retrospectively, and the patients were not randomized. Regarding molecular markers, isocitrate dehydrogenase (IDH) mutations are less common in the older with GBM. Meanwhile, MGMT promoter methylation has been identified in approximately half of patients with GBM (23). The inability to access the retrospective data of molecular analyses of patients such as MGMT and IDH in our study was also another limiting factor that could have affected survival. Nevertheless, the strength of the present work is the standardized collection of patient characteristics, especially the standardization of patients' ECOG performance scores is crucial.

Conclusion

For older patients with newly diagnosed GBM, current management includes surgery, RT, and chemotherapy; however, survival is significantly worse than that observed in younger patients. Cancer and aging are dynamic multidimensional processes that pose challenges to older patients and require multidisciplinary evaluation. Therefore, the results of our study also emphasize the importance of evaluating the general health status of geriatric oncology patients because it suggests that additional factors such as performance status and comorbidities, which change with age as well as age progression, may be at least as important as age in the treatment tolerance of patients. While age-related differences in treatment completion rates and survival outcomes were observed, it is essential to approach each patient individually, considering a comprehensive assessment of their overall health, comorbidities, and treatment tolerance. Research in this area, particularly where geriatric assessment is performed prior to treatmentş, may facilitate the development of more specialized treatment strategies for older patients with glioblastoma.

Ethics

Footnotes

Authorship Contributions

Kurt İnci et al. Temozolomide Therapy and Geriatric Glioblastoma

Eur J Geriatr Gerontol 2024;6(3):165-170

O.Y., C.K., Analysis or Interpretation: B.K.İ., F.G., P.K.T., Literature Search: B.K.İ., Writing: B.K.İ., C.K.

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Determinants of Hospital Stay, Mortality, and Readmission in Aspiration Pneumonia Patients

Şehnaz Olgun Yıldızeli

Marmara University Faculty of Medicine, Department of Pulmonology and Intensive Care, İstanbul, Turkey

Abstract

Objective: Aspiration pneumonia (AP) is an important subset of pneumonia in elderly. This study aimed to identify risk factors affecting hospital length of stay (LoS), mortality, and readmission in patients with AP.

Materials and Methods: This retrospective observational study analyzed data from 263 patients hospitalized with a diagnosis of AP (n=133) and community-acquired pneumonia (n=130) between December 2020 and November 2023.

Results: Dementia/Parkinson's disease (p<0.001), cerebrovascular accident (p<0.001), motor neuron disease (p<0.001), polypharmacy (p<0.001) and sedative drug usage (p<0.001) were common in AP patients as risk factors for aspiration. Additionally, LoS (p<0.001), mortality (p<0.001) and readmission (p<0.001) were common in the AP group. Readmission mortality for the AP group was 57.1%. Multivariate analyses of factors contributing to increased LoS were the presence of a caregiver (p=0.014), need for intensive care unit (ICU) during hospitalization (p=0.006), ICU LoS (p<0.001) and hospital admission within the last 90 days (p=0.02). Risk factors for readmission included high Charlson Comorbidity Index (CCI) (p=0.032), fever at admission (p=0.008) and ICU need during hospitalization (p=0.028). For in-hospital mortality, a lower body mass index (BMI) (p=0.01), more than one caregiver (p=0.045) and increased hospital LoS (p=0.028) were identified as independent risk factors.

Conclusion: Extended hospitalization for AP is associated with the recent hospitalization, need for care, ICU admission requirement, and prolonged ICU stay. Fever upon admission, high CCI, and ICU need were associated with an increased risk of readmission, whereas independent indicators of mortality included high care needs, low BMI, and prolonged hospitalization.

Keywords: Aging, aspiration pneumonia, demography of older populations, home and community-based services, readmission

Introduction

Pneumonia represents a significant contributor to adult mortality worldwide (1,2). Aspiration pneumonia (AP) constitutes a subset of pneumonia and stands as one of the most prevalent causes in these demographics (1). Aspiration is characterized by the entry of gastric or oropharyngeal contents into the larynx and lower respiratory tract. In adults, pneumonia can also result from the aspiration of intraoral secretions, particularly during sleep. Studies suggest that 5-66.8% of hospitalized cases with a pneumonia diagnosis are attributable to AP (3). The identification of AP relies on radiological evidence of infiltration following a

suggestive history in individuals at risk of aspiration (4). Given the absence of definitive diagnostic criteria, the populations studied may vary across research efforts (1).

AP is a multifactorial condition influenced by several factors, with impaired swallowing function, reduced cough reflex, and compromised immunity identified as primary contributors (2,4,5). Various risk factors associated with AP include age, male gender, dysphagia, diabetes mellitus, degenerative and neurological lung diseases, impaired consciousness, dementia, dehydration, and the use of proton pump inhibitors (PPIs) and antipsychotic drugs (6-8). Additionally, critical conditions such

Şehnaz Olgun Yıldızeli. Mortality Indicies in Aspiration Pneumonia

Eur J Geriatr Gerontol 2024;6(3):171-177

as supine position, gastroparesis, and nasogastric intubation have been linked to an increased risk of AP in critically ill patients. The groups at particular risk encompass burn victims, sepsis patients, individuals with traumatic injuries, and those who recovering from surgical procedures (9).

In patients who have undergone intubation, the immediate post-extubation phase is recognized as a precarious period, susceptible to mechanical trauma and drug-related effects (10).

The selection of antibiotics for treatment and the duration of therapy may vary according to the patient's residency and medical history (1). Although numerous publications address the risk factors and treatment modalities for cases of AP, there is a scarcity of studies focusing on factors influencing mortality and assessing readmission. Most published studies have investigated AP under the broader category of community-acquired pneumonia (CAP), with limited analyses specifically targeting patients hospitalized with a diagnosis of AP.

This study aimed to identify the risk factors influencing hospital length of stay (LoS), mortality, and readmission in patients admitted with a diagnosis of AP.

Materials and Methods

Between December 2022 and November 2023, all hospitalized patients diagnosed with AP or CAP who were older than 18 years were retrospectively screened. Informed consent was read and sign by participants. This study was approved by the Marmara University Faculty of Medicine Clinical Research Ethics Committee (approval number: 09.2023.1380, date: 03.11.2023). According to the Turkish Thoracic Society Community Acquired Pneumonia Guideline criteria for the diagnosis of community-acquired pneumonia, cough, sputum, fever, shortness of breath, accompanied by newly emerging pulmonary infiltration in lung radiology (chest X-Ray or computerized tomography of chest) was defined as the presence of at least two symptoms of wheezing and the presence of an increase in white blood cell or an increase in C-reactive protein (CRP) in the complete blood count analysis supporting these criteria. The diagnosis of AP was accepted as the presence of a witnessed aspiration event or the patient's known dysphagia and difficulty swallowing, which are risky conditions for aspiration, and the diagnosis of pneumonia was based on the radiological and laboratory tests mentioned above (11).

Patient data, including demographic information, cigarette smoking history, occupational and environmental exposures, Charlson Comorbidity Index (CCI), Eastern Cooperative Oncology Group (ECOG) score, medical treatments, presence of fever on admission, CRP and procalcitonin levels on admission, residential and feeding status, alternative feeding during hospitalization and discharge, caregiver information, secondary infections during hospitalization, growth patterns in respiratory cultures, need for intensive care admission, LoS, length of intensive care unit (ICU) stay, discharge status, nutritional status at discharge, and readmission information, were systematically recorded for analysis. All patients diagnosed with AP were evaluated by a neck and head surgeon that was specialist on swallowing functions and detected with any level of swallowing disfunction.

Statistical Analysis

Descriptive statistics were employed to delineate patient characteristics. Non-parametric continuous variables are presented as medians with interquartile ranges, whereas parametric continuous variables are expressed as mean±standard deviation. Categorical variables are presented as counts and percentages, where applicable. Group disparities were scrutinized utilizing the chi-square test for categorical variables, the t-test for normally distributed continuous variables, and the Mann-Whitney U test for non-normally distributed continuous variables. The association was evaluated using Spearman's correlation. Multivariate logistic analysis, incorporating a forward stepwise likelihood test, was conducted to assess mortality, readmissions, and length of hospital stay. All analyses were performed using IBM SPSS Statistics 29.

Results

A total of 337 patients hospitalized with the diagnosis of AP or CAP between December 2020 and November 2023 were screened, and 263 patients with complete data were included in the study.

Of these, 133 patients were diagnosed with AP and 71 (53.4%) were male and median age 86 [interquartile range (IQR): 79-91]; 130 patients were diagnosed with CAP, 96 (73.8%) were male and median age 66 (IQR: 58-71). Demographics and characteristic of two groups were shown in Table 1.

When we compared the two groups, dementia/Parkinson's disease (p<0.001), cerebrovascular accident (CVA) (p<0.001), motor neuron disease (p<0.001), polypharmacy (p<0.001) and use of sedative drug (p<0.001) were significantly more common in the AP group, while diagnosis of gastroesophageal reflux disease (GERD) 35 (26.3%) vs. 56 (43.1%) (p=0.004) was common in the CAP group. There were no significant differences in the mean antipsychotic drug use, diagnosis of obstructive sleep apnea syndrome, and chronic respiratory disease between the groups. CCI (p<0.001) and ECOG performance status were higher in the AP group. The presence of fever (p<0.001), presence of sputum (p<0.001) and hypoxemia/cyanosis (p=0.007) were common in patients with CAP at the time of hospital admission (Table 1).

Eur J Geriatr Gerontol 2024;6(3):171-177

Şehnaz Olgun Yıldızeli. Mortality Indicies in Aspiration Pneumonia

When examining the point of origin of the patients, it was found that 56 (42.1%) patients were transferred from home, 34 (25.6%) were transferred from the ICU, 30 (22.6%) were transferred from a nursing home, and 13 (9.8%) were transferred from another hospital in AP group (Table 1). Also, in this group, a closer look at the reasons for hospitalization of patients transferred from the ICU revealed that 15 (11.3%) patients were postoperative, 13 (9.8%) patients were hospitalized due to respiratory failure, and 6 (4.6%) patients were diagnosed with an acute CVA.

Laboratory results at admission showed that procalcitonin (p<0.001) and albumin (p<0.001) levels were lower in AP patients and these patients also tended to be more anemic (p<0.001). (Table 1). Furthermore, use of antibiotics in the last 90 days was common in CAP patients (p=0.027) and 64 (48.1%) patients in the AP group had a history of previous hospitalization for AP.

In the cultural analysis of sputum or deep tracheal aspiration materials 11 (8.2%) patients had positivity in the AP group, and the most common bacterial types were *Peptostreptococcus* 6 (54.5%), *Fusobacterium* 3 (27.2%), and *Prevotella* 2 (18.1%), while the cultural positivity was 41.5% (54 patients) in CAP and *Streptococcus pneumonia* 23 (42.5%), *Moraxella catarrhalis* 14 (25.9%), and *Klebsiella pneumonia* 7 (12.9%) were the most common isolated strains.

In the nutrition route evaluation, only 2 (1.5%) patients in the CAP group were fed modified oralnutrition apart from normal oral nutrition, whereas in the AP group, 64 (48.1%) patients were fed modified oral, 26 (19.5%) patients were fed a nasogastric tube (N/G), and 3 (2.3%) patients were fed percutaneous endoscopic gastrostomy (PEG) (Table 1). PEG placement before discharge was needed in 67 (51.9%) patients with AP. The presence of caregiver and number of caregivers differed between groups, as shown in Table 1.

The need for ICU admission during hospitalization (p<0.001) and ICU LoS (p=0.019) were significantly different between groups (Table 1).

Evaluating the outcomes of the groups, hospital LoS (p<0.001), mortality (p<0.001) and readmission (p<0.001) were common in the AP group. The readmission mortality rate in the AP group was 57.1%; however, no mortality was observed after readmission in the CAP group.

In the univariate analysis, several risk factors affecting hospital LoS stay were identified, including older age, male gender, the presence of dementia/Parkinson's disease, high CCI, sedative drug use, polypharmacy, poor performance score, presence of pressure sore, fever, hypoxemia/cyanosis, ICU LoS, higher admission CRP, admission procalcitonin levels, presence of anemia, admission albumin level, presence of antibiotic use in the past 90 days, hospital admission in the past 90 days, nasogastric feeding route, caregivers, number of caregivers more than 1, history of previous AP, ICU admission during the current hospitalization, secondary infections, and hospital mortality (see in the Appendix). However, following multivariate analysis, only ICU LoS [odds ratio (OR): 1.12] [95% confidence interval (CI):0.66-1.59], presence of hospital mortality (OR: 10.7) (95% CI: 7.75-13.69) (p<0.001), need for caregivers (OR: 6.9) (95% CI: 3.89-10.09) (p=0.014), ICU admission during the current hospitalization (OR: 6.76) (95% CI: 4.22-9.31) (p=0.006) and hospital admission in the past 90 days (OR: 6.07) (95% CI: 2.05-10.09) (p=0.02) were identified as independent risk factors for increased hospital LoS (Table 2).

When evaluating the risk factors for readmission after discharge in the univariate analysis, several risk factors were detected, including older age, the presence of dementia/Parkinson's disease, high CCI, polypharmacy, sedative drug use, poor performance score, presence of pressure sore, fever, higher admission CRP, admission procalcitonin levels, presence of anemia, admission albumin level, presence of antibiotic use in the past 90 days, hospital admission in the past 90 days, nasogastric feeding route, caregivers, number of caregivers more than 1, history of previous AP, ICU admission during the current hospitalization, secondary infections, and PEG placement before discharge (see in the Appendix). However, following multivariate analysis, only having a high CCI (OR: 0.77) (95% CI: 1.07-4.39) (p=0.032), presence of fever upon admission (OR: 4) (95% CI: 1.65-11.68) (p=0.008), and ICU admission during the current hospitalization (OR: 2.21) (95% CI: 1.26-66.23) (p=0.028) were found to be independent risk factors for readmission following discharge (Table 3).

For predicting in-hospital mortality, the univariate analysis identified several risk factors, including older age, lower body mass index (BMI), presence of dementia/Parkinson's disease, high CCI, polypharmacy, sedative drug use, poor performance score, presence of pressure sore, fever, higher admission CRP, admission procalcitonin levels, presence of anemia, admission albumin level, presence of antibiotic use in the past 90 days, hospital admission in the past 90 days, caregivers, number of caregivers more than one, history of previous AP, increased hospital LoS, ICU admission during the current hospitalization, secondary infections, and place of secondary infections (see in the Appendix). However, following multivariate analysis, only having a lower BMI (OR: 1.46) (95% CI: 0.45-0.89) (p=0.01), the presence of more than one caregiver (OR: 2.56) (95% CI: 0.01-0.94) (p=0.045), and increased hospital LoS (OR: 1.65) (95% CI: 1.18-3.10) (p=0.028) were found to be independent risk factors for in-hospital mortality (Table 4).

Table 1. Characteristics and outcomes of patients

	Total n=263	Aspiration pneumonia n=133 (50.6)	Community-acquired pneumonia n=130 (49.4)	p
Age*	75 (64-87)	86 (79-91)	66 (58-71)	<0.001
Male	167 (63.5)	71 (53.4)	96 (73.8)	<0.001
Body mass index*	26 (22-29)	24 (21-28)	27 (23-31)	0.02
Current or ex-smoker	163 (62)	70 (52.6)	93 (71.5)	0.02
Cigarette pack/year*	25 (15-35)	21 (15-35)	25 (16-34)	0.334
History of				
Dementia/Parkinson's disease	90 (34.2)	84 (63.2)	6 (4.6)	<0.001
Cerebrovascular accident	59 (22.4)	56 (42.1)	3 (2.3)	<0.001
Motor neuron diseases	14 (5.3)	14 (10.5)	0	<0.001
Polypharmacy	63 (23.9)	56 (42.1)	8 (6.15)	<0.001
Sedative drug use	27 (10.2)	26 (19.5)	1 (0.7)	<0.001
Antipsychotic use	32 (12.2)	19 (14.3)	13 (10)	0.347
OSAS	34 (13.9)	15 (11.3)	19 (14.6)	0.420
Chronic respiratory disease	138 (52.7)	77 (58.3)	61 (46.1)	0.06
GERD	91 (34.6)	35 (26.3)	56 (43.1)	0.004
Charlson Comorbidity Index	3 (1-4)	4 (3-6)	1 (0-2)	<0.001
ECOG performance status scale	2 (1-4)	4 (3-4)	1 (1-1)	<0.001
Presence of				
Pressure sore	32 (12.2)	32 (24.2)	0	<0.001
Fever	135 (51.3)	45 (33.8)	90 (69.2)	<0.001
Cough	238 (90.5)	122 (91.7)	116 (89.2)	0.490
Sputum	97 (36.9)	32 (24.1)	65 (50)	<0.001
Dyspnea	143 (54.4)	72 (54.1)	71 (54.1)	0.938
Hypoxemia/cyanosis	218 (82.9)	102 (76.2)	116 (89.2)	0.007
Points of origin				
Home	186 (70.7)	56 (42.1)	130 (100)	<0.001
Nursing home	30 (11.4)	30 (22.6)	0	
Other hospital	13 (4.9)	13 (9.8)	0	
ICU	34 (12.9)	34 (25.6)	0	
Laboratory results at admission				
CRP*	103 (82-165)	103 (82-142)	104 (79-189)	0.672
Procalsitonin*	1 (0.53-2.1)	0.6 (0.4-1.2)	1.5 (0.78-3.1)	<0.001
Albumin*	3.3 (3.1-3.6)	3.1 (2.9-3.3)	3.5 (3.2-3.6)	<0.001
Anemia	114 (43.3)	82 (61.7)	32 (24.6)	<0.001
Sputum culture positivity	65 (24.7)	11 (8.2%)	54 (41.5%)	<0.001
Antibiotic use within the last 90 days	92 (35)	38 (28.6)	54 (41.5)	0.027
Hospitalization within 90 days	33 (12.5)	14 (10.5)	19 (14.6)	0.317
History of aspiration pneumonia	64 (24.4)	64 (48.4)	0	<0.001
Nutrition route				
Normal oral	168 (63.9)	40 (30.1)	128 (98.5)	<0.001
Modified oral	66 (25.1)	64 (48.1)	2 (1.5)	
N/G	26 (9.9)	26 (19.5)	0	
PEG	3 (1.1)	3 (2.3)	0	
The presence of a caregiver	120 (45.6)	109 (82)	11 (8.5)	<0.001
Presence of more than 1 caregiver	44 (16.7)	42 (31.6)	2 (1.5)	<0.001
Secondary infection during admission	95 (36.1)	73 (54.9)	22 (16.9)	<0.001
PEG placement before discharge	67 (25.9)	67 (51.9)	0	<0.001
ICU admission during hospitalization	53 (20.2)	39 (29.3)	14 (10.8)	<0.001
ICU length of stay*	5 (3-6)	5 (4-7)	4 (4-7)	0.019
Outcomes				
Hospital length of stay*	10 (7-15)	13 (10-18)	7 (5-10)	<0.001
Mortality	25 (9.5)	21 (15.8)	4 (3.1)	<0.001
Readmission	23 (9.5)	21 (18.8)	2 (1.5)	<0.001
Readmission mortality	12 (52.2)	12 (57.1)	0	0.217

*Data are presented as median (interquartile range), and categorical variables are presented as n (%).
OSAS: Obstructive sleep apnea syndrome, GERD: Gastroesophageal reflux disease, ECOG: Eastern Cooperative Oncology Group, ICU: Intensive care unit, N/G: Nasogastric tube, PEG: Percutaneous endoscopic gastrostomy, CRP: C-reactive protein

Table 2. Factors associated with hospital length of stay following multivariate analysis			
	OR	95% CI	p
ICU length of stay	1.12	0.66 – 1.59	<0.001
Hospital mortality	10.7	7.75 – 13.69	<0.001
Having caregivers	6.9	3.89 – 10.09	0.014
ICU admission during the current hospitalization	6.76	4.22 – 9.31	0.006
Hospital admission within 90 days	6.07	2.05 – 10.09	0.02
OR: Odds ratio, CI: Confidence interval, ICU: Intensive care unit			

Table 3. Factors associated with readmission following multivariate analysis			
	OR	95% CI	p
Higher Charlson Comorbidity Index	0.77	1.07 – 4.39	0.032
Fever at admission	4	1.65 – 11.68	0.008
ICU admission during the current hospitalization	2.21	1.26 – 66.23	0.028
OR: Odds ratio, CI: Confidence interval, ICU: Intensive care unit			

Table 4. Factors associated with mortality following multivariate analysis			
	OR	95% CI	p
Lower BMI	1.46	0.45 – 0.89	0.01
Having more than one caregiver	2.56	0.01 – 0.94	0.045
Hospital length of stay	1.65	1.18 – 3.10	0.028
OR: Odds ratio, CI: Confidence interval, BMI: Body mass index			

Discussion

In this study, data from 263 patients hospitalized with a diagnosis of AP and CAP were analyzed. Compared with CAP, patients diagnosed with AP had more dementia/Parkinson's disease, CVA history, hypoalbuminemia and anemia, and worse CCI and ECOG scores, while the frequency of fever and sputum production were higher and hypoxemia was more common in patients diagnosed with CAP. Hospitalization, mortality, and readmission were significantly higher in the AP group. In patients diagnosed with AP, factors contributing to increased LoS included the presence of a caregiver, the need for ICU during hospitalization, the length of ICU stay, and hospital admission within the last 90 days; risk factors for readmission included a high CCI, the presence of fever on admission, and the need for ICU during hospitalization. Regarding risk factors determining mortality in AP patients, it was found that a longer hospital stay, lower BMI, and the presence of more than one caregiver were independent factors.

In literature studies on AP, it has been consistently reported that the study populations are typically aged 70 and above (12). It has been underscored that the risk of developing AP increases with age, particularly beyond 70, and cases occurring in this age group often involve malignancies, neuromuscular diseases, or chronic respiratory conditions. In our study, age was significantly different between the AP and CAP patients. The ages range between 52-96 years in patients diagnosed

with AP, and we observed 12 (9%) patients below the age of 70 in this group. It was noted that a majority of these patients developed AP either following a surgery or during intensive care hospitalization due to respiratory failure.

AP holds significant prominence among CAP (13), and dysphagia is believed to contribute to this condition in up to 60% of the elderly population (14). Studies have indicated that cases with a history of recurrent pneumonia are often attributed to aspiration, and "recurrent pneumonia" has been proposed as a typical indicator of AP (3,15,16). Similarly, another study noted a higher prevalence of nutritional modification or nasogastric feeding before hospitalization in patients admitted with AP. Our study also revealed that 64 (48%) patients underwent home nutrition modification, 26 (19.5%) were fed with N/G and 3 (2.3%) had PEG in the AP group, whereas only 2 (1.5%) patients in the CAP group had modified their diet for nutrition. Implementing home nutrition modification implies that a significant proportion of patients exhibited clinical manifestations potentially linked to aspiration, regardless of prior hospitalization for AP. In our study, all patients in the AP group underwent swallowing evaluations during hospitalization. PEG was recommended for 71 (52.2%) patients, and PEG was performed in 66 (49.6%) patients. Notably, two (40%) patients declined the procedure, and one (1.5%) patient, discharged with PEG was readmitted within 30 days.

Şehnaz Olgun Yıldızeli. Mortality Indicies in Aspiration Pneumonia

Eur J Geriatr Gerontol 2024;6(3):171-177

In a comprehensive review of the literature, van der Maarel-Wierink et al. (17) conducted a detailed study identifying 13 conditions that may pose risk factors for AP, including age, male gender, chronic lung disease, dysphagia, diabetes mellitus, dementia, angiotensin i-converting enzyme deletion, poor oral hygiene, malnutrition, Parkinson's disease diagnosis, antipsychotic use, PPI use, and angiotensin-converting enzyme inhibitor use. Suzuki et al. (18) discovered that low BMI and albumin levels, indicative of malnutrition, increased the risk of aspiration. Similarly, in our study, advanced age, low BMI, presence of dementia/Parkinson diagnosis, and lower albumin levels were common in the AP group, whereas GERD and male sex were common in the CAP group, and no significant difference was observed between the groups in terms of chronic lung disease, which was reported as a risk factor for aspiration. While our study exclusively focused on cases with AP without specifying individual risk factors, we evaluated the impact of these risky conditions on the LoS, readmission, and mortality. Unlike van der Maarel-Wierink et al. (17) study, age, male gender, chronic lung disease, and dementia were not found to affect LoS and mortality in our study. However, mortality was observed to be higher in patients with low BMI.

In this study, we examined the factors influencing LoS in patients diagnosed with AP. We found that the presence of a caregiver, ICU need during hospitalization, and hospital admission within the last 90 days were significant factors affecting LoS. Additionally, for readmission, a high CCI and the presence of fever on admission were identified as significant factors. Consistent with our findings, a study evaluating LoS in patients diagnosed with pneumonia suggested that AP was associated with a longer hospital stay than other types of pneumonia. In the subgroup analysis, male sex and multilobar infiltration on chest X-ray at admission were associated with increased LoS. Notably, in our study, the effect of sex on LoS was not significant, and a specific radiological evaluation was not conducted.

In a study by Noguchi et al. (19), the evaluation of 6-month mortality and recurrent AP within 30 days after discharge focused on patients with AP. This study assessed CVA, disorientation, bed addiction, dementia, sleeping drug use, and GERD as risk factors for aspiration. This study demonstrated that dementia, sleeping drug use, and poor performance status increased the risk of both aspiration and mortality. In this study, we also demonstrated that dementia, CVA, higher ECOG status, higher CCI points, polypharmacy, and sedative drug usage was common in the AP group, similar to Noguchi et al. (19) However, in terms of risk factors for mortality, we found that a longer hospital stay, lower BMI, and the presence of more than one caregiver were independent factors. Although the mortality relationship between long hospital stays and low BMI was predictable, interestingly, having more than one caregiver was also found to be significant in terms of mortality in this study. The possible reasons for this are that the number of caregivers may increase as the workload of a single caregiver may be high in patients with high care needs or dependencies. For social and cultural reasons in our country, caregivers are usually primary or secondary relatives of patients rather than professionals. It is believed that irregularities during patient and caregiver follow-up with insufficient knowledge and competence may be related to this situation. The results suggest that the longer hospital stay of patients with caregivers is related to the possible high fragility of these patients.

We also focused on evaluating risk factors for AP requiring readmission and in multivariate analyses we identified high CCI, presence of fever at admission, and ICU need during hospitalization as significant risk factors. In a meta-analysis conducted by Komiya et al. (20) the study evaluated the frequency of AP and related mortality in hospitalized cases with CAP. According to their findings, cases with AP exhibited higher mortality compared to pneumonia without aspiration, which is consistent with our results. Risk factors for mortality in elderly patients with pneumonia were previously studied, and heart failure, high ECOG score, high pneumonia severity index score, shock, Gram-negative bacterial pneumonia, respiratory failure, and renal failure were identified as possible risk factors (21). In a recent study by Shin et al. (22) which focused on risk factors for mortality in isolated AP cases, increasing age and the development of the need for mechanical ventilation during hospitalization were identified as independent risk factors for mortality. Moreover, prolonged hospital stay was highlighted as a factor contributing to increased mortality in patients aged 65 and over.

Similar to the study by Shin et al. (22) our study focused on isolated AP cases, and risk factors for mortality were identified. In our study, factors such as BMI, having more than one caregiver, and a prolonged hospital stay were associated with increased mortality. These findings suggest that our study represents a patient group with a high likelihood of frailty.

Study Limitations

Because of its retrospective nature, this study has some limitations. Some patients were excluded due to data loss. As part of the diagnosis of AP relies on patient or caregiver testimony, we did not perform fluoroscopy. Blood results were obtained at the initial hospital admission, potentially creating disparities between the dates of aspiration and hospital admissions. Detailed information on the hospitalization of patients requiring ICU admission was not available. Additionally, specific radiological evaluations were not included in the study.

Conclusion

In summary, the findings of this study indicate that AP and CAP have different characteristics. In cases of AP, factors such as the need for care, recent hospitalization within the last 3 months, requirement of ICU during hospitalization, and prolonged ICU LoS contribute to an extended duration of hospitalization. Additionally, readmission is associated with higher mortality in this group, cases with fever at admission, high CCI, and ICU need during hospitalization are at risk for readmission. Independent indicators of mortality in AP include high need for care, low BMI, and extended hospitalization.

Ethics

Ethics Committee Approval: This study was approved by the Marmara University Faculty of Medicine Clinical Research Ethics Committee (approval number: 09.2023.1380, date: 03.11.2023).

Informed Consent: The informed consent form was read and signed by the participants to -inform them about the study purpose and methodology.

Footnotes

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Impact of Sleep Quality on Disease Activity and Clinical Outcomes in Older Patients with Inflammatory Bowel Disease

Ⓓ Çağatay Çavuşoğlu[1], Ⓓ Tevhide Şahin[2], Ⓓ Arzu Okyar Baş[3], Ⓓ Merve Güner[4], Ⓓ İlker Boğa[5], Ⓓ Yelda Öztürk[6], Ⓓ Onur Keskin[7], Ⓓ Erkan Parlak[7], Ⓓ Bülent Sivri[7], Ⓓ Meltem Gülhan Halil[3], Ⓓ Mustafa Cankurtaran[3], Ⓓ Taylan Kav[7], Ⓓ Burcu Balam Doğu[3]

[1]University of Health Sciences Turkey, Şanlıurfa Mehmet Akif İnan Training and Research Hospital, Clinic of Internal Medicine, Division of Geriatrics, Şanlıurfa, Turkey
[2]Konya City Hospital, Clinic of Internal Medicine, Division of Geriatrics, Konya, Turkey
[3]Hacettepe University Faculty of Medicine, Department of Internal Medicine, Division of Geriatrics, Ankara, Turkey
[4]Erzurum Regional Training and Research Hospital, Clinic of Internal Medicine, Division of Geriatrics, Erzurum, Turkey
[5]Elazığ Training and Research Hospital, Clinic of Internal Medicine, Division of Geriatrics, Elazığ, Turkey
[6]Eskişehir City Hospital, Clinic of Internal Medicine, Division of Geriatrics, Eskişehir, Turkey
[7]Hacettepe University Faculty of Medicine, Department of Internal Medicine, Division of Gastroenterology, Ankara, Turkey

Abstract

Objective: Sleep quality can affect how inflammatory bowel disease (IBD) is assessed, managed, and monitored in older patients. This study aimed to investigate the relationship between sleep quality, geriatric syndrome, and IBD disease activity in older patients.

Materials and Methods: This study included a cohort of 91 individuals diagnosed with IBD. The Harvey-Bradshaw Index (HBI) and mayo score (MS) were used as tools for assessing disease activity in crohn's disease (CD) and ulcerative colitis (UC), respectively. The Pittsburgh sleep quality index were used (PSQI) to evaluate sleep quality. A logistic regression analysis was performed to identify the independent components of sleep quality.

Results: The median age of the patients was 60 (50-80) years, and 44% (n=40) of the patients were female. The CD group accounted for 46.2% (n=42) of the IBD group. Sleep quality was impaired in 47.6% (n=20) in CD and 46.9% (n=23) in UC. The HBI of those with poor sleep quality was statistically higher than that of those with normal sleep quality [5 (2-9) vs. 4 (1-8), p=0.035]. No significant relationship was found between sleep quality and MS. There was a moderately significant correlation between the PSQI score and the HBI (r=0.509, p=0.008); on the contrary, there was no significant correlation between the PSQI score and MS. Those with active CD had a higher PSQI score than inactive disease [score 6 (1-11) vs. 3 (1-7), p=0.005]. Upon logistic regression analysis, the parameters independently related to sleep quality were GDS-15 [OR=1.680 (1.294-2.180), p<0.001], urinary incontinence [OR=7.706 (1.177-50.463), p=0.033], and 4-m gait speed [OR=0.360 (0.002-0.617), p=0.022].

Conclusion: In patients with IBD, sleep quality can be affected not only by disease activation and geriatric syndromes. Therefore, a comprehensive and inclusive approach, including the utilization of comprehensive geriatric assessment, may be an important component of patient management.

Keywords: Sleep quality, inflammatory bowel disease, geriatric assessment, comprehensive geriatric assessment, activity score

Introduction

Inflammatory bowel disease (IBD) is a chronic illness that presents with various symptoms, including abdominal pain, unintended weight loss, diarrhea (with or without hematochezia), developmental delays, pyrexia, dermatological manifestations, sporadic arthralgia, and joint effusion. IBD frequently presents as two distinct conditions known as ulcerative colitis (UC) and Crohn's disease (CD). Therapy for inflammatory bowel illnesses poses various obstacles, including the chronicity of the condition, influence of patient tiredness on quality of life, potentially severe adverse effects of drugs, and occasional treatment resistance (1).

Sleep disturbances are commonly reported in patients with chronic inflammatory illnesses and are acknowledged as a significant contributing factor to worsening their condition (2). Assessing sleep disruption in patients with IBD is essential, regardless of disease stage. Poor sleep quality may indicate subclinical inflammation, which is a valuable indicator for disease monitoring and treatment. Therefore, it is crucial to incorporate sleep quality assessment into the diagnostic process of IBD (3,4). Sleep disturbances are commonly examined using subjective scales in research studies. The Pittsburgh Sleep Quality Index (PSQI) is commonly used as a metric in cases of IBD (5).

Multiple factors contribute to the onset of sleep disruption among patients diagnosed with IBD. Several factors can influence an individual's sleep quality, such as sadness and anxiety, the presence of an active disease, advanced age, cognitive functioning, elevated levels of inflammatory markers, and substance abuse (6). The application of comprehensive geriatric assessment (CGA) is essential for identifying and managing the diverse psychological, physical, and cognitive challenges frequently observed in the elderly population (7). The sleep quality of older adults diagnosed with IBD is impacted by a range of factors, with geriatric syndromes playing a notable role, particularly in IBD activity.

The primary aim of this research endeavor is to investigate the potential association between sleep quality and clinical outcomes, namely the manifestation of IBD disease and geriatric syndromes, among patients aged 50 years or older who are diagnosed with IBD.

Materials and Methods

Study Design

The research was approved by the Assessment and Evaluation Ethics Sub-Working Group of Hacettepe University Ethics Committee (approval number: 2019/28-29, date: 03.12.2019). Verbal and written informed consent was obtained from all patients.

The present investigation was carried out at the outpatient clinics of Geriatric Medicine and Gastroenterology, situated within a university hospital, from December 4, 2019 to December 4, 2020. This study included individuals aged 50 years who were diagnosed with IBD and sought care at a gastroenterology outpatient clinic for six months. The individuals in question were directed to the geriatric medicine outpatient clinic to undergo comprehensive geriatric assessment and have their sleep quality evaluated subsequent to determining their activation scores. Individuals who were excluded from the study were those with unstable general illnesses, psychiatric disorders, and drug use that had the potential to impact sleep. In total, a subset of 101 patients who were recommended for study inclusion were assessed. Among them, three patients were not in a stable condition, five patients declined to participate, and two patients were eliminated from the study due to their use of antihistamine medications, which have the potential to impact sleep. Consequently, the present investigation was undertaken with a sample size of 91 individuals. Sociodemographic information, chronic medical conditions, medication usage, and timing of IBD diagnosis were documented for the study participants. The comorbid diseases of the patients were assessed using the Cumulative Illness Rating Scale-Geriatric (CIRS-G) scale. The CIRS-G was developed to assess the likelihood of survival among elderly individuals. This assessment employs a scoring mechanism that spans 0 to 4 points, denoting the extent of disease severity across 14 distinct organ systems. The scale's total score spans 0-56 points (8). Following that, the patients received a CGA performed by the same geriatrician. The study assessed various measures related to the functioning and well-being of older adults. These measures included the activities of daily living (ADL) (9,10), instrumental activities of daily living (IADL) (11,12). Mini nutritional assessment-short form (MMSE) (13,14). Fifteen-item geriatric depression scale (GDS-15) (GDS-15) (15,16). Mini nutritional assessment-short form (MNA-SF) (17,18), and 4-m gait speed test. Additionally, grip strength, urinary incontinence (UI), and falls were examined as part of the CGA. The PSQI (19,20) was used to evaluate the sleep quality of the participants.

CGA Parameters

The ADL, which stands for ADL, is a comprehensive assessment tool that evaluates an individual's functional abilities in six domains (9). The scale was validated in a Turkish population by Arik et al. (10). The IADL encompasses a comprehensive set of eight areas: shopping, telephone usage, laundry, housekeeping, food preparation, transportation utilization, prescription management, and financial management (11). Turkish validation of IADL was carried out by Isik et al. (12) The MMSE was designed to evaluate the cognitive functioning of individuals (13). Güngen et al. (14) conducted a validation

study on the MMSE for the Turkish population. The GDS-15 is a psychometric instrument with a numerical range ranging from 0 to 15, specifically designed for evaluating the emotional state of elderly individuals; a score of 5 on binary response questions suggests that the patients being surveyed are potentially susceptible to experiencing symptoms of depression (15). Ertan and Eker (16) conducted research to validate the GDS-15 in the Turkish population. The MNA-SF was employed to evaluate the presence of malnutrition and validated in a Turkish population (17,18).

Assessment of Sleep Quality

PSQI is a thorough assessment tool used to measure sleep quality. The survey comprised a comprehensive set of 24 items, where 19 items were self-reported by the patients, and the remaining five items were completed by their cohabiting partners. Although the scoring method does not incorporate the replies supplied by partners, the inputs offer significant insights into the sleep patterns exhibited by the patients.

Seven specific factors were evaluated to calculate the PSQI score, including subjective sleep quality, sleep onset latency, total sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medicine, and daytime impairment. The cumulative index score is obtained by adding the scores of the seven components together. The PSQI score ranges from 0 to 21, with a score of 5 indicating suboptimal sleep quality. A higher composite score indicates an increased prevalence of sleep quality issues (19). Ağargün et al. (20) validated the PSQI of the Turkish population.

IBD Activity Scores

In this study, two activity indices were used to assess the activity level of individuals diagnosed with IBD. The Harvey-Bradshaw Index (HBI) was employed to assess patients diagnosed with CD. The HBI encompasses four distinct categories: general well-being, abdominal pain, frequency of daily bowel movements, and presence of complications. The cumulative score derived from the index ranged from 0 to 26 points. According to a previous study, a score of 5 points indicates remission, whereas a score ranging from 5 to 7 points suggests mild disease.

Additionally, a score ranging from 8 to 16 points is associated with moderate disease, whereas a score exceeding 16 indicates severe disease (21). Remission was determined using an HBI score of 5 points, whereas active disease was defined as a score of 5 points. The study employed the Mayo Score (MS) for UC Activity, which includes four distinct criteria: stool frequency (ranging from 0 to 3), rectal bleeding (ranging from 0 to 3), flexible proctosigmoidoscopy outcome (ranging from 0 to 3), and physician's global assessment (ranging from 0 to 3). The overall score ranged from 0 to 12, with higher scores indicating greater disease activity (22).

Statistics

The IBM Statistical Package for the Social Sciences (SPSS) software version 22.0 for Windows is used to perform the statistical analyses. Many statistical techniques are involved in analyzing the distribution of numerical parameters, such as constructing a histogram, calculating the coefficients of variation, and conducting the Kolmogorov-Smirnov tests. The statistical tests used to compare categorical variables are presented in numerical and percentage format (n, %), including the chi-squared and Fisher exact tests. The Mann-Whitney U test and Student's t-test were used to evaluate differences between groups in relation to the distribution of quantitative data. A Spearman correlation analysis is performed for numerical parameters that do not have a normal distribution. A univariate analysis was conducted to investigate the variables associated with sleep quality. The multivariate analysis included parameters that exhibited a p-value of less than 0.05 to identify factors that had a significant independent association with sleep quality using the backward stepwise model. Statistical significance is indicated by a significance level of less than 0.05.

Table 1. Characteristic features of patients with Crohn's disease and ulcerative colitis

	Crohn's (n=42)	Ulcerative colitis (n=49)	p
Age (years)	62 (51-80)	59 (50-76)	0.089
Gender, female	19 (47.5%)	21 (52.5%)	0.820
Time of diagnosis (months)	57.50 (2-468)	73 (3-310)	0.181
CIRS-G	6 (2-11)	5 (2-13)	0.039
CRP (mg/dL)	0.46 (0.13-17)	0.37 (0.10-7.79)	0.537
Number of drugs	4 (1-12)	3 (1-11)	0.688
Handgrip (kg)	25.80 (11-63.80)	33.90 (9.40-55.30)	0.020
ADL	6 (5–6)	6 (5–6)	0.755
IADL	7 (6–8)	7 (6–8)	0.852
MMSE	29 (26–30)	29 (23–30)	0.785
GDS-15	2 (0–12)	2 (0–12)	0.559
MNA-SF	13 (7–14)	14 (8-4)	0.635
Falls	8 (72.7%)	3 (27.3)	0.053
Urinary incontinence	7 (50%)	7 (50%)	0.779
PSQI score	4 (1–11)	5 (1–12)	0.917

Categorical variables are presented as n (%), and skew distributed continuous variables are presented as median (min-max).
CIRS-G: Cumulative Illness Rating Scale-Geriatric, CRP: C-reactive protein, ADL: Activities of daily living, IADL: Instrumental activities of daily living, MMSE: Mini-mental state examination, GDS-15: Geriatric depression scale, MNA-SF: Mini nutritional assessment-short form, PSQI: Pittsburgh sleep quality index

Results

The median age of the patients was 60 years (50-80). The median duration from the initial diagnosis to IBD diagnosis was 66 (range: 2-468) months. Patients diagnosed with CD comprised 46.2% (n=42) of the total number of patients diagnosed with IBD. Table 1 presents the overall traits and demographic attributes of individuals diagnosed with CD and residing in the UC. Based on the characteristics of the CGA, no statistically

significant differences were observed between patients diagnosed with CD and those diagnosed with UC, except for the CIRS-G and Handgrip measures. The study observed that the patients' median PSQI score was 4 points, with a range of 1 to 12. A substantial positive association was observed between the PSQI score and HBI (r=0.509, p=0.008). However, no significant correlation was found between the MS and PSQI score (r=0.041, p=0.773). Table 2 presents the correlation between the quality of sleep and the overall features of the patients. No statistically significant correlation was observed between Mayo and PSQI scores. Patients with CD in remission exhibited lower PSQI scores than those with active illness [PSQI score of 3 (1-7) vs. 6 (1-11), p=0.005, respectively]. Table 3 presents the association between PSQI scores and CGA parameters. The analysis revealed substantial correlations between the PSQI score and several CGA parameters, including ADL, 4-meter walking speed, MMSE, GDS-15, and MNA-SF scores. In total, 15.4% of the patient population exhibited symptoms of UI, with 85% of these individuals specifically experiencing urge incontinence. Furthermore, a total of 12% of patients experienced at least one fall within the previous year. No statistically significant link was observed between the pharmaceutical interventions employed for the treatment of IBD and the subjective assessment of sleep quality. Table 4 presents the logistic regression analysis, which evaluates the characteristics independently associated with sleep quality. Harwey-Bredshaw index, GDS -15, falls, UI, 4-m gait speed, and CIRS-G were included in the logistic regression analysis. A review of the correlation between the GDS-15 and PSQI suggested that the GDS-15 score was correlated with the PSQI subcategories, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction (r=0.358, r=373, r=273, r=364, r=451, r=228, r=264; p<0.001, p<0.001, p=0.09, p<0.001, p<0.001, p=0.030, p=0.012, respectively). 4 meter gait speed test was correlated with the subjective sleep quality, sleep duration, and sleep disturbance subcategories of the PSQI (r=-0.216, r=-0.238, r=-0.367; p=0.040, p=0.023, p<0.001, respectively). Although there was no noteworthy

Table 2. Characteristics of patients by sleep quality

	PSQI normal (n=48)	PSQI abnormal (n=43)	p
Age (years)	61 (50-80)	50 (50-73)	0.521
Harvey-Bradshaw score	4 (1-8)	5 (2-9)	0.038
Mayo score	2 (0-9)	3 (0-12)	0.389
CRP (mg/dL)	0.55 (0.13-17)	0.37 (0.10-7.79)	0.377
Time of diagnosis (months)	67.50 (2-324)	61 (3-468)	0.246
Number of drugs	3 (1-11)	4 (1-12)	0.143
CIRS-G	4 (2-9)	6 (2-13)	0.013
4-m gait speed (m/s)	1.08 (0.53-1.88)	0.84 (0.56-1.31)	<0.001
Handgrip (kg)	35.30 (12.20-63.80)	28.30 (9.40-51.50)	0.163
Falls during the last 1 year	2 (18.2%)	9 (81.8)	0.012
Urinary incontinence	2 (14.3%)	12 (85.7%)	0.002
ADL	6 (5-6)	6 (5-6)	0.864
MMSE	29 (25-30)	28 (23-30)	0.070
GDS-15	1 (0-7)	6 (0-12)	0.001
MNA-SF	14 (10-14)	13 (7-14)	0.001
DM	10 (50%)	10 (50%)	0.781
HT	17 (47.2%)	19 (55.2%)	0.393
COPD	9 (81.8%)	2 (18.2%)	0.039
Gender, female	17 (42.5%)	23 (57.5)	0.083
Use of biological agents	15 (45.5)	18 (54.5%)	0.293
Oral steroid use	7 (50%)	7 (50%)	0.823
Oral 5-ASA	30 (50.8)	29 (49.2)	0.622
Methotrexate use	0 (0%)	2 (100%)	0.221
Azathioprine use	15 (55.6%)	12 (44.4%)	0.644
Topical 5-ASA	11 (68.8%)	5 (31.3%)	0.070
Topical steroids	0 (0%)	2 (100%)	0.492

Categorical variables are presented as n (%), and skew distributed continuous variables are presented as median (min-max).
CIRS-G: Cumulative Illness Rating Scale-Geriatric, CRP: C-reactive protein, ADL: Activities of daily living, IADL: Instrumental activities of daily living, MNA-SF: Mini nutritional assessment- short form, DM: Diabetes mellitus, HT: Hypertension, COPD: Chronic obstructive pulmoner disease, 5-ASA: 5-aminosalicylic acid, MS: Mayo score, PSQI: Pittsburgh sleep quality index, MMSE: Mini mental state examination, GDS-15: Geriatric depression scale

Table 3. CGA and correlation with PSQI

	Spearman's rho coefficient (r)	p
ADL	-0.278	p=0.008
MNA-SF	-0.439	p<0.001
GDS-15	0.637	p<0.001
MMSE	-0.263	p=0.012
4-m gait speed (m/s)	-0.255	p=0.013
Handgrip (kg)	-0.138	p=0.191

ADL: Activities of daily living, MMSE: Mini mental state examination, GDS-15: Geriatric depression scale, PSQI: Pittsburgh sleep quality index, CGA: Comprehensive geriatric assessment

Table 4. Logistic regression analysis to determine the independent correlates for sleep quality				
Parameters	**Odds ratio**	**95% confidence interval**		**p**
		Lower limit	**Upper limit**	
GDS-15	1.680	1.294	2.180	<0.001
Urinary incontinence	7.706	1.177	50.463	0.033
4-m gait speed (m/s)	0.360	0.002	0.617	0.022
Harwey-Bredshaw index, Geriatric depression scale-15, falls, urinary incontinence, 4-m gait speed, and CIRS-G were included in the logistic regression analysis. The backward stepwise model was used, and the last model (Step 4) has been presented in this table. GDS-15: Geriatric depression scale-15				

correlation between grip strength and PSQI score, a significant negative correlation was discovered in relation to the sleep latency and sleep disturbance subcategories of the PSQI (r=-0.234, r=-0.320; p=0.025, p=0.002, respectively).

Discussion

The findings of the current investigation elucidated a correlation between disease activity and sleep quality among individuals diagnosed with CD. Furthermore, our study demonstrated an independent correlation between sleep quality and other factors, such as mood, walking speed, and UI, in individuals diagnosed with IBD.

In this study, no significant distinction was observed in terms of sleep quality scores between patients with CD and those with UK. However, HBI was correlated with sleep quality. Conversely, the MS was not correlated with sleep quality. The current investigation yielded results indicating a lack of association between the quality of sleep and activation of UC disease, which is consistent with the existing scholarly literature on the subject matter. According to the cited citation (3,27-29), it can be inferred that there is supporting evidence for the claim. In addition, Gingold-Belfer et al. (23) demonstrated that individuals diagnosed with CD and experiencing heightened disease activation exhibited suboptimal sleep quality. Nevertheless, the quality of sleep remained unaffected in those who did not experience illness activation. A study conducted by Ali et al. (24) demonstrated a potential association between sleep quality and histological inflammatory activity in individuals diagnosed with CD. In contrast to our research, Bazin et al. (25) employed actigraphy, which is a scientifically validated approach for assessing sleep quality. Prospective studies employing objective assessment methods and involving a substantial number of individuals are necessary to enhance our understanding of the causal association between sleep quality and disease activation.

The GDS-15, 4-meter gait speed test, and UI status, which were included in the CGA, were independently associated with sleep quality. Becker et al. (26) discovered a significant correlation between sleep quality and depression in older patients. The findings of the current investigation indicate that the depression score has a negative impact on all subcategories of the PSQI. Individuals diagnosed with IBD have a higher prevalence of

bladder overactivity, nocturia, and urge incontinence. This finding can be attributed to shared sensory afferent neurons connecting the distal colon and bladder and an elevated release of brain-induced neurotrophic factors (27). The increasing intensity and frequency of UI have a detrimental impact on sleep quality. The occurrence of nocturnal incontinence and its frequency has the potential to alter an individual's sleep patterns, resulting in compromised sleep quality (28).

Muscle strength and functionality may influence the sleep quality of older people. The study conducted by Rubio-Arias et al. (29) revealed a positive correlation between improvements in sleep quality and increases in both 4-m gait speed and handgrip strength. The present investigation shows a notable association between 4-m gait speed and PSQI score. This finding can be elucidated by the outcomes of Zhang et al., (30) who suggested that the interplay between muscle strength and sleep quality contributes to the relationship between 4-m gait speed and sleep quality.

In contrast to previous studies (30,31), the current study did not find a statistically significant association between grip strength and PSQI score. Upon analyzing the subcategory scores of the PSQI, a significant association was observed between the subcategories of sleep latency, sleep disruption, and grip strength. The absence of a significant correlation between the overall PSQI score and grip strength may be due to several factors. One potential factor contributing to this phenomenon is the limited sample size of the participants. It is imperative to employ reliable measurement techniques, such as dual-energy X-ray absorptiometry, which is considered the gold standard, to better understand the correlation between muscle power and strength and sleep quality (32).

Assessing the extent of dependency in ADL living is a crucial initial characteristic to consider when evaluating older people. The influence of daily activities on sleep quality has been documented in previous studies (33,34). This study found a statistically significant association between the level of dependency on everyday activities and the quality of sleep.

Malnutrition has been shown to have significant adverse effects on the prognosis of patients with IBD (35,36). Malnutrition has been found to have a negative impact on the quality of sleep experienced by individuals, leading to an increased risk

of developing sleep disorders. Consequently, this can adversely affect the overall quality of life of affected patients (37). In accordance with previous research, the findings of this study indicate a positive association between those experiencing suboptimal sleep quality and elevated MNA-SF scores.

The cognitive status of older adults significantly influences the quality of sleep. Gildner et al. (38) found a favorable association between cognitive test scores and sleep quality. The findings revealed a modest association between the MMSE and PSQI scores, which can be attributed to the lack of homogeneity in the participants' cognitive distributions. Indeed, we determined that only 6% of the subjects exhibited compromised cognitive abilities.

Sleep problems in individuals with CD or UC are closely linked to symptoms assessed by the HBI and MS. Frequent defecation and abdominal pain are primary contributors to poor sleep quality, causing nocturnal awakenings and discomfort that can severely disrupt sleep patterns. Addressing these symptoms through effective disease management can significantly improve the sleep and overall quality of life for affected individuals (39,40).

The study's strength rests in its primary examination of the association between CGA and sleep quality in older individuals with IBD. Prospective studies are required to further investigate the impact of CGA on the sleep quality of individuals with IBD. Moreover, further investigation is required to examine the post-treatment condition of patients and determine the impact of improved sleep quality on geriatric aspects, including nutrition and cognitive function, in individuals with IBD.

Study Limitations

The current study has certain limitations. One notable limitation of this study is the requirement for an impartial metric, such as polysomnography, to assess sleep quality. Moreover, extrapolating the results to a more extensive demographic proved to be difficult given the study's cross-sectional design and restricted sample size. One of the most significant limitations of the study is the lack of an assessment of frailty. Frailty is a geriatric syndrome directly related to an individual's performance, regardless of age, and plays a crucial role in disease prognosis and treatment response. In future studies, the use of appropriate frailty scales for clinical assessment, treatment response, and prognosis evaluation in patients with IBD could contribute significantly to the literature. The inadequate number of both active and inactive patients with CD and UC in our study is a significant issue. This affects the generalizability of the findings. Therefore, these numbers of patients did not yield statistically significant results and could not be generalized. In future studies to investigate the relationship between CGA and severity, researchers should consider an adequate number of active and inactive patients.

Another limitation of our study was the lack of evaluation of sleep, stool frequency, and pain. This assessment could not be performed because the subcomponents of the HBI and Mayo scoring were not recorded in the dataset.

Conclusion

Older IBD patients' treatment and management should not only consider disease activation but also geriatric syndromes, including sleep problems. CGA with its multifaceted approach, can play a significant role in the appropriate evaluation, diagnosis, treatment, and follow-up of this vulnerable population. Incorporating CGA alongside disease activation scores in the management of commonly encountered sleep disturbances should be considered as part of an appropriate approach.

Ethics

Ethics Committee Approval: The research was approved by the Assessment and Evaluation Ethics Sub-Working Group of Hacettepe University Ethics Committee (approval number: 2019/28-29, date: 03.12.2019).

Informed Consent: Verbal and written informed consent was obtained from all patients.

Footnotes

Authorship Contributions

Concept: Ç.Ç., T.Ş., M.G., E.P., B.S., M.G.H., B.B.D., Design: Ç.Ç., T.Ş., A.O.B., İ.B., Y.Ö., O.K., M.C., B.B.D., Data Collection or Processing: Ç.Ç., T.Ş., M.G., O.K., M.G.H., M.C., T.K., Analysis or Interpretation: Ç.Ç., A.O.B., M.G., İ.B., E.P., B.S., M.C., T.K., B.B.D., Literature Search: Ç.Ç., A.O.B., E.P., B.S., M.C., T.K., B.B.D., Writing: Ç.Ç., İ.B., O.K., E.P., B.S., B.B.D.

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Validation and Reliability Study of the Turkish Version of the Social Health Scale for the Elderly

Celalettin Cevik[1], Hakan Baydur[2], Raziye Ozdemir[3], Sait Sonmez[4]

[1]Balikesir University Faculty of Health Sciences, Department of Public Health Nursing, Balikesir, Turkey
[2]Manisa Celal Bayar University Faculty of Health Sciences, Department of Social Work, Manisa, Turkey
[3]Karabuk University Faculty of Health Sciences, Department of Midwifery, Karabuk, Turkey
[4]Balikesir University, Institute of Health Sciences, Department of Public Health Nursing, Balikesir, Turkey

Abstract

Objective: To evaluate the psychometric properties of the Turkish version of the Social Health Scale for The Elderly (SHSE) scale.

Materials and Methods: This methodological study was conducted with aged ≥60 years living in two urban and semi-urban neighborhoods in Balikesir between September 2020 and November 2020 by holding face-to-face interviews. The data of the study were collected using the SHSE, multidimensional scale of perceived social support, EuroQol-5D (EQ-5D) quality of life questionnaire, and WHO-5 Well-Being Index. In the analysis, in addition to descriptive findings, Cronbach's alpha value and confirmatory factor analysis were performed using SPSS 25.0, jasp 0.14, and lisrel 9.1.

Results: Cronbach's alpha values for the overall SHSE and its perceived environmental resource (PER), social adjustment (SA), and social support (SS) subdimensions were 0.89, 0.95, 0.63, and 0.54, respectively. The confirmatory factor analysis summary goodness of fit values of the scale were 0.067 for the root mean square error of approximation, 0.968 for the comparative fit index, and 0.087 for the standardized root mean square residual. The test-retest correlation coefficient of the scale was 0.99 for the overall SHSE and 1.00, 1.00, and 0.95 for its PER, SA, and SS subdimensions, respectively.

Conclusion: The SHSE used in this study is a valid and reliable scale for Turkish society. It contains psychometric features that can be used in the assessment of the social health of the elderly. The SHSE can be used not only to investigate the risks or protective factors of social health but also to comprehensively assess health status in conjunction with other health domains.

Keywords: Social health, quality of life, reliability, validity, elderly.

Introduction

The elderly population, which forms an important part of society due to its increasing number, should be carefully followed up. The study predicts that the number of people aged 60 and over in the world is 900 million, which may increase to 2 billion by 2050, and that 80% of this elderly population will be in low/middle income countries (1). In Turkey, the elderly population is expected to comprise 10.2% in 2023 and is expected to be 12.9% in 2030, and 22.6% in 2060 (2). On the other hand, although the life expectancy of the elderly is prolonged, they are considered as weak and vulnerable, and in the at-risk group in terms of health; thus, they should be followed up carefully, their risk factors should be clearly identified, and priority should be given to inclusive health and social services aimed at eliminating these risk factors (3-5). As defined by the World Health Organization (WHO), "health not only is the absence of a disease or disability but also is a state of complete physical, mental and social well-being" (6). On the other hand, in the elderly population, the concept of complete well-being differs. Many older adults with few chronic diseases can consider themselves healthy enough. However, under normal conditions, high cognitive and physical functionality means that the level of active social participation is high (7). Therefore, if the health status of the elderly is to

Cevik et al. Properties of the Social Health Scale for the Elderly

Eur J Geriatr Gerontol 2024;6(3):185-193

be described comprehensively and accurately, measurements specific to their health status should be used. The concept of social health can be measured in terms of social support, social adjustment, and perceived environmental resources, which include the social health of the individual and society (8). These concepts are associated with loneliness in older adults (9) and their quality of life (10). In addition, the environment in which older adults live has the potential to affect their psychological and physical health (11). Another important aspect of the evaluation of social health is the necessity of obtaining data on the social health of society. In fact, a society will be healthy only if it can access the necessary services equally and fairly and if its health outcomes are positive. Due to the increase in the elderly population, there is a need for a valid and reliable measurement tool to assess the health and social health of older adults. Moreover, cultural adaptation of the Social Health Scale for The Elderly (SHSE) is important since no developed and adapted scale to assess the social health of the elderly in Turkey exists. This study aimed to evaluate the psychometric properties of the Turkish version of the SHSE scale.

Materials and Methods

This methodological study was conducted by interviewing people aged sixty and over in the urban Gaziosmanpasa and semi-urban Sütlüce neighborhoods in Balikesir city center between September 2020 and November 2020. Balikesir is a province whose socioeconomic development is above the average of Turkey and is dominated by the agricultural, livestock, and tourism sectors. Balikesir, which has a median age of 40.20 years, ranks sixth in Turkey in terms of the rate of its elderly population (16.1%) (12).

Ethics

Ethics Committee Approval, the study was approved by the Clinical Research Ethics Committee of Balikesir University Faculty of Medicine (approval number: 2020/154, date: 09.09.2020) and was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants.

Participants

The study population consists of 2528 people. We aimed to have a sample size equal to at least 5-10 times the number of items in the scale (13). Within this context, we reached 250 people aged 60 and over, who were able to answer all the questions and who volunteered to participate in the study, communicate in Turkish, and use the multi-stage sampling method.

Assessment Tools

The data of the study were collected using the Multidimensional Scale of Perceived Social Support, EQ-5D Quality of Life Questionnaire, WHO-5 Well-Being Index, SHSE, and Personal Information Form.

Personal Information Form: This form consists of 16 items that question the participants' sociodemographic characteristics and healthy lifestyle characteristics and was developed by the researchers (4,8,14,15).

EQ-5D Quality of Life Questionnaire: We preferred to use the EQ-5D quality of life questionnaire in our study because it is an internationally used and widely applied tool administered specifically to the age group evaluated in our study (8). The Turkish version of the scale, which was developed by the EuroQoL group in 1990 and translated into 171 languages, was used (16). The EQ-5D is a self-report scale consisting of five questions and five dimensions: mobility, self-care, usual activities of daily living, pain and discomfort, and anxiety and depression. Responses to the questions were rated on a three-point Likert scale. Scores on the five dimensions of the scale range from -0.59 to 1, where 0 indicates death, 1 indicates perfect health, negative values indicate loss of consciousness, being bedridden, etc. shows their status.

Multidimensional Scale of Perceived Social Support (MSPSS): Another tool we preferred was the multidimensional scale of perceived social support (MSPSS) because it is widely used internationally and administered specifically to the age group assessed in our study (17, 18). The MSPSS developed by Zimet et al. (19) in 1988 and adapted into Turkish by Eker and Arkar (20) in 1995 consists of 12 items and 3 subdimensions: family, friend, and a significant other. Each subdimension includes four items. Each item was rated on a 7-point scale. The total scale score is obtained by summing the scores for each item. The higher the score, the higher the level of perceived social support is (19, 20).

WHO-5 Well-Being Index Scale (WHO-5): We also preferred the WHO-5 because it is widely administered in many studies to assess the mental well-being of older adults, particularly the mental well-being of those in the age group evaluated in the present study (21, 22). The scale consisting of five items probing emotional well-being during the previous two weeks was adapted into a Turkish one by Eser et al. (21) Each item is scored between 1 and 5. The lowest score indicates the absence of well-being, whereas the highest score indicates the highest level of well-being.

The Social Health Scale for the Elderly: The SHSE, which was developed by Bao et al. (8) in 2018, is used to assess the social health of the elderly. This study consists of 25 items and the following 3 sub-dimensions: perceived environment, social adjustment and social support (8). To calculate the scale score, first, the raw values of the answers given to the scale items are converted to a value ranging between 0 and

Eur J Geriatr Gerontol 2024;6(3):185-193

Cevik et al. Properties of the Social Health Scale for the Elderly

4. Then, the normalized score calculation for the overall scale and its dimensions is performed using the following formula, as suggested in the original version. In this calculation, the scores obtained with a mean of 50 and a standard deviation of 10 according to T scoring were calculated using the formula below, considering the distribution's own values (mean and standard deviation values) ([Supplementary material 1](#), [Supplementary material 2](#)).

Normalized Score Calculation

$$T_i = 50 + 10 \times (R_i - M_n) / SD_n$$

In the formula, Ti indicates the standard t score for the individual whose score is to be calculated, Ri indicates the raw calculated score for the individual, Mn indicates the mean of the calculated raw scores, and SDn indicates the standard deviation of the calculated raw scores. The total score ranges from 25 to 125; a higher score indicates greater social health.

Data Collection

The first interviews with the participants (n=250) were conducted face-to-face. The second interview for the test-retest (n=50) was conducted by phone to eliminate the possibility of being in the pandemic period and not being able to be at home. The second interview data were collected by making a phone call by randomly selecting people who shared their phone numbers in the first interview. The data was collected during the coronavirus disease-19 pandemic. For this reason, while interviewing the elderly, who are vulnerable groups during the pandemic, data were collected by following pandemic precautions, such as wearing masks, distance, and hygiene to prevent contamination. In the present study, the streets in the neighborhoods were accepted as clusters, and 25 people in each of the 10 randomly determined streets were reached, making up 250 people. To determine the reliability of the scale over time, it is recommended to apply the same test to the same sample group at 2-3 weeks intervals (23). Two weeks after data collection, SHSE was re-administered to 50 people randomly selected from the study group. The questionnaire was administered to the participants twice at a two-week interval. Of the participants who met the inclusion criteria (in line with the principles of anonymity, privacy, and general ethics) and participated in the first survey, they were asked whether they wanted to take part in the second survey to be administered two weeks later and to provide their telephone numbers.

Scale Adaptation Steps: The stages of adapting the scale to Turkish are as follows:

1. Translation of the scale from English to Turkish by two translators independent of each other,

2. Combining Turkish translations and creating a translated version agreed upon

3. The back-translation of the agreed translation into English by a native English speaker

4. Comparison of the back-translated scale with the original English version

5. Discussing and reaching consensus on problematic items in backward and forward translated texts,

6. The scale translated into Turkish and revised is sent to the author who developed the scale and accepted as the final version after his approval,

7. Administrating the pre-test (cognitive inquiry),

8. Forming the final version of the scale (24).

Statistical Analysis

The SPSS 25.0, Jasp 0.14.1, and Lisrel 9.1 programs were used to analyze the research data. The SPSS 25.0 program was used for descriptive statistics, and the Jasp 0.14.1 program was used for reliability analysis, criterion and known groups validity. Confirmatory factor analysis was performed using the lisrel 9.1 and jasp 0.14.1 programs. The content validity of the scale was evaluated by obtaining expert opinion (Davis method). The scale was evaluated by 5 experts who work in the field of elderly health. Item analysis was performed on application data obtained from the Turkish version of the scale. Then, based on the confirmatory approach, reliability and validity analyses were performed according to the classical test theory. Raw distributions of the responses given by the participants to the scale items and the mean±SD, median, minimum, and maximum values for the dimension scores, and the floor and ceiling effects are presented. In addition, the difficulty level of each item was presented.

In the reliability analysis, the Cronbach's alpha value, which is the internal consistency coefficient of the overall scale and its subdimensions, the alpha value obtained after the item was deleted from the overall scale and the relevant dimension, and the item-total correlation were given.

In the validity analysis, confirmatory factor analysis, convergent validity, and discriminant validity were examined. Because this study is a scale adaptation study, we only tested to what extent the existing structure produced a result that was compatible with the conceptual structure. Thus, maximum likelihood confirmatory factor analysis was performed. The three-dimensional structure and the items that constitute this structure were analyzed.

In the criterion validity test, social support, well-being, and quality of life scales and correlation coefficients were considered. For the validity of the known groups, the comparison of various sociodemographic characteristics and scale scores was performed using the t-test, and the mean differences and significance of the results were presented using effect sizes.

Cevik et al. Properties of the Social Health Scale for the Elderly

Eur J Geriatr Gerontol 2024;6(3):185-193

Results

In the study, 250 people aged ≥60 years were included. The mean age of the participants was 68.3±6.2 years. Of these, 52.8% were women, 90.0% were married, 57.6% were primary school graduates, 8.0% were employed, and 26.4% had chronic diseases (Table 1).

Content validity was assessed using the Davis technique (1992). Content validity and concurrent face validity were evaluated by 5 academicians that were experts in the field of the elderly in Turkey. The content validity rates of the scale items ranged from 0.86 to 1.

The distribution of scores for the overall scale and its subdimensions and items are presented in Table 2. After the distribution range of each item was transformed to between 0

Table 1. Descriptive characteristics of the research group		
Variable	n	%
Years mean (SD)	68.32	6.23
60-69	164	65.6
70-79	72	28.8
80 and above	14	5.6
Gender		
Female	132	52.8
Male	118	47.2
Marital status		
Married	225	90.0
Spouse deceased	22	8.8
Lives separately	3	1.2
Education		
Primary school	144	57.6
Middle school	35	14.0
High school	44	17.6
University and above	27	10.8
Job (preretirement / ongoing)		
Housewife	107	42.8
Employee	51	20.4
Officer	56	22.4
Small business	11	4.4
Freelance	10	4.0
Farmer	15	6.0
Income		
Income is less than expenses	96	38.4
Income equals expenses	135	54.0
Income more than expenses	19	7.6
Working		
Yes	20	8.0
No	230	92.0
Health insurance		
General health insurance	225	90.0
Social security	25	10.0

Table 1. Continued		
Variable	n	%
Living alone		
Yes	15	6.0
No	235	94.0
Perception of sleep quality		
Good	171	68.4
Middle	69	27.6
Bad	10	4.0
Smoking		
Yes	42	16.8
No	161	64.4
Left	47	18.8
Alcohol use		
Yes	5	2.0
No	218	87.2
Left	27	10.8
Number of vegetables and fruits consumed daily (portion)		
0	27	10.8
1	200	80.0
2 and above	23	9.2
Bread type		
Whole wheat / bran	220	88.0
White bread	30	12.0
Oil type		
Olive oil	88	35.2
Sunflower oil	162	64.8
Chronic disease		
Yes	66	26.4
No	234	93.6
Total	250	100.0
n: count, SD: Standard deviation		

Eur J Geriatr Gerontol 2024;6(3):185-193

Cevik et al. Properties of the Social Health Scale for the Elderly

and 4, mean scores, deviations, and item difficulty values were presented. According to the obtained values, while items 22, 14, and 25 had the highest item difficulty at the level of 0.17, 0.22, and 0.29, respectively, items 20, 1, and 15 had the lowest item difficulty at the level of 0.89, 0.78, and 0.76, respectively. The maximum percentage of floor and ceiling effects for the overall scale and each dimension was 3.6%.

According to the analysis of the internal consistency coefficients, Cronbach's alpha values for the overall SHSE and its social support, social adjustment, and perceived environmental resources subdimensions were 0.90, 0.95, 0.63, and 0.67, respectively.

When an item was deleted, alpha values were sufficient except for items 11 and 22. Except for items 14, 22 and 24 in the scale, the correlation coefficients between all other items and their dimensions were greater than 0.30. To check the stability of the scale over time, the SHSE was re-administered to 50 people, and the intraclass correlation coefficient was determined as ≥0.95. The suitability of the data for factor analysis was performed using the KMO value and Bartlett's sphericity test. According to

Table 2. Item analysis and reliability results								
Item (I)	Mean±SD	Item difficulty	r	α del	α	ICC	Floor effect %	Ceiling effect %
Social support	2.67±0.32				0.95	1.00	0.0	3.6
I01	3.11±0.98	0.78	0.83	0.95				
I02	2.63±0.95	0.66	0.81	0.95				
I03	2.97±1.01	0.74	0.83	0.95				
I04	2.87±0.99	0.72	0.82	0.95				
I05	2.52±0.90	0.63	0.80	0.95				
I06	2.76±1.03	0.69	0.76	0.95				
I07	2.94±1.00	0.73	0.82	0.95				
I08	2.66±0.98	0.67	0.79	0.95				
I09	2.61±1.00	0.65	0.79	0.95				
I10	2.74±0.99	0.69	0.84	0.95				
I11	2.00±0.83	0.50	0.56	0.96				
I12	2.17±0.98	0.54	0.66	0.95				
Social adjustment	1.86±0.84				0.63	0.98	0.0	0.0
I13	1.40±1.22	0.35	0.28	0.63				
I14	0.89±0.94	0.22	0.27	0.62				
I15	3.04±0.84	0.76	0.25	0.62				
I16	2.59±1.00	0.65	0.45	0.55				
I17	2.02±1.14	0.51	0.53	0.51				
I18	1.24±0.88	0.31	0.41	0.57				
Perceived environmental resources	1.85±0.91				0.67	0.95	0.0	0.0
I19	1.73±1.17	0.43	0.59	0.56				
I20	3.54±0.76	0.89	0.28	0.66				
I21	2.21±1.34	0.55	0.32	0.66				
I22	0.68±1.16	0.17	0.15	0.70				
I23	1.73±0.83	0.43	0.70	0.56				
I24	1.14±0.97	0.29	0.19	0.68				
I25	1.93±0.90	0.48	0.60	0.58				
SHSE Total	2.25±0.75				0.90	0.99	0.0	0.0

SD: Standard deviation, r: item rest correlation, α del: Cronbach's α if item deleted, α: Cronbach's α, Avr.: Average inter-item correlation, ICC: Intraclass correlation coefficient (for the test-retest analysis), SHSE: Social health scale for the elderly

Cevik et al. Properties of the Social Health Scale for the Elderly

Eur J Geriatr Gerontol 2024;6(3):185-193

the KMO test, the Mokken scaling analysis values of the items varied between 0.41 and 0.96, which was considered suitable for factor analysis performed according to the results of the Bartlett test of sphericity (χ^2=4036,453, p<0.001). To confirm the construct validity of the scale, a confirmatory factor analysis was performed. The analysis of the goodness-of-fit results demonstrated the following: χ^2/df=2.11, CFI=0.968, TLI=0.965 and GFI=0.961. The error fit values, root mean square error of approximation (RMSEA) was 0.067 and standardized root mean square residual (SRMR) was 0.087. In the examination of the scale items, the items that caused inadequate fit in terms of factor loadings and error variance were items 13, 20, 21, and 23 (Figure 1).

Correlation analysis was performed between the scores obtained from the overall scale and its subdimensions and the scores for social support, well-being, and quality of life to establish the criterion validity of the scale. A significant correlation was observed between the scores for the overall scale and its sub-dimensions (p<0.01).

The correlation coefficients between the total SHSE score and Social Support, WHO-5, EQ-5D QoL, and EQ-5D VAS scores were 0.54, 0.26, 0.36, and 0.28, respectively (Table 3).

According to the results of the known-groups validity analysis, there was a significant relationship between sex, education status, place of residence, health perception, presence of a chronic disease, and SHSE total score. The highest significant effect size was related to the presence of a chronic disease, whereas the lowest significant effect size was related to educational status. There was a significant relationship between social support and variables such as place of residence, health perception, and presence of chronic disease; social adjustment was associated with variables such as sex, income, place of

residence, health perception, and chronic disease; and perceived environmental resources were associated with variables such as education, income, health perception, and presence of a chronic disease (Table 4).

In the research group, after the suitability of the psychometric properties, the SHSE mean score is 50.76±9.94, the mean social support subscale mean score is 50.67±9.85, the mean Social Adjustment subdimension mean score is 50.34±10.25,
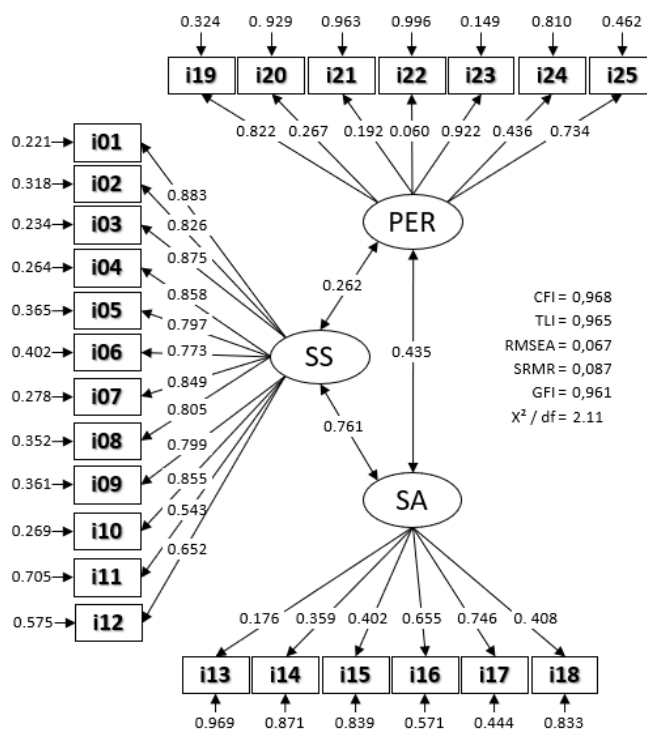
Figure 1. Confirmatory factor analysis

Table 3. Correlation between the SHSE scale and social support, well–being, and quality of life

Variables	Social support	Social adjustment	Perceived environmental resources	SHSE
1. Social support	–			
2. Social adjustment	0.56***	–		
3. Perceived environmental resources	0.17**	0.33***	–	
4. SHSE	0.91***	0.74***	0.50***	–
5. MSPS significant other	0.52***	0.44***	0.24***	0.57***
6. MSPS family	0.19**	0.16*	–0.04	0.17**
7. MSPS friend	0.34***	0.36***	0.14*	0.37***
8. MSPS total	0.50**	0.44***	0.23***	0.54***
9. WHO-5	0.17**	0.28***	0.29***	0.26***
10. EQ-5D QoL	0.32***	0.26***	0.23***	0.36***
11. EQ-5D VAS (0-100)	0.19**	0.29***	0.26***	0.28***
*p< 0.05, **p< 0.01, ***p< 0.001, SHSE: Social Health scale for the Elderly, MSPS: Multidimensional Scale of Perceived Social Support, WHO-5: Well-Being Index				

Table 4. Known-groups validity, effect size								
Variables	**Social support**		**Social adjustment**		**Perceived environmental resources**		**SHSE**	
	Loc.	d	Loc.	d	Loc.	d	Loc.	d
Sex **(Male–female)**	−1.88	0.19	−8.09	0.88***	0.48	0.04	−3.35	0.34**
Age **(60 to 74–over 75)**	1.70	0.17	3.13	0.31	0.97	0.08	2.28	0.23
Education status **(Below primary–above secondary)**	−0.86	0.09	−2.00	0.2	−6.63	0.59***	−2.89	0.29*
Income **(insufficient–sufficient)**	0.88	0.09	−2.55	0.26*	−6.04	0.53***	−1.67	0.17
The district lived in **(urban–semi–urban)**	−5.06	0.52***	−3.62	0.37***	−0.51	0.04	−4.65	0.48***
Perception of health status **(bad–well)**	−5.71	0.59***	−3.60	0.36*	−5.18	0.45***	−6.35	0.66***
The presence of chronic disease **(yes–no)**	−7.75	0.82***	−6.18	0.64***	−6.16	0.54***	−8.72	0.94***

*p <0.05, **p <0.01, ***p <0.001,
Loc.: Location parameters (mean differences), d: Cohen's d (0.2 small, 0.5 medium, 0.8 large) effect size, SHSE: Social Health scale for the Elderly

and the mean perceived environment subscale mean score is 50.63±9.96.

Discussion

This study evaluated the psychometric properties of the Turkish version of the long form of the SHSE developed by Bao et al. (8) which contains 25 items. In the literature, Bao et al. (8) conducted a study in China with people aged 60 years and over (n=2415) to develop the SHSE. However, the SHSE has not yet been adapted to other languages other than the present study; therefore, in the discussion section, only the results of Bao et al.'s (8) study and those of the present study are discussed and compared. Validity and reliability analyses were performed using a confirmatory approach. According to the results obtained from the study, the scale has a psychometric performance so that it can be administered to the Turkish elderly population. For the overall SHSE and each dimension, the percentage of floor and ceiling effect was maximum 3.6%. Accordingly, no ceiling or floor effect (expected to be less than 15%) was observed for any dimension score (25). According to the internal consistency coefficients of the scale subdimensions, the Cronbach's alpha values of the overall SHSE and its social support, social adjustment, and perceived environmental resources subdimensions were 0.90, 0.95, 0.63, and 0.67, respectively (23). Although Cronbach's alpha was slightly below the generally accepted value of 0.7 for the social adjustment and perceived environmental resources subdimensions, it was at an acceptable level for the overall SHSE and its Social Support subdimension. In Bao et al.'s (8) study, the standardized Cronbach's alpha coefficient was 0.79 for the overall SHSE

and 0.85, 0.61, and 0.65 for the perceived environmental resource, social adjustment, and social support subdimensions, respectively. Bao et al. (8) conducted a study on the short version of the SHSE in 2018 by interviewing people aged 60 years and over in China and found that the test-retest variability of the scale was 0.77, the internal consistency reliability was 0.79, the concurrent validity was 0.64, and the goodness of fit was 0.97 (8). This value should not exceed the alpha value of each item. The Cronbach's alpha values of the items, except for the items 11 and 22, whose alpha values exceeded the expected value, adequately contributed to the dimension. Bao et al. (8) conducted a study on the short version of the SHSE-long form in 2018 by interviewing people aged 60 years and over in China, and they determined that test-retest variability of the scale was 0.77, its internal consistency reliability was 0.79, its co-validity was 0.64, and its goodness of fit was 0.97 (8). In Iran, Fahimian et al. (26) In the SHSE adaptation study, which was conducted by interviewing 160 elderly people, the internal consistency of the scale was found to be high, similar to our study. In a cross-sectional study conducted in Iran using the SHSE scale, the total SHSE score and subscale scores were found to be between 0.70 and 0.91, respectively, at an acceptable level, similar to our study (27).

The results of the confirmatory factor analysis of the goodness of fit performed in the construct validity of the scale demonstrated the following: χ^2/df=2.11, CFI=0.968, TLI=0.965 and GFI=0.961. The error fit values, RMSEA was 0.067 and SRMR was 0.087. It was determined that the scale produced acceptable results in terms of both fit and error, which was consistent with the results obtained in Bao et al. (8) study.

Cevik et al. Properties of the Social Health Scale for the Elderly

Eur J Geriatr Gerontol 2024;6(3):185-193

According to the analysis of the scale items, the items causing insufficient fit in terms of factor loading and error variance were items 13, 20, 21, and 23. According to the analysis of these questions, the frequency of doing housework, access to public transportation, transportation to a sports area/social facility, and low level of compliance with recreational services in the living environment may be due to the limited environmental regulations specific to older adults, low perception of old age in Turkish society, limited services for older adults, and limited environmental regulations specific to older adults by local governments; in other words, social and institutional consciousness has not yet been established. The other items had factor loadings and error variances that were compatible with the whole. According to the analysis of these questions, the frequency of doing housework, access to public transportation, transportation to a sports area/social facility, and low level of compliance with recreational services in the living environment may be due to the limited environmental regulations specific to older adults, low perception of old age in Turkish society, limited services for older adults, and limited environmental regulations specific to older adults by local governments; in other words, social and institutional consciousness has not yet been established. Our review of various studies demonstrated that there was not an ideal model in this regard in Turkey (3) and that older adults faced various inequalities (4). According to the correlation analysis between the scores obtained from the overall SHSE and its subdimensions and the scores for the criterion validity and social support, well-being, and quality of life, there was a significant correlation between the overall SHSE score and the subdimension scores (0.50-0.91). Consistent with our study, in Bao et al.'s (8) study, the correlation between the subdimension scores and the overall SHSE score ranged between 0.61 and 0.81. In the present study, the correlation coefficients between the total SHSE score and social support, WHO-5, EQ-5D QoL, and EQ-5D VAS scores were 0.54, 0.26, 0.36, and 0.28, respectively; in other words, the criterion validity was moderately strongly correlated. In Bao et al.'s (8) study, a moderate relationship between social support and the two scales on which the SHSE score was evaluated.

According to the results of the known-groups validity analysis, there was a significant relationship between the SHSE total score and variables such as sex, education status, place of residence, health perception, and presence of chronic disease. The SHSE is sensitive to many sociodemographic characteristics. In the study in which the SHSE was developed by Bao et al. (8), the SHSE score was higher in women aged 60-69 years, those living in urban areas, high school/university graduates, married ones, those not living alone, non-smokers, those who had no disability in doing movements and performing self-care, and those with high educational status. The two studies are similar

in terms of discrimination, and the groups that can be defined as disadvantaged have low social health in both studies. Lu et al. (28) conducted a study to investigate the relationship between quality of life and the SHSE in people aged 60 years and over in China. They stated that the SHSE is distinctive and can be used in the assessment of social health (28). In a cross-sectional study conducted in Iran, the distinctiveness of the scale was demonstrated, and it was found that there were significant differences in marital status, participation in recreational activities, educational status, income, employment status, and participation in exhibitions (27).

Study Limitations

The limitation of the study is that some of the characteristics of the participants related to the SHSE, well-being, quality of life, and social support were questioned based on their self-report. Another limitation is that there is limited research on the social health of the elderly, and horizontal discussions were often conducted in the discussion section.

Conclusion

The Turkish version of the SHSE is valid and reliable. The psychometric properties of the scale are distinctive and compatible. The scale can be used to determine the social well-being of elderly people. We recommend that cultural differences in the scale be investigated and compared in detail. The SHSE can be used not only to investigate the risks or protective factors of social health but also to comprehensively assess health status in conjunction with other health domains.

Ethics

Ethics Committee Approval: Ethics Committee Approval, the study was approved by the Clinical Research Ethics Committee of Balikesir University Faculty of Medicine (approval number: 2020/154, date: 09.09.2020) and was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent: Informed consent was obtained from all participants.

Eur J Geriatr Gerontol 2024;6(3):185-193

Cevik et al. Properties of the Social Health Scale for the Elderly

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ORIGINAL RESEARCH

Malnutrition, Sarcopenia, and Dysphagia Awareness: We Still Below the Expected Point

● Ekin Oktay Oğuz, ● Pelin Ünsal

Etlik City Hospital, Clinic of Internal Medicine, Division of Geriatrics, Ankara, Turkey

Abstract

Objective: Malnutrition prevalence is approximately 40-50% in hospitalized patients, especially patients followed at internal medicine clinics who have polymorbidities and are at increased risk of malnutrition. The aim of this study was to determine awareness among internal medicine research assistants regarding the assessment of malnutrition, sarcopenia, and dysphagia, which are frequently observed in patients attending internal medicine clinics.

Materials and Methods: A questionnaire consisting of nine questions was applied to the Etlik City Hospital Internal Medicine research asistants who agreed to participate in the survey based on previous studies conducted by the researchers.

Results: Forty-four (86.3%) of the internal medicine research assistants thought that they were insufficiently knowledgeable about nutrition management. Twenty-two (43.1%) participants stated that they regularly evaluated the nutritional status of every older patient in a hospital setting. 2% (n=1) and 5.9% (n=3) of participants, respectively, performed valid tests for malnutrition and dysphagia screening, and internal medicine research assistants did not report using any reliable tests to screen for sarcopenia. Retrospectively, 35.3%, 47.1%, and 52.9% of those surveyed did not routinely screen for malnutrition, dysphagia, or sarcopenia. Research assistants in internal medicine were divided into two groups based on their profession time.There was no difference about nutrition knowledge, malnutrition, dysphagia and sarcopenia screening between the two groups. We found that the nutritional knowledge of internal medicine residents is inadequate.

Conclusion: Nutritional interventions require multidisciplinary work, and all healthcare professionals should increase their awareness and knowledge about nutrition in routine clinical practice.

Keywords: Malnutrition, sarcopenia, dysphagia, survey, internal medicine

Introduction

Malnutrition is defined as an insufficient intake of nutrients, such as energy and protein, leading to impairment of body composition (1). In particular, patients followed-up at internal medicine clinics are at increased risk of malnutrition. The prevalence of malnutrition in hospitalized patients is approximately 40-50%, and it increases with age and the presence of polymorbidities (2). Malnourished patients require more assistance with activities of daily living, longer hospital stays, and greater risks of complications and readmissions (3). Furthermore, the mortality rate of patients who received nutritional care after discharge was reduced (4). Sarcopenia

and dysphagia, which are both causes and consequences of malnutrition, are also important geriatric syndromes. Sarcopenia is a syndrome characterized by progressive loss of muscle mass and strength, which is a significant cause of disability (5). Dysphagia is a condition characterized by difficulty swallowing food or liquid from the mouth to the stomach, which can lead to malnutrition, dehydration, and aspiration pneumonia (6). All three conditions include overlapping clinical features, shared common pathophysiological mechanisms, and are associated with worse outcomes (7). The syndromes of malnutrition, sarcopenia, and dysphagia should be well recognized by internal medicine physicians. However, studies have revealed a fairly low degree of awareness regarding nutrition (8). According to

a recent study, only a small number of patients are diagnosed with malnutrition and receive nutritional support therapy, even though up to 50% of patients are at risk for malnutrition (9). The main cause of undiagnosed malnutrition, sarcopenia, and dysphagia is a lack of awareness of the essential role of nutritional support. This is due to insufficient nutrition education received by research assistants and medical schools (10,11). The present study aimed to determine the awareness of internal medicine research assistants regarding malnutrition, sarcopenia, and dysphagia assessment.

Materials and Methods

A questionnaire was recommended to evaluate the awareness of malnutrition among the internal medicine research assistants before the Etlik City Hospital Internal Medicine Clinic Training Meetings, which had the topic of "malnutrition in older patients". A questionnaire consisting of nine questions was applied to the research asistants who agreed to participate in the survey, based on previous studies conducted by the researchers. The main subjects included in the questionnaire were the demographics of the participants, awareness of malnutrition, and proficiency in screening for and evaluating malnutrition, sarcopenia, and dysphagia. The study was approved by the Local Ethics Committee of Etlik City Hospital (approval number: AEŞH-EK1-2023-121, Date: 03.05.2023). All participants provided written informed consent, and the study was conducted in accordance with the Helsinki Declaration.

Statistical Analysis

Out of the 106 internal medicine research assistants, 51 of whom were invited and worked at Etlik City Hospital during the study, completed the survey. Considering that the participation rate in a similar survey among oncologists in a previous study was 5.7% (12), in the power analysis, it was decided to include a sample size of this study n=50 internal medicine research assistants in the study group with a margin of error of 0.05 and a power of 90%. Descriptive statistics are presented as median (25th percentile-75th percentile) for variables with a skew distribution and as percentage (%) for categorical variables. The chi-square test, or Fisher's exact test, was used to compare participants' answers to the questionnaire and their number of years in the profession. A p value<0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics, Version 23 (Armonk, NY: IBM Corp.).

Results

A total of 51 internal medicine research assistants were included in the study. The median profession time of research assistants is 2 (1-4) years.

Forty-two (82.4%) of the participants believed that malnutrition had a large effect on the prognosis of older patients followed

in internal medicine clinics, whereas nine (17.6%) felt that malnutrition had a moderate impact. There are no participants who point out that nutrition status had no effect on prognosis. Only seven (13.7%) participants thought that they knew adequately about nutrition management, while 44 (86.3%) of the internal medicine research assistants thought that they were insufficiently knowledgeable on this topic. Retrospectively, 88.2% (n=45) and 82.4% (n=42) of the participants believed that their knowledge of enteral and parenteral nutrition was incomplete when asked about it (Figures 1 and 2).

Twenty-two (43.1%) participants regularly evaluated the nutritional status of every older patient in a hospital setting.
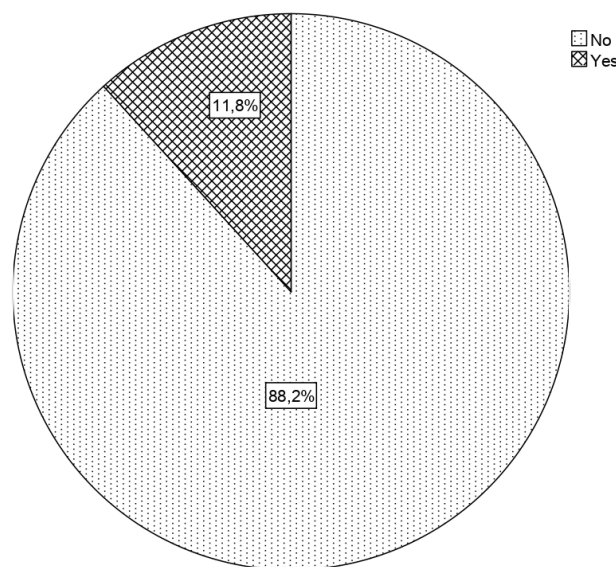
Figure 1. Do you have sufficient knowledge of enteral nutrion indications?
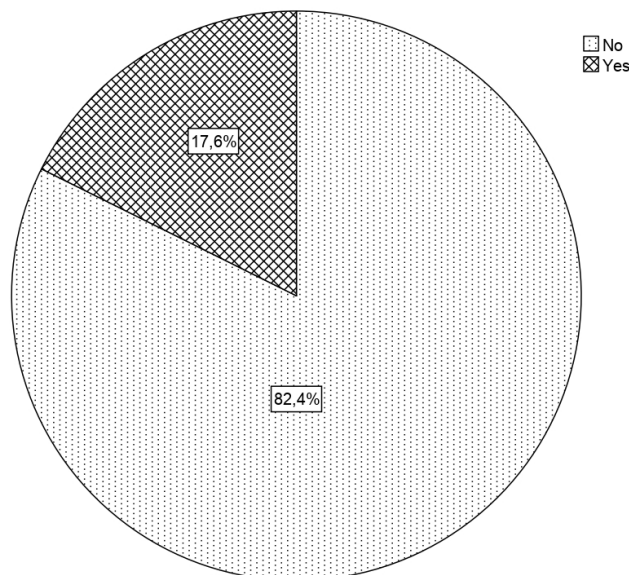
Figure 2. Do you have sufficient knowledge of paranteral nutrion indications?

Five (9.8%) of the internal medicine residents reported that they always, 27 (52.9%) often, and 18 (35.3%) rarely consulted the clinical nutrition unit for patients who were malnourished or at risk of malnutrition.

While 2% (n=1) and 5.9% (n=3) of participants, respectively, performed valid tests for malnutrition and dysphagia screening, internal medicine research assistants did not report using any reliable tests to screen for sarcopenia. Retrospectively, 35.3%, 47.1%, and 52.9% of those surveyed did not routinely screen for malnutrition, dysphagia, or sarcopenia (Table 1).

Research assistants in internal medicine were divided into groups based on their profession time: two years and less or two years more. We compared the nutrition knowledge, malnutrition, dysphagia, and sarcopenia screening groups and found no difference between the two groups. In addition, groups' levels of screening awareness and knowledge were poor (Tablo 2).

Discussion

In this study, we investigated the awareness of malnutrition, dysphagia, and sarcopenia among the internal medicine research assistants who worked at the tertiary hospital. Malnutrition is a prevalent and serious problem among patients admitted to internal medicine clinics. One of the reasons is that internal medicine departments examine more frail, sarcopenic, and postmorbid older patients than other departments. These factors suggest that internal medicine professionals are highly aware of malnutrition. However, studies have shown that medical professionals at all levels lack sufficient nutritional knowledge, resulting in inadequate treatment of malnutrition (13-15). According to our study, internal medicine research assistants realized the importance of malnutrition, but most of them did not have sufficient knowledge about malnutrition management. Screening for malnutrition was not a routine procedure among our internal medicine research assistants; however, 60% of

Table 1. Questionnaire items and answers

Quastionnaire item	n	%
How significantly can the prognosis of older patients admitted to the internal medicine department be affected by the presence of malnutrition?		
Too much	42	82.4
Mildy	9	17.6
Little	0	–
Do you find your knowledge about nutrition management sufficient?		
Yes	7	13.7
No	44	86.3
In your routine clinical practices for inpatient care, can you evaluate every older patient's nutritional status?		
Yes	22	43.1
No	29	56.9
How often would you like to consult the clinical nutrition unit for your older patients who are malnourished or at risk of malnutrition?		
Always	5	9.8
Often	27	52.9
Sometimes	18	35.3
Never	0	–
Do you have sufficient knowledge of enteral nutrition indications?		
Yes	6	11.8
No	45	88.2
Do you have sufficient knowledge of paranteral nutrition indications?		
Yes	9	17.6
No	42	82.4
The malnutrition screening		
I perform it using validity tests, including NRS 2002, MUST, and MNA-SF.	1	2
I perform it using anthropometric measurements (such as weight and BMI) and/or an evaluation of the food diary	32	62.7
I do not routinely do	18	35.3
The dysphagia screening		
I perform it using validity tests, including a water bolus test or EAT-10	3	5.9
I screen only patients with risk factors such as presenting with stroke, dementia, or aspiration pneumonia	24	47.1
I do not routinely do	24	47.1
The sarcopenia screening		
I perform it using validity test, including SARC-F, handgrip strenght, 5- times sit-to- stand test	0	–
I screen only patients with risk factors.	24	47.1
I do not routinely do	27	52.9
NRS: Numerical rating scale, MUST: Malnutrition universal screening tool, MNA-SF: Mini nutritional assessment - short form, EAT-10: Eating assessment tool - 10		

Table 2. Profession time and nutrition awareness levels

	Profession time ≤2 years (n=27)	Profession time >2 years (n=24)	p
How significantly can the prognosis for older patients admitted to the internal medicine department be affected by the presence of malnutrition? Too much Mildly	20 (74.1%) 7 (25.9%)	22 (91.7%) 2 (8.2%)	0.147
Do you find your knowledge about nutrition management sufficient? Yes No	2 (7.4%) 25 (92.6%)	5 (20.8%) 19 (79.2%)	0.232
In your routine clinical practices for inpatient care, can you evaluate every older patient's nutritional status? Yes No	10 (37%) 17 (63%)	12 (50%) 12 (50%)	0.351
How often would you like to consult the clinical nutrition unit for your older patients who are malnourished or at risk of malnutrition? Always Often Sometimes	2 (7.4%) 15 (55.6%) 10 (37%)	3 (13%) 12 (52.2%) 8 (34.3%)	0.803
Do you have sufficient knowledge of enteral nutrition indications? Yes No	3 (11.1%) 24 (88.9%)	3 (12.%%) 21 (87.5%)	0.878
Do you have sufficient knowledge of paranteral nutrition indications? Yes No	4 (14.8%) 23 (85.2%)	5 (20.8%) 19 (79.2%)	0.718
The malnutrition screening I perform it using validity tests I perform it using anthropometric measurements and/or an evaluation of the food diary I do not routinely do	– 18 (66.7%) 9 (33.3%)	1 (4.2%) 14 (58.3%) 9 (37.5%)	0.515
The dysphagia screening I perform it using validity tests I screen only patients with risk factors such as presenting with stroke, dementia, or aspiration pneumonia I do not routinely do	1 (3.7%) 14 (51.9%) 12 (44.4%)	2 (8.3%) 10 (41.7%) 12 (50%)	0.662
The sarcopenia screening I perform it using validity test I screen only patients with risk factors I do not routinely do	– 13 (48.1%) 14 (51.9%)	– 11 (45.8%) 13(54.2%)	0.869

participants indicated that they evaluated anthropometric measurements and food diaries. A study conducted in Italy showed that 50% of the participants were not routinely screened for malnutrition (8). This lack of knowledge about malnutrition is a huge global problem. In a study in which internal medicine interns were trained on the factors that determine "hazards of hospitalization in older patients", it was observed that 60% of interns who both rotate and train in geriatric clinics evaluate malnutrition and weight loss in older patients (16). The knowledge of the nutritional management of malnutrition among Saudi doctors was also found to be unsatisfactory. Approximately 80% of Saudi doctors reported having challenges with the screening, assessment, and treatment of malnutrition (17). Similarly, in our study, more than 80% of the participants stated that they were inadequate regarding enteral and parenteral nutrition indications.

Dysphagia is a geriatric syndrome prevalent among older adults and has been linked to mortality, significantly longer hospital stays, and higher costs (18). The majority of the research assistants, with the exception of the 6% who completed our study, had no knowledge or experience with dysphagia. In a study, half of the internal medicine specialists reported not having received dysphagia training. When identifying the dysphagia; 7% stated that they questioned the patient, 19.2% asked the patient to drink or eat food, and 42.3% evaluated using both methods. However, 7.7% of the participants stated that they were unaware of the topic (19). Internal medicine professionals need to increase their awareness and expertise

regarding dysphagia practice through training in continuing education procedures since they will deal with this disorder more frequently. Sarcopenia is associated with adverse health outcomes, such as decreased quality of life and mortality. In one study, only 12% of health care professionals evaluated sarcopenia in routine practice. It was stated that the most important challenges in the diagnosis of sarcopenia were the lack of a device to measure muscle mass and the long time required to perform diagnostic tests (20). Only 13% of dietitians and physicians had adequate knowledge regarding malnutrition, cachexia, and sarcopenia (21). Compared with other clinics, oncology clinics were found to have an awareness of both malnutrition and sarcopenia that was >80%. However, in our study, 50% of the patients did not present with sarcopenia (22). The absence of knowledge regarding the assessment of nutritional status, sarcopenia, and dysphagia at hospital admission in older adults, prevents determining the patients who can benefit from effective nutritional treatment. In a recent multicenter study in our country, only 51.8% of patients with nutritional risk received nutritional treatment, others not receiving support (23). The use of malnutrition and sarcopenia guideline recommendations in daily practice can be crucial to increase awareness about malnutrition and sarcopenia. We should keep in mind that the follow-up and treatment of these patients should be the responsibility of interdisciplinary teams (21).

Study Limitations

There are some limitations in our study. The first and most important is the small sample size, which represents a single hospital. We assessed only internal medicine research assistants' knowledge, we did not include more senior professionals or other medical departments research asistants. Strength of the our study is the evaluated knowledge of malnutrition, dysphagia, and sarcopenia in the same questionnaire. Repeating the survey after a few lessons on nutrition, dysphagia, and sarcopenia would be interesting and instructive for the education and practice of internal medicine research assistants.

Conclusion

Nutritional interventions require multidisciplinary work, and all healthcare professionals should increase their awareness and knowledge about nutrition in routine clinical practice.

Ethics

Ethics Committee Approval: The study was approved by the local Ethics Committee of Etlik City Hospital (approval number: AEŞH-EK1-2023-121, date: 03.05.2023).

Informed Consent: All participants provided written informed consent.

Footnotes

Authorship Contributions

Surgical and Medical Practices: E.O.O., P.Ü., Concept: E.O.O., P.Ü., Design: E.O.O., P.Ü., Data Collection or Processing: E.O.O., P.Ü., Analysis or Interpretation: P.Ü., Literature Search: E.O.O., P.Ü., Writing: E.O.O., P.Ü.

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

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ORIGINAL RESEARCH

Nocturnal Hypertension and its Relationship with Vitamin D in Older Hypertensive Adults

Deniz Mut Sürmeli[1], Tuğba Turgut[2], Remzi Bahsi[3], Hande Selvi Öztorun[4], Murat Varlı[1]

[1]Ankara University Faculty of Medicine, Ibn-i Sina Hospital, Clinic of Geriatrics, Ankara, Turkey
[2]Antalya Training and Research Hospital, Clinic of Geriatrics, Antalya, Turkey
[3]Samsun Training and Research Hospital, Clinic of Geriatrics, Samsun, Turkey
[4]Ankara Bilkent City Hospital, Clinic of Geriatrics, Ankara, Turkey

Abstract

Objective: Nocturnal hypertension (HT) predicts HT-related end-organ damage and cardiovascular mortality, with a complex pathophysiology involving multiple factors. Vitamin D is considered an emerging contributor. This study examined the relationship between vitamin D level and nocturnal HT in older adults with HT.

Materials and Methods: This cross-sectional study examined 219 patients aged ≥60 years, who underwent ambulatory blood pressure (BP) monitoring. An average nighttime systolic BP≥120 mm Hg and/or diastolic BP≥70 mm Hg was diagnosed as nocturnal HT. Vitamin D insufficiency was defined as serum 25 (OH) vitamin D levels 30 ng/mL.

Results: The prevalence of nocturnal HT was 69.9% among older hypertensive adults. In the group with nocturnal HT, there was a significantly higher percentage of patients with vitamin D insufficiency than those without (89.5% vs. 72.7%; p=0.002). A reverse linear relationship was noted between the quartiles of 25 (OH) vitamin D and the occurrence of nocturnal HT. The percentage of individuals with nocturnal HT declined as the quartiles of 25 (OH) vitamin D increased (p-value for trend = 0.015). In the multivariate logistic regression analysis, after accounting for age, Charlson's comorbidity index, and average daytime systolic BP values, vitamin D insufficiency was linked to a significantly higher likelihood of nocturnal HT (OR=4.92, 95% CI=1.66-14.61, p=0.004).

Conclusion: Vitamin D insufficiency may contribute to the development of nocturnal hypertension in older hypertensive adults.

Keywords: 25-Hydroxyvitamin D 2, aged, ambulatory blood pressure monitoring, hypertension, blood pressure

Introduction

Nocturnal hypertension (HT) can be diagnosed through ambulatory blood pressure monitoring (ABPM) and is defined as having a mean systolic blood pressure (SBP) ≥120 mm Hg and/or diastolic blood pressure (BP) of ≥70 mm Hg during the night (1). BP follows a circadian rhythm throughout the day, marked by the reduction of sympathetic activity and increase in parasympathetic activity during nighttime, leading to decreased BP during sleep. Consequently, daytime BP tends to be higher than nighttime BP. Normally, the decrease in nighttime BP should range between 10-20%, indicating a typical dipping BP pattern. The physiological dipping pattern of BP is lost or insufficient in nocturnal HT, leading to a nondieting or reverse dipping pattern, where night BP dipping is 10% or even increases instead of decreasing, respectively (2). Nocturnal HT emerges as a stronger predictor of future cardiovascular mortality than daytime HT and holds more significance than dipping status concerning HT-related end organ damage (proteinuria, left ventricular hypertrophy, arterial stiffness and retinopathy) and cardiovascular events (angina pectoris, myocardial infarction, heart failure, stroke) (3-6). Nocturnal HT is observed in approximately 40-60% of the general population

(7). However, various factors, such as age, ethnicity, and the presence of comorbid conditions, particularly those causing autonomic dysfunction, water retention, or sleep disturbances, significantly influence its occurrence (8,9). Due to the high prevalence and serious health consequences of nocturnal HT, there is a growing interest in identifying new factors that contribute to its development and treatment. This effort involves exploring alternative therapeutic approaches beyond conventional lifestyle modifications, dietary interventions, and antihypertensive medications, which may contribute to improving BP management. Vitamin D is one of these emerging factors under investigation and has gained considerable attention. Serum vitamin D levels in older adults are influenced by their residential status, whether in a nursing home or within the community, along with factors such as specific comorbidities, medication usage, or even sex and body mass index. Vitamin D deficiency is defined as levels below 20 ng/mL, while insufficiency is defined as levels between 21 and 29 ng/mL (10). The prevalence of vitamin D insufficiency among community-living older adults above 60 years was reported as 31.7% (11). Although the optimal serum vitamin D level for extraskeletal function remains unknown, the American geriatrics society recommends maintaining vitamin D concentrations exceeding 30 ng/mL in older adults to support bone health (12). Several studies have investigated the impact of low vitamin D levels on BP, suggesting that they may contribute to the development of HT through various mechanisms and could be linked to a non-dipping BP pattern. However, the precise clinical implications of vitamin D levels on nocturnal HT, particularly among older adults, remain inadequately defined in clinical practice. In this study, our goal was to investigate the prevalence of nocturnal HT among hypertensive older adults and examine its correlation with vitamin D levels, along with other clinical factors.

Materials and Methods

Patient Selection

In this cross-sectional study, patients who were treated at the geriatrics outpatient clinic of Ankara University Faculty of Medicine between January 2016 and December 2018 and who underwent 24-hour ABPM were evaluated. Among these patients, those who i) were aged 60 and over, ii) were receiving antihypertensive treatment, or iii) were diagnosed with HT according to the ABPM results were included in the study. Patients meeting the following criteria were excluded from the study: i) those receiving Vitamin D treatment when serum levels were measured, ii) those without a diagnosis of HT, iii) those with 24 hours of ABPM recording or 70% successful systolic and diastolic BP recordings during a 24-hour period, and iv) those receiving antihypertensive drugs in the evening or before bedtime. This study adhered to the Declaration of Helsinki's principles and obtained ethical approval from Ankara

University's ethical committee (approval number:17-1121-18, date: 22.10.2018). This study was conducted using patient files, and informed consent was waived due to the retrospective nature of the data analysis, in line with institutional and ethical guidelines.

Medical History and Laboratory Assessments

The ages, sexes, weights, heights, smoking and alcohol habits, comorbidities, and antihypertensive medications of the patients were recorded from their medical records. Additionally, the Charlson Comorbidity Index (CCI) of the patients was calculated to evaluate the burden of comorbidities (13). To assess patients' functionality, Katz activities of daily living scores (maximum score of 8 points indicating full attendance to activities), Lawton instrumental activities of daily living scores (maximum score of 17 points indicating full attendance to activities), handgrip strengths (kg), 4-meter walking speeds (m/sec), and fall histories in the last year were also recorded (14,15). Handgrip strength was measured using an automated hand dynamometer (Takei scientific instruments, Niigata, Japan), and walking speeds were determined by measuring the time taken to walk 4 meters, followed by calculating the corresponding speed in meters per second. In men, handgrip measurements 32 kg and in women, measurements 22 kg indicate low muscle strength (16). A gait speed of 0.8 m/s defines low physical performance (16). Laboratory parameters, including creatinine, lipid profile, inflammatory markers, hemoglobin, calcium, intact parathyroid hormone (PTH), and 25 (OH) vitamin D levels, were recorded from patients' electronic medical records, all of which were performed within 1 month of the ABPM. These parameters were chosen based on their known associations with HT and were recorded from the patients' electronic medical records. High-performance liquid chromatography (Immuchrom GmBH, Heppenheim, Germany) was used to measure serum 25 (OH) vitamin D levels. The intra-assay and inter-assay variability percentages were 3% and 5%, respectively. Serum levels below 30 ng/mL indicate vitamin D insufficiency.

Ambulatory Blood Pressure Monitoring

The ABPM results of the patients were obtained from the electronic medical records. Patients' 24-hour ambulatory BP was measured using a validated automated non-invasive oscillometric device (Mobil-O-Graph Monitor; IEM GmbH, Stolberg, Germany) (17). The device was programed to measure BP at 20-minute intervals during the day and at 30-minute intervals during night time over 24 hours. The patients' sleeping and waking hours were recorded either by the patients themselves or by their relatives and then entered the software before downloading the BP recordings. Consequently, the device can calculate the percentage decrease in nighttime systolic BP. Based on this percentage decrease, patients were classified into four categories: reverse dippers (with a BP drop of less than 0%),

Sürmeli et al. Nocturnal Hypertension and Vitamin D

Eur J Geriatr Gerontol 2024;6(3):200-207

non-dipper (with a BP drop of less than 10%), dippers (with a BP drop between 10% and 20%), and extreme dippers (with a BP drop of more than 20%). The diagnosis of HT is established based on the use of at least one antihypertensive medication or according to the results of ABPM. ABPM results were interpreted in line with the 2023 European society of hypertension guidelines, which define HT as having an average daytime SBP ≥135 and/or diastolic blood pressure (DBP)≥85 mmHg and/or 24hour SBP≥130 and/or DBP≥80 mmHg. Nocturnal HT was defined as an average nighttime SBP≥120 mm Hg and/or DBP≥70 mm Hg (1).

Statistical Analysis

Statistical analyses were conducted using SPSS Statistics (version 29.0.2.0, Armonk, NY: IBM Corp.). Categorical variables were analyzed using count and percentage distributions, whereas continuous variables were assessed using medians and interquartile ranges (IQR). The patients were categorized based on the presence (+) or absence (-) of nocturnal HT. Categorical variables were compared using either the chi-square test or Fisher's exact test, while continuous variables were assessed using the Wilcoxon rank-sum test. Multivariate logistic regression analysis was performed to adjust for potential confounding factors associated with the presence of nocturnal HT. Odds ratios were calculated. Statistical significance was set at p<0.05.

Results

The study included 219 patients. Table 1. Delineated patient features, organized according to the presence of nocturnal HT. Among the 219 patients, 153 (69.9%) had nocturnal HT, whereas 66 (30.1%) patients did not have nocturnal HT. The patients had a median age of 76.3 (70.3-82.8) years. There was no significant difference in the median age between patients with (76.3) and without (77.5) nocturnal HT (p=0.449), and age categories were similarly distributed between the groups (p=0.899). Of the patients, 83 (37.9%) were male and 136 (62.1%) were female, indicating comparable sex distributions in the groups with and without nocturnal HT (p=0.547). In Table 2, the ABPM results of the groups with and without nocturnal HT are presented. The average daytime SBP and DBP, average nighttime SBP and DBP, and 24-h SBP and DBP values were significantly higher in the group with nocturnal HT (p<0.001). Moreover, the percentage decrease in SBP during sleep was significantly lower in the group with nocturnal HT (0.7% vs. 5.8%; p<0.001). The prevalence of non-dipper was the highest, with 111 cases (51.4%). However, when comparing dipping patterns between patients with and without nocturnal HT, the prevalence of reverse dippers (65 cases, 42.5% vs. 12 cases, 19%) is higher in the group with nocturnal HT, and the prevalence of dippers is lowest (13 cases, 8.5% vs. 15 cases, 23.8%) (p<0.001).

In Table 3, laboratory results were presented according to the presence of nocturnal HT. Hemoglobin levels, lipid profiles, creatinine levels, calcium levels, and inflammation markers among the groups showed no significant differences. However, the median 25 (OH) vitamin D level was significantly lower in the group with nocturnal HT compared to those without (15.5 vs. 21.1; p=0.013). Furthermore, the percentage of patients with 25 (OH) vitamin D levels below 30 ng/mL was significantly higher in the group with nocturnal HT (137 cases, 89.5%) than in those without nocturnal HT (48 cases, 72.7%), with a p-value of 0.002. A negative linear correlation was found between the quartiles of 25 (OH) vitamin D and the occurrence of nocturnal HT. The percentage of patients with nocturnal HT declined as quartiles of 25 (OH) vitamin D increased (p for trend=0.015). Additionally, intact PTH levels were significantly higher in the nocturnal HT group (median 87.1 pg/mL vs. 62.5 pg/mL; p=0.048). Vitamin D insufficiency significantly increased the odds of nocturnal HT, even after accounting for age, CCI, and average daytime SBP values in the multivariate logistic regression. (OR=4.92, 95% CI 1.66-14.61, p=0.004) (Table 4).

Discussion

This study explored the prevalence of nocturnal HT and its relationship with vitamin D levels in older adults with HT. Our study revealed a prevalence of nocturnal HT of 69.9% among older hypertensive adults, in line with other studies reporting rates between 40% and 60%, and reaching 70% in poorly controlled hypertensive patients (7,18). Furthermore, we observed a negative association between vitamin D levels and nocturnal HT, with the percentage of patients experiencing nocturnal HT increasing as 25 (OH) vitamin D levels decreased. This correlation was independent of advanced age, CCI, and average daytime systolic BP values which are commonly associated with nocturnal HT. Although the underlying mechanism of nocturnal HT is not clear, stimulation of the renin-angiotensin-aldosterone system, renal dysfunction, and elevated sympathetic activation are thought to be the main mechanisms (19). Thus, conditions that induce these states, such as chronic kidney disease, diabetes mellitus, or other diseases causing autonomic dysfunction, as well as conditions like obstructive sleep apnea syndrome (OSAS), chronic pain, and restless leg syndrome that can disrupt sleep patterns and cause increased sympathetic activation at night, may contribute to nocturnal HT. Additionally, aging, anxiety disorders, and obesity are commonly cited as risk factors for nocturnal HT (19). In our study, aside from the significant correlation of vitamin D and PTH levels with nocturnal HT, we did not observe any other significant differences in the presence of nocturnal HT among individuals with age, diabetes mellitus, renal insufficiency, and adiposity. Vitamin D receptors (VDRs) are present in nearly all nucleated cells, and 3% of the

Eur J Geriatr Gerontol 2024;6(3):200-207

Sürmeli et al. Nocturnal Hypertension and Vitamin D

Table 1. Basic characteristics of the patients according to their nocturnal hypertension status

	All (n=219)		Nocturnal hypertension (+) (n=153, 69.9%)		Nocturnal hypertension (−) (n=66, 30.1%)		p
Median age, years (IQR)	76.7	(70.3-82.8)	76.3	(70.3-82.5)	77.5	(72-84.1)	0.449
Age group, n (%)							0.899
60-69 years	43	(19.6)	30	(19.6)	13	(19.7)	
70-79 years	91	(41.6)	65	(42.5)	26	(39.4)	
≥80 years	85	(38.8)	58	(37.9)	27	(40.9)	
Sex, n (%)							0.547
Male	83	(37.9)	56	(36.6)	27	(40.9)	
Female	136	(62.1)	97	(63.4)	39	(59.1)	
BMI, n (%)							0.417
<18.5	3	(1.4)	3	(2)	0	(0)	
18.5-24.9	57	(26)	39	(25.7)	18	(27.3)	
25-29.9	74	(33.8)	48	(31.6)	26	(39.4)	
≥30	84	(38.4)	62	(40.8)	22	(33.3)	
Active smokers	23	(10.5)	16	(10.5)	7	(10.6)	0.974
Functional status							
Katz ADL, median (IQR)	6	(5-6)	6	(5-6)	6	(5-6)	0.154
Lawton IADL, median (IQR)	14	(7.5-17)	14	(6.5-17)	14	(8-17)	0.384
Fall in the last year, n (%)	71	(32.4)	52	(34)	19	(28.8)	0.451
Muscle strength of female subjects (kg), median (IQR)	15.7	(10.8-20)	14.5	(9.5-19.4)	16.6	(13-20.5)	0.125
Muscle strength of males (kg), median (IQR)	24.9	(19.9-31.8)	25.2	(20-33.1)	23.7	(16.5-28.3)	0.185
Physical performance (m/sec), median (IQR)	0.57	(0.40-0.66)	0.50	(0.38-0.66)	0.57	(0.44-0.66)	0.282
Comorbidities, n (%)							
Diabetes mellitus	113	(51.6)	85	(55.6)	28	(42.4)	0.074
Chronic kidney disease*	88	(40.2)	62	(40.5)	26	(39.4)	0.876
Depression	64	(29.2)	47	(42.3)	17	(38.6)	0.673
Coronary artery disease	51	(23.3)	35	(22.9)	16	(24.2)	0.826
Dementia	26	(11.9)	20	(13.1)	6	(9.1)	0.403
Cerebrovascular disease	22	(10)	14	(9.2)	8	(12.1)	0.502
Heart failure	15	(6.8)	11	(7.2)	4	(6.1)	0.762
CCI, median (IQR)	5	(4-7)	5	(4-7)	5	(4-6)	0.420
Antihypertensive drugs, n (%)							
ARB	109	(48.2)	74	(48.4)	35	(53)	0.526
Diuretics	107	(47.3)	75	(49)	32	(48.5)	0.942
CCB	95	(42)	66	(43.1)	29	(43.9)	0.912
β-blockers	88	(38.9)	62	(40.5)	26	(39.4)	0.876
ACE inhibitors	46	(20.4)	29	(19)	17	(25.8)	0.257
α-agonists	19	(8.4)	14	(9.2)	5	(7.6)	0.704
MRA	7	(3.1)	5	(3.3)	2	(3)	0.927
Number of antihypertensive drugs, median (IQR)	2	(1-3)	2	(1-3)	2	(1.75-3)	0.407

*Patients with an estimated glomerular filtration rate of 60 mL/min,
ADL: Activities of daily living, ACE: Angiotensin-converting enzyme, ARB: Angiotensin receptor blockers, BMI: Body mass index, CCB: Calcium channel blockers, CCI: Charlson comorbidity index, IADL: Instrumental activities of daily living, IQR: Interquartile range, kg: Kilograms, m: Meter, MRA: Mineralocorticoid receptor antagonists, n: Number of cases, sec: Second

Table 2. Ambulatory blood pressure results according to nocturnal hypertension status

	All (n=219)		Nocturnal hypertension (+) (n=153, 69.9%)		Nocturnal hypertension (−) (n=66, 30.1%)		p
Average daytime SBP (mmHg)	128	(119–141)	136	(126–146)	116	(110–121.2)	<0.001
Average daytime DBP (mmHg)	75	(68–81)	78	(73–84)	67	(64–73)	<0.001
Average night SBP (mmHg)	125	(114–139)	134	(124–144)	111	(105–114.2)	<0.001
Average night DBP (mmHg)	70	(64–79)	75	(70–82)	62	(57–65)	<0.001
Average 24-h SBP (mmHg)	128	(118–141)	136	(126–145)	114	(110–120)	<0.001
Average 24-h DBP (mmHg)	73	(68–80)	77	(72.5–83)	66	(63–69)	<0.001
SBP drop during sleep (%)	2	(−3.3–7.3)	0.7	(−4.85–5.55)	5.8	(0.9–10.35)	<0.001
SBP dipping status*							<0.001
Reverse dippers, n (%)	77	(35.6)	65	(42.5)	12	(19)	
Non-dippers, n (%)	111	(51.4)	75	(49)	36	(57.1)	
Dippers, n (%)	28	(13)	13	(8.5)	15	(23.8)	

Reported values are medians (IQR) or counts (percent), *Extreme dipping category was excluded due to only 3 cases,
BP: Blood pressure, DBP: Diastolic blood pressure, n: Number of cases, SBP: Systolic blood pressure, IQR: Interquartile range

Table 3. Laboratory results according to the nocturnal hypertension status

	Nocturnal hypertension (+) (n=153, 69.9%)		Nocturnal hypertension (−) (n=66, 30.1%)		p
Hemoglobin, g/dL (n=219)	12.7	(11.5-13.8)	12.3	(11.4-13.7)	0.473
Total cholesterol, mg/dL (n=216)	187.5	(157.7-221)	195	(164.2-220.2)	0.525
LDL, mg/dL (n=218)	116	(88.2-139.7)	115	(94.5-136.7)	0.794
Triglyceride, mg/dL (n=217)	127	(95-169)	130	(95.5-170)	0.525
HDL, mg/dL (n=216)	46	(38-54)	47.5	(39-56)	0.426
Creatinine, mg/dL (n=219)	0.96	(0.76-1.19)	0.93	(0.77-1.18)	0.755
Albumin, g/dL (n=219)	4.2	(3.9-4.4)	4.1	(3.8-4.4)	0.915
CRP, mg/L (n=200)	3.87	(1.6-10.8)	5.8	(1.8-14.7)	0.224
Sedimentation rate, mm/hr (n=199)	19.5	(12-30.7)	23	(13-34)	0.232
25 (OH) D, ng/mL (n=219)	15.5	(9.47-23.3)	21.1	(12.1-30.6)	0.013
25 (OH) D groups, n (%)					
<30 ng/mL	137	(89.5)	48	(72.7)	0.002
25 (OH) D quartiles, n (%)					
1st quartile	43	(28.1)	12	(18.2)	0.015*
2nd quartile	41	(26.8)	14	(21.2)	
3rd quartile	38	(24.8)	17	(25.8)	
4th quartile	31	(20.3)	23	(34.8)	
Intact PTH, pg/mL (n=88)	87.1	(61.6-127.7)	62.5	(39.6-96.3)	0.048
Calcium, mg/dL (n=219)	9.5	(9.2-9.9)	9.5	(9.1-9.7)	0.374

Reported values are medians (IQR) or counts (percent), *p-value for trend across quartiles,
CRP: C-reactive protein, dL: Deciliter, HDL: High density lipoprotein, IQR: Interquartile range, g: Gram, LDL: Low density lipoprotein, n: Number of cases, mg: Milligram, ng: Nanogram, PTH: Parathormone, IQR: Interquartile range

Eur J Geriatr Gerontol 2024;6(3):200-207

Sürmeli et al. Nocturnal Hypertension and Vitamin D

Table 4. Results of univariate and multivariate analyses of predictors of nocturnal hypertension

	Univariate			Multivariate		
Variable	OR	95% CI	p	OR	95% CI	p
Age (continuous)	0.98	0.94-1.02	0.422	1.02	0.97-1.09	0.273
CCI (continuous)	1.08	0.92-1.27	0.297	0.92	0.73-1.17	0.926
25 (OH) vitamin D (<30 vs. ≥30 ng/mL	3.21	1.51-6.79	0.002	4.97	1.68-14.71	0.004
Average daytime systolic blood pressure (continuous)	1.15	1.10-1.19	<0.001	1.16	1.11-1.21	<0.001

CCI: Charlson comorbidity index, CI: Confidence interval, OR: Odds ratio

human genome is regulated by vitamin D, indicating a wider-ranging role for vitamin D beyond its traditional functions in regulating calcium and bone homeostasis (20). Moreover, cardiomyocytes, endothelial cells, and vascular smooth muscle cells have VDRs (21-23). This implies that vitamin D deficiency could potentially result in vascular dysfunction through these cardiovascular cells, trigger arterial atherogenesis, and play a role in HT by promoting arterial stiffness (24). In advanced age, independent of serum 25 (OH) vitamin D levels, a decrease in VDR expression has also been noted (25). Additionally, in mice with deactivated VDR or 1a-hydroxylase gene, an increase in renin expression and plasma angiotensin 2 production, leading to HT and cardiac hypertrophy, was observed (26,27). Vitamin D deficiency can lower blood calcium levels, leading to PTH release. In a study involving older adults, although no relationship was observed between HT and vitamin D levels, an association was noted with high PTH levels (28). This correlation was further supported by the administration of PTH, which resulted in elevated BP in healthy adults (29). Despite numerous studies examining the relationship between BP and vitamin D levels, the findings remain contradictory even across several recent studies (30,31). Moreover, conflicting results have also emerged from vitamin D supplementation trials investigating its potential for reducing BP. While studies focusing solely on the impact of vitamin D on HT often fail to demonstrate significant reductions, combining vitamin D supplementation with other standard antihypertensive medications appears to have more promising outcomes (32).

When investigating studies that evaluated the relationship between vitamin D levels and nocturnal BP decrease, it was observed that the number of studies was limited, and once again, the results were inconsistent. Although a few studies have indicated an association between low vitamin D levels and nondieting BP status, all of these studies were conducted with relatively younger patients (with mean ages≤50 years) compared with our study, and none of them directly evaluated nocturnal HT (33-35). However, another study showed that except for nocturnal diastolic BP decrease, there was no association between vitamin D levels and dipping status in hypertensive adults (36). Additionally, in a different study, which involved relatively older patients (mean age 61.8 years) compared with other studies, the relationship between the

severity of autonomic dysfunction and dipping status with vitamin D levels in patients with Parkinson's Disease was explored. However, no correlation was found between any of these factors (37). Nocturnal HT is a stronger predictor of HT-related end organ damage and future cardiovascular mortality than daytime HT and dipping status.(4) Therefore, unlike other studies that primarily focused on evaluating dipping status, this study investigated the prevalence of nocturnal HT and its association with vitamin D and other clinical factors in older patients with hypertension. Furthermore, we provided a comprehensive evaluation of various patient factors, including functionalities, physical performance, and muscle strengths, together with comorbidities, antihypertensive medications, and related laboratory parameters.

Study Limitations

Our study has several limitations. This was a cross-sectional investigation, so it was incapable of determining a direct cause-and-effect relationship between vitamin D levels and nocturnal HT. Additionally, we lacked information on patients' sleep patterns or conditions that could cause sleep disturbances, such as OSAS, anxiety disorders, chronic pain conditions, or other undiagnosed conditions that may affect the sleep-wake cycle. Furthermore, we did not have data on whether the participants had any form of autonomic dysfunction that could contribute to nocturnal HT.

Conclusion

In conclusion, our study suggests a correlation between vitamin D insufficiency and nocturnal HT in older hypertensive adults, independent of age, comorbidity burden, or average daytime SBP values. This relationship appears to be mediated by various complex pathogenetic mechanisms and is influenced by multiple factors. The extensive occurrence of vitamin D insufficiency in older adults with nocturnal HT underscores the importance of screening serum 25 (OH) vitamin D levels when necessary. This practice appears to be beneficial for not only bone health but also BP regulation. Although the results of vitamin D supplementation trials on HT are conflicting, the advantages of vitamin D supplementation for both the skeletal and extraskeletal systems are notable. Additionally, its minimal side effects at appropriate dosages and cost-effectiveness

Sürmeli et al. Nocturnal Hypertension and Vitamin D

Eur J Geriatr Gerontol 2024;6(3):200-207

suggest that it may still be considered alongside traditional antihypertensive treatment, especially to sustain serum 25 (OH) vitamin D levels above 30 ng/mL in older adults. Nevertheless, further research is required to explore its potential protective or therapeutic effects on nocturnal HT through prospective studies.

Ethics

Ethics Committee Approval: This study adhered to the Declaration of Helsinki's principles and obtained ethical approval from Ankara University's ethical committee (approval number:17-1121-18, date: 22.10.2018).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: D.M.S., T.T., R.B., H.S.Ö., M.V., Concept: D.M.S., M.V., Design: D.M.S., M.V., Data Collection or Processing: D.M.S., T.T., R.B., H.S.Ö., Analysis or Interpretation: D.M.S., M.V., Literature Search: D.M.S., T.T., R.B., H.S.Ö., Writing: D.M.S., M.V.

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

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ORIGINAL RESEARCH

Relationship of Phase Angle with Sarcopenia Components and Comprehensive Geriatric Assessment in Physically Independent Older Adults

🄳 Fatma Özge Kayhan Koçak[1], 🄳 Sumru Savaş[2], 🄳 Asli Kilavuz[2], 🄳 Sibel Çavdar[3]

[1]University of Health Sciences Turkey Tepecik Education and Research Hospital, Division of Geriatric Medicine, Department of Internal Medicine, İzmir, Turkey
[2]Ege University Faculty of Medicine, Division of Geriatrics, Department of Internal Medicine, İzmir, Turkey
[3]İzmir Bayraklı Integrated Health Campus (City Hospital), Division of Geriatrics, Department of Internal Medicine, İzmir, Turkey

Abstract

Objective: This study aimed to investigate the relationship between phase angle (PhA), sarcopenia components, and comprehensive geriatric assessment in physically independent older adults.

Materials and Methods: This cross-sectional study involved 135 physically independent older adults admitted to a geriatric outpatient clinic. All participants underwent bioelectrical impedance analyses and comprehensive geriatric assessments. The individuals were investigated in two groups regarding PhA: 1st versus 2nd and 3rd terciles. The individuals in the first tercile were considered to have low PhA (for women <4.6° and men <5.4°).

Results: The prevalence of individuals with low PhA was 22% (n=30). PhA was correlated with hand grip strength (HGS) and appendicular skeletal muscle mass (ASMM) overall (r=0.523; p<0.001, r=0.335; p<0.001, respectively). A moderately positive, moderately significant correlation was found between PhA and ASMM in males (r=0.618; p<0.001), with the highest significance of all. In univariate analysis, components of sarcopenia and comprehensive geriatric assessments were not associated with low PhA values overall and in the male group (p>0.05). Only ASMM was significantly associated with low PhA in the univariate and multivariate analyses in the female group (p=0.02 and p=0.03, respectively).

Conclusion: Challenges such as the use of different formulas for calculating ASMM and various cutoff values for different ethnic groups can be barriers to ASMM assessment. PhA might be a simple predictor of ASMM in physically independent older women.

Keywords: Sarcopenia, frailty, older adults, comprehensive geriatric assessment

Introduction

Phase angle (PhA) is a parameter derived from bioelectrical impedance analysis (BIA), a non-invasive method used to assess body composition and cellular health, and it is a new indicator of functional status and muscle quality (1,2). In clinical practice, PhA measurements obtained through BIA are used in diverse settings, including nutritional assessment, muscle health, disease severity and prognosis, hydration status, and overall health and functioning. Recent studies have found a strong link between hand grip strength (HGS), PhA, and nutritional status (3-5). In addition, PhA was found to predict survival in hospitalized patients (3,6).

In both sexes, PhA also decreases progressively after 40 years of age and in the following years (7). The PhA cutoff value for predicting sarcopenia can vary depending on the characteristics of the patient group being studied. Vincenzo et al. (6) conducted a recent meta-analysis and reported that lower PhA with various cutoff values between 4.05 and 5.05 was associated with sarcopenia. In another study, Rosas-Carrasco et al. (8) found that a PhA cutoff value of 4.1 showed a significant association

Eur J Geriatr Gerontol 2024;6(3):208-215

Koçak et al. Phase Angle and Sarcopenia Components

between PhA and both frailty and sarcopenia. Similarly, in the case of malnutrition, different PHA cut-off has been found (5,9).

It is important to interpret PhA values in the context of individual patient characteristics, including age, sex, body composition, and underlying health conditions. Additionally, PhA could be used as a component of a comprehensive assessment in conjunction with other clinical data-assessments and biomarkers to guide clinical decision-making. The majority of PhA trials were conducted in frail patients with co-morbidities. We know that it is important to prevent frailty, sarcopenia, and malnutrition before they occur. The PhA could be a quick, easy, and useful screening tool to assess early changes in parameters associated with frailty, sarcopenia, and malnutrition. So, in this study, we aimed to investigate the relationship between bioimpedance PhA, sarcopenia components, and comprehensive geriatric assessment in physically independent older adults.

Materials and Methods

Participants

This study is a part of Scientific Research Projects TGA-2020-21562, and it is a cross-sectional study conducted at the Geriatrics Medicine and Internal Medicine Outpatient Clinics of Ege University Medical Faculty between May 2019 and October 2019. Participants who did not give informed consent, those aged <60 years, with sensory deficits, finger/hand amputations, and active arthritis, as well as hemiplegic/quadriplegic patients, and those with recent (last 3 months) upper extremity surgery and acute infection/symptoms were excluded from the study. Participants were considered physically independent if they were independent in their activities of daily living (ADL) and could walk without assistance. Independence in ADL was defined as a score of 6 on the Katz ADL Scale (10,11). The inclusion and exclusion criteria are explained in detail in Figure 1. The present study was approved by the Ethics Committee of Ege University Medical Research Ethics Committee (approval number: E41277, date: 07.02.2019). All recruited patients provided written informed consent.

Measurements

Height, weight, waist circumference (WC) (cm), mid-upper arm circumference (MAC) (cm), and calf circumference (CC) (cm) of the participants were measured, and body mass index (BMI) (kg/m^2) was calculated as anthropometric assessment. Participants' height (cm) and weight (kg) were measured using a stadiometer and BIA (Tanita MC-780 body analysis monitor), respectively. The BMI values were assessed using the standard formula: BMI: $(kg)/height^2$ (m^2). The PhA value (◦) was assessed using a multifrequency tetrapolar instrument (Tanita MC-780
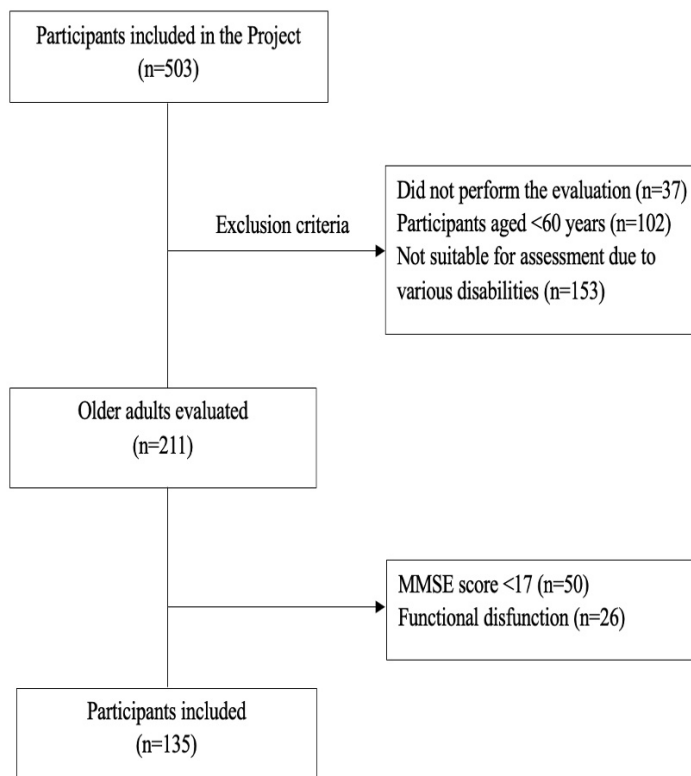

Figure 1. Flowchart of the study

MMSE: Mini-mental state examination

Koçak et al. Phase Angle and Sarcopenia Components

Eur J Geriatr Gerontol 2024;6(3):208-215

BIA) at 50 kHz based on a previous study (12). The volunteers were instructed to fast overnight (12 hours before the test) and to avoid strenuous physical activity, caffeine, and alcohol consumption the day before. They were asked to remove their shoes and heavy outer clothes before the measurement. The procedures were performed based on the study of Verney et al. (13). Appendicular skeletal muscle mass (ASMM) was estimated in kilograms using the equation of Sergi et al. (14).

Handgrip strength (HGS) was measured using a Jamar Plus+ digital dynamometer (Performance Health Supply, Inc, Cedarburg, WI), and a Takei T.K.K. 5401 digital dynamometer (Takei Scientific Instruments Co. Ltd., Tokyo, Japan). The HGS measurements are described in detail in Savas et al. (15). A four-meter gait speed test was performed to assess physical performance (16). A gait speed (GS) <0.8 m/s was considered to indicate low physical performance.

Sarcopenia Diagnosis

Sarcopenia has been defined in accordance with the criteria of the revised EWGSOP (EWGSOP2) consensus (17) as follows; 1) Low HGS using local thresholds calculated according to Bahat et al. (18) (for males <35 kg, and females <20 kg), 2) Low ASMM calculated according to EWGSOP2 (for males <20 kg, for females <15 kg), 3) Slow gait speed calculated by a four-meter gait speed test (<0.8 m/s). Participants categorized as "probable sarcopenia" if only low muscle strength is present, and "confirmed sarcopenia" if both low muscle mass (MM) and low muscle strength were present.

Comprehensive Geriatric Assessment

The following components of comprehensive geriatric assessment were evaluated: cognitive function using the mini mental state examination (MMSE) (19,20), frailty using the FRAIL scale (21,22), and nutritional status using the mini nutritional assessment-short form (MNA-SF) (23,24).

Statistics

Data were analyzed using SPSS version 25.0 for Windows. Data normality was obtained by Kolmogorov-Smirnov test. PhA, ASMM, WC, CC, and HGS by both dynamometers in women, ASMM, MAC, WC, CC, and HGS by both dynamometers in men were normally distributed. Due to the absence of specific cutoff points, the distribution of PhA was divided into terciles, and values below the first tercile were considered low. The individuals were divided into three groups: 1st vs. 2nd and 3rd terciles. The individuals in the first tercile were considered to have low PhA (for women< 4.6° and men< 5.4°). The t-test and Mann–Whitney U test were used to analyze quantitative variables when available. Normally distributed quantitative variables, quantitative variables without normal distribution, and categorical variables were expressed by mean±standard

deviations, median (interquartile range), and frequency (percentages) respectively. The normally distributed parameters were analyzed using the Pearson correlation coefficient. The correlations were also tested separately for gender groups. While investigating the associations between non-normal distributions, the correlation coefficients and their significance were calculated using the spearman test. A logistic regression model was performed for variables that showed significant relationships with the univariate analysis. Multivariable logistic regression analysis was performed to calculate the adjusted odds ratios (ORs) and 95% confidence interval of individuals with low PhA (first vs. second and third terciles), ASMM, HGS, and GS. Hosmer-Lemeshow goodness-of-fit statistics was used to assess model fit. P<0.05 was considered statistically significant.

Results

Participants Characteristics

A total of 135 physically independent older adults were included in the study after applying extensive exclusion criteria. The median age was 66.5 (min.-max. 60-90) years in women and 70 (min.-max. 60-88) years in men. Females composed 50.4% of the study population. According to the WHO criteria, 30.4% (n=41) of participants were obese (BMI ≥30), 35.6% (n=48) of participants were overweight (30> BMI ≥25). In all, HGS by Jamar and HGS by Takei were 30.9±9 kg, 30.2±7.4 kg, respectively. Forty-six point seven percent (n=63) of all had low ASMM and 18.5% (n=25) had low GS. In females; PhA, HGS by Jamar, HGS by Takei, GS, and ASMM were 5.1±0.7°, 24.5±5.3 kg, 25.2±4.6 kg, 1.1±0.3 m/sn, 15.1±1.9 kg, respectively. In the male group, PhA, HGS by Jamar, HGS by Takei, GS, and ASMM were 5.7° (0.8), 37.5±7.1 kg, 35.3±6.2 kg, 1.1±0.3 m/sn, 20.8±3.2 kg, respectively. Considering the dynamometer used, the rate of probable sarcopenia was the same although the rate of confirmed sarcopenia changed. Forty (70.4%) participants had probable sarcopenia. The rate of confirmed sarcopenia by the Jamar dynamometer was 18.5% (n=25), whereas the rate of confirmed sarcopenia by the Takei dynamometer was 17% (n=23). The prevalence of the individuals with low PhA was 22% (n=30). In terms of comprehensive geriatric assessment, only the MNA score was associated with PhA in men. We have shown the characteristics of the participants according to PhA cutoff points (per tercile) and gender are presented in Table 1.

In the overall group and in men, PhA was weakly correlated with the MNA score (r=0.314; p<0.001, r=0.328; p=0.007, respectively). PhA was correlated with HGS and ASMM in all groups. A positive, moderately significant correlation was found between PhA and ASMM in the older males (r=0.618; p<0.001). In women, PhA was correlated with all components of sarcopenia, although its significance was weak (Table 2). Components of sarcopenia and comprehensive geriatric assessments were not

Eur J Geriatr Gerontol 2024;6(3):208-215

Koçak et al. Phase Angle and Sarcopenia Components

Table 1. Characteristics of the participants according to phase angle cut-off points (per tercile) and gender

	Overall (n=135)	Low PhA (n=16)	Not low PhA (n=51)	p	Women (n=68)		
					Low PhA (n=14)	Not low PhA (n=54)	
Age, y	69 (8)	72.5 (10)	68 (8)	0.01	65.5 (9.8)	67.5 (6)	0.5
Weight, kg	71.7 (13.3)*	75.4 (13.8)*	76.4 (13.9)*	0.8	64.4 (10.2)*	68 (11.5)*	0.3
BMI	27.7 (4.8)*	25.8 (5.3)*	27.6 (4.7)*	0.2	26.5 (3.9)*	28.5 (4.8)*	0.1
CC, cm	37.5 (3.7)*	37.8 (4.1)*	37.3 (3.5)*	0.7	36 (4.1)*	38 (3.7)*	0.09
WC, cm	98 (12.7)*	99.4 (13.2)*	101.5 (13)*	0.6	92.2 (11.5)*	95.8 (11.8)*	0.3
MAC, cm	30.3 (3.6)*	29.5 (3.6)*	30.1 (3.3)*	0.5	28.3 (3.6)*	31.3 (3.5)*	**0.007**
HGS[1], kg	30.9 (9)*	35.7 (6.5)*	38 (7.3)*	0.3	22.3 (3)*	25 (5.7)*	**0.02**
HGS[2], kg	28.6 (11.2)	33.4 (5.3)*	36 (6.4)*	0.2	22.6 (3.1)*	26 (4.7)*	**0.02**
ASMM, kg	17.3 (5.49)	20.5 (2.4)*	20.8 (3.5)*	0.7	14 (1.7)*	15.4 (1.9)*	**0.02**
GS, m/sn	1.1 (0.3)*	1 (0.2)*	1.1 (0.3)*	0.3	1 (0.2)*	1.1 (0.3)*	0.3
PhA,º	5.4 (1)	4.9 (0.55)	5.9 (0.7)	**0.00**	4.2 (0.2)*	5.4 (0.6)*	**0.00**
MMSE	29 (2)	29 (2)	29 (2)	0.8	29 (2)	29 (2)	0.8
FRAIL	0 (1)	0 (0)	0 (1)	0.3	0 (1)	0 (1)	0.8
MNA	14 (2)	13.5 (2)	14 (1)	**0.04**	13 (2)	14 (2)	0.8

*Normally distributed quantitative variables were expressed by mean (standard deviations) PhA. PhA: Phase angle, Low PhA: Phase angle for women <4.6° and men <5.4°, CC: Calf circumference, WC: Waist circumference, MAC: Mid-upper arm circumference, BMI: Body mass index, HGS[1]: Handgrip strength max using Jamar digital, HGS[2]: Handgrip strength max using Takei max, GS: Gait speed, ASMM: Appendicular skeletal muscle mass, MMSE: Mini-mental state examination, FS: FRAIL scale, MNA: Mini nutritional assessment

Table 2. Correlation analysis between phase angle and components of sarcopenia and comprehensive geriatric assessments

	Overall		Men		Women	
	r	p	r	p	r	p
PhA x HGS[1]	0.523	**<0.001**	0.312	**0.01**	0.255	**0.036**
PhA x HGS[2]	0.528	**<0.001**	0.372	**0.002**	0.281	**0.02**
PhA x ASMM	0.335	**<0.001**	0.618	**<0.001**	0.349	**0.004**
PhA x GS	0.165	0.05	0.133	0.282	0.224	0.066
PhA x CC	0.072	0.406	-0.064	0.605	0.213	0.08
PhA x WC	0.190	**0.027**	0.080	0.521	0.057	0.642
PhA x MAC	0.111	0.199	0.087	0.486	0.226	0.064
PhA x MMSE	-0.023	0.791	0.043	0.73	-0.085	0.492
PhA x FS	-0.117	0.176	0.091	0.463	-0.109	0.378
PhA x MNA	0.314	**<0.001**	0.328	**0.007**	0.163	0.185

Normally distributed and non-normally distributed parameters were analyzed using the Pearson and Spearman tests, respectively.
PhA: Phase angle, ASMM: Appendicular skeletal muscle mass, HGS: Handgrip strength, GS: Gait speed, HGS[1]: Handgrip strength max using Jamar digital, HGS[2]: Handgrip strength max using Takei max, CC: Calf circumference, WC: Waist circumference, MAC: Mid-upper arm circumference, MMSE: Mini mental state examination, FS: FRAIL Scale, MNA: Mini nutritional assessment

associated with low PhA in overall and the male group (p>0.05). Only ASMM was significantly associated with low PhA in univariate and multivariate analysis in females. The results of the regression analyses of sarcopenia components associated with PhA in the female and male group are shown in Table 3.

Discussion

The aim of this study was to investigate the relationship between PhA, sarcopenia components, and comprehensive geriatric assessment in physically independent older adults. Correlation analysis revealed that PhA was correlated with all components of sarcopenia, except GS, in both sexes. The results of logistic regression analysis showed no significant relationship between low PhA and sarcopenia components in men, whereas low PhA was associated with ASMM in older women. In the comprehensive geriatric assessment, only the MNA score was correlated with and associated with PhA in the men's group. However, because no other associated factors were found, multivariate analysis could not be performed to assess the association between PhA and MNA score in men. In this study, PhA was positively correlated with HGS and ASMM in

Koçak et al. Phase Angle and Sarcopenia Components

Eur J Geriatr Gerontol 2024;6(3):208-215

Table 3. Logistic regression analysis of phase angle and components of sarcopenia according to gender

	Low PhA					
Variables	Univariate			Multivariate		
	OR	CI (95%)	p	OR	CI (95%)	p
Women						
HGS[1]	0.897	0.79-1.02	0.096	1.151	0.888-1.493	0.289
HGS[2]	0.823	0.697-0.972	**0.022**	0.751	0.553-1.021	0.067
ASMM	0.656	0.459-0.939	**0.021**	0.636	0.422-0.959	**0.031**
GS	0.305	0.028-3.382	0.333	0.124	0.004-3.934	0.237
Men						
HGS[1]	0.951	0.72-1.036	0.250	-	-	-
HGS[2]	0.932	0.844-1.030	0.166	-	-	-
ASMM	0.967	0.802-1.166	0.723	-	-	-
GS	0.326	0.036-2.957	0.319	-	-	-

PhA: Phase angle, ASMM: Appendicular skeletal muscle mass, HGS: Handgrip strength, GS: Gait speed, HGS[1]: Handgrip strength max using Jamar digital, HGS[2]: Handgrip strength max using Takei, CI: Confidence interval, OR: Odds ratio

all groups. The highest positive significant moderate correlation between PhA and ASMM was observed in males, whereas the highest significant positive correlation between PhA and HGS was observed overall. In contrast to our study, most studies did not separate men and women before the correlation analysis. A study conducted by Kilic et al. (25) on 263 older adults reported a positive correlation between PhA and MM. Similar to our study, Unterberger et al. (26) and Duarte Martins et al. (27) also demonstrated that HGS had a weak positive correlation with PhA overall. Unfortunately, the correlation between PhA and ASSM was not assessed in these two studies. In addition, the correlation results vary depending on the calculation formula and MM parameter used in the studies. Yamanaka et al. (28) determined MM estimated by their clinical formulas, which were not publicly available. They found that PhA was positively and moderately correlated with HGS, skeletal muscle mass (SMM), and GS (28). Do Nascimento et al. (29) have determined muscle mass index (MMI) adjusted by body surface and MM estimated by Sergi et al. (14) equation. They found that PhA had a weak positive correlation with SMMI in patients with Parkinson disease. Araújo et al. (30) have used MMI adjusted by height and MM estimated by Janssen et al. (31) formula, and they found a similar positive weak correlation between PhA and ASMMI (30). On the contrary, Pessoa et al. (16) used a similar adjustment and formula for calculating MMI and MM as Araujo et al (30) they found that PhA was not correlated with MM, MMI, and HGS. The main difference between these two studies is that Pesso et al. (16) only studied women, whereas Araujo et al. (30) studied both sexes. Most meta-analyses have shown a significant relationship between PhA and the different components of sarcopenia (6). In our study, sarcopenia components, such as HGS and ASMM, were found to be associated with low PhA in physically independent older women in the regression analysis. Studies on healthy older adults have yielded diverse outcomes.

Most studies have focused on the association between PhA and the presence of sarcopenia, with statistically significant lower PhA values found in the presence of sarcopenia (25,32). In a cross-sectional study involving patients with cancer, the mean age was 60 years, and a 1-degree increase in PhA increased the predicted value of HGS evaluated using a Jamar hydraulic hand dynamometer by 8% (33). Unterberger et al. (26) and Duarte Martins et al. (27) evaluated the physical performance data of older adults, not separating men and women and found that PhA predicted HGS in multiple regression analysis. A recent study found that PhA predicted appendicular ASMMI, adjusted by height, ASMM estimated by Janssen et al. (31) formula in linear regression analysis (30). On the contrary, Pessoa et al. (16) have used similar adjustments and formulas for calculating MMI and MM, and they found that there were no associations between low PhA and any components of sarcopenia in older women in the multivariate logistic regression analysis. Unlike our study and similar studies, Pessoa et al. (16) included only older women. Additionally, we used the first tercile value to identify patients with low PhA, as the aim of the study was not only to detect sarcopenia. Most studies have performed receiver operating characteristic analysis to identify the cutoff values of PhA to identify sarcopenia, and they found lower PhA cutoff values than in our study (6). This may be one reason for the discrepancy between our results and those reported in the literature.

In the univariate analysis, HGS using Takei was associated with PhA, whereas HGS using Jamar digital was not. Recently, various instruments have been used to measure handgrip strength, and the results have varied. In general, previous studies have found a significant relationship between HGS assessed by the Jamar hydraulic dynamometer and PhA (27,34,35). A recent study using a Saehan hydraulic hand dynamometer to assess

Eur J Geriatr Gerontol 2024;6(3):208-215

Koçak et al. Phase Angle and Sarcopenia Components

HGS found no association between PhA and HGS (30). In another study investigating the relationship between PhA and muscle performance, there was no correlation between PhA and HGS measured using a Jamar handgrip dynamometer in older adults (36). With aging, MM loss accompanied by increased extracellular fluid levels leads to decreased PhA (2,37). Norman et al. (38) concluded that PhA decreases as fat mass increases in older people. In a study of patients with cancer with a mean age of 60.4±11.4 years, PhA decreased as the percentage of muscle fat infiltration increased, whereas GS and HGS did not change (39). A study of 207 older adults referred for comprehensive geriatric assessment by Basile et al. (40) found similar results. In light of these studies, PhA appeared to have a linear relationship with MM, independent of multiple factors such as age. Given that moderately low SMM is associated with shorter survival rates in older adults, PhA may be an inexpensive early marker for the detection of sarcopenia (27). In the literature, PhA has been found to be associated with various health outcomes, including nutritional, inflammation, and hydration status. The present study found that the MNA score was associated with PhA in men. Ramos da Silva et al. (41) showed that changes in nutritional risk index influenced PhA as a nutritional status marker in women with breast cancer undergoing chemotherapy. A similar relationship between subjective global assessment and PhA was shown in hemodialysis patients (42). In contrast, Unterberger et al. (26) found that PhA was not associated with protein intake in healthy older adults. The latest studies have shown that the combination of PhA and MNA-SF is predictive of sarcopenia, whereas PhA is predictive of malnutrition and oropharyngeal dysphagia (9,43,44). In this study, we found no significant association between PhA and frailty. This may be due to the fact that we included older adults with Katz scores of 6 were included in the study. However, the relationship between frailty and PhA has been demonstrated in many studies. PhA was lower in frail patients than in those with robust in community-dwelling older adults (8,45). A similar relationship between frailty and PhA was also observed in patients with cancer (39). Uemura et al. (32) followed up 4452 community-dwelling older adults for 24 months, and they found that only PhA was an independent predictor of incident disability in both sex groups in Cox regression analysis. It was also found that an increased PhA was positively associated with improved ADL during rehabilitation after osteoporotic fractures (46).

Study Limitations

There are a number of limitations to this study. First, there are no definitive data on patients at risk of sarcopenia due to comorbidities, such as COPD and diabetes. This makes it difficult to reach any concrete conclusions about them. Although multi-frequency BIA measurements were used in this study, only the PhA value at 50 kHz was used for statistical analyses. The differences in measurements between BIA devices from different manufacturers and the fact that these measurements vary depending on whether a single-frequency or other multi-frequency BIA device is used make it difficult to generalize the results. In addition to technology harmonization, cross-calibration of electrical resistances is also required to allow direct comparison of results from different studies and to facilitate the use of commonly accepted reference values. To gain a more complete understanding of the prognostic utility of PhA, analyzing PhA at different frequencies would be interesting in future studies. The cross-sectional study design is another limitation of this study. Due to the relatively small sample size, no clear causal relationship was established. Our study did not include a physical activity questionnaire. This may be a limitation if PhA is also related to physical activity.

Conclusion

Our study showed that PhA in physically independent older women was associated with components of sarcopenia, except GS, suggesting that PhA is reduced in sarcopenic individuals. Challenges such as the use of different formulas for calculating ASMM and various cutoff values for different ethnic groups can be barriers to ASMM assessment. PhA may be a simple predictor of ASMM in physically independent older women. Further studies are needed to determine whether PhA can be used as an additional parameter to detect poor muscle quality and to define sarcopenia.

Ethics

Ethics Committee Approval: The present study was approved by the Ethics Committee of Ege University Medical Research Ethics Committee (approval number: E41277, date: 07.02.2019).

Informed Consent: All recruited patients provided written informed consent.

Footnotes

Authorship Contributions

Surgical and Medical Practices: F.Ö.K.K., A.K., S.S., Concept: F.Ö.K.K., A.K., S.S., Design: A.K., S.S., Data Collection or Processing: F.Ö.K.K., A.K., S.Ç., Analysis or Interpretation: F.Ö.K.K., A.K., S.Ç., Literature Search: F.Ö.K.K., A.K., S.Ç., S.S., Writing: F.Ö.K.K., A.K., S.Ç., S.S.

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Koçak et al. Phase Angle and Sarcopenia Components

Eur J Geriatr Gerontol 2024;6(3):208-215

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CASE REPORT

A Rare Geriatric Case: Omalizumab As a Rescue Therapy For Asthma-Chronic Obstructive Pulmonary Disease Overlap

🆔 Erdem Yalçınkaya[1], 🆔 Yasin Yıldız[2], 🆔 Büşra Can[2], 🆔 Hüseyin Arıkan[1], 🆔 Derya Kocakaya[1], 🆔 Şehnaz Olgun Yıldızeli[1],
🆔 Sait Karakurt[1]

[1]Marmara University Faculty of Medicine, Department of Pulmonary Medicine and Critical Care, İstanbul, Turkey
[2]Marmara University Faculty of Medicine, Department of Internal Medicine, Division of Geriatrics, İstanbul, Turkey

Abstract

The most common obstructive lung diseases observed during clinical practice include chronic obstructive pulmonary disease (COPD) and asthma. They share similarities in terms of clinical presentation. Asthma-COPD overlap is defined as an obstructive lung condition with clinical and inflammatory characteristics of asthma and COPD or predominantly COPD combined with bronchodilator responsiveness and elevated peripheral eosinophil count.

Keywords: ACO, clinical geriatrics, frailty, omalizumab, rescue therapy

Introduction

The present case highlights the efficacy of omalizumab as a rescue therapy for Asthma and chronic obstructive pulmonary disease (COPD) Overlap (ACO) in a frail older patient. Omalizumab should be considered in patients who are unresponsive to standard treatment.

Case Report

A 74-year-old male patient presented to the emergency department with dyspnea. He resided with his wife, and he did not use any assistive devices before hospitalization. He was assessed as semi-dependent in activities of daily living (ADL) and dependent in instrumental activities of daily living (IADL). Frailty and nutritional status were assessed using the FRAIL score and the mini nutritional assessment (MNA) score, respectively. A FRAIL score of 3/5 indicated frailty, whereas an MNA score of 10/14 was considered as malnutrion risk. The patient with no known comorbidities other than COPD reported a pattern of staying up late and experiencing excessive daytime sleepiness but did not report any forgetfulness, malaise, or anhedonia. In the past year, he did not report any falls or urinary incontinence.

There was no reported pain. His vaccination history included 2 doses of inactivated Sars-Cov-2 vaccine, 4 doses of mRNA vaccine, and 1 dose of pneumococcal conjugate 13 vaccine. He had pollen,dust, and perfume allergies and was an ex-smoker with a smoking history of 25 pack years.

The patient had a history of COPD with long-term use of inhaled glucocorticoids combined with short-acting β2 receptor agonists (SABAs) and a need for long-term oxygen therapy. He presented with shortness of breath and increased need for oxygen. Emphysematous changes were observed in the bilateral lung parenchyma on chest computed tomography (CT) scan performed over 4 years ago. Upon admission, the patient complained of dry cough for several days and breathlessness for several hours. Clinical examination revealed tachypnea with prolonged expiration, a silent chest on auscultation, and hypoxemia with an SpO_2 of 90% on 15 L of oxygen. Chest CT showed air trapping, peribronchial wall thickening, interlobular septal thickening, and ground glass appearance in both lungs, along with pleural effusion measuring 1 cm in the thickest part in both hemithorax (Figure 1). Arterial blood gas analysis showed hypercapnia with a partial pressure of carbon dioxide
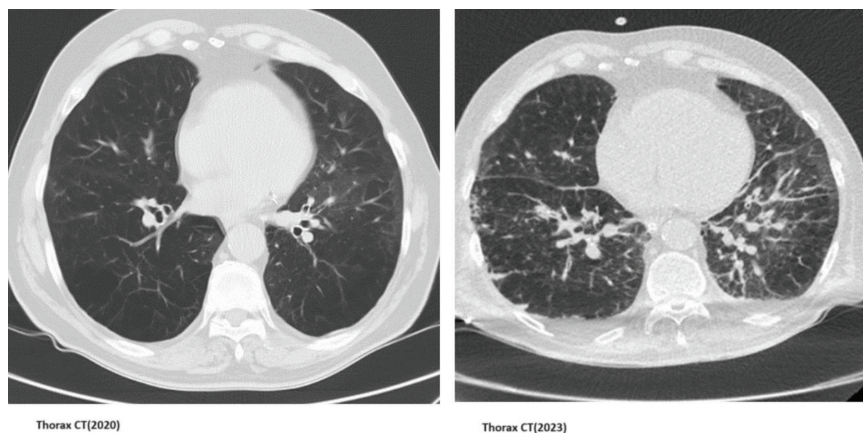
Figure 1. Chest CT showed air trapping, peribronchial wall thickening, interlobular septal thickening, and ground glass appearance in both lungs, along with pleural effusion measuring 1 cm in the thickest part in both hemithoraxes

CT: Computed tomography

(PaCO$_2$) of 80 mm Hg (pH=7.08 and PaO$_2$=56). The patient was diagnosed with COPD exacerbation, and noninvasive mechanical ventilation (NIMV) was initiated to the patient. Due to worsening hypercapnia and respiratory failure, the patient was intubated and referred to the intensive care unit (ICU).

During the patient's ICU follow-up, blood and sputum cultures were obtained. Subsequently, antibiotic therapy with piperacillin-tazobactam 4.5 grams every 6 hours and clarithromycin 500 mg twice daily was initiated. Additionally, a respiratory viral pathogen panel, nasal swab COVID-19 PCR test, Legionella urine antigen test, sputum culture, Mycoplasma pneumoniae, and Chlamydia pneumoniae immunoglobulin M antibodies were requested, and all results were negative. Bronchoscopy and chest radiography excluded pneumothorax and obstruction from a foreign body or mucus.

The patient received methylprednisolone (320 mg for 2 days, 240 mg for 1 day, and 160 mg from day 4 and gradually tapered and discontinued in 40 days), theophylline 480 mg/day, inhaled corticosteroids (ICS), and SABAs every 2 hours, montelukast 10 mg/day and cetirizine 10 mg/day along with intravenous magnesium sulfate. Ketamine (150 mg/h) was used for sedation because of its bronchodilatory effect. Despite these treatments, the patient's extubation attempts failed. Clinical examination revealed prolonged expiration and a silent chest on auscultation. Asthma-COPD ACO was suspected based on the patient's history and clinical presentation.

The patient had a previous total immunoglobulin E (IgE) level of 369.00 IU/mL, so the current total IgE blood level was 281.00 IU/mL (normal, <100 IU/mL). His eosinophil level was 0.00x10^3 /μl (normal 0.0-0.7 x10^3 /μl) in the complete blood count.

Omalizumab 450 mg subcutaneously was administered on the 7th day of hospitalization. Extubation was attempted again on the following day, and the patient tolerated it NIMV was applied

for 12 h/day. High flow nasal oxygen therapy was administered during intervals. On the 11th day of ICU admission, the patient no longer required NIMV. Normal lung sounds became audible during auscultation.

During follow-up, the maximum CO$_2$ level in arterial blood gas was measured at 60 mmHg. The patient was transferred to the pulmonary medicine department on the 14th day of hospitalization which was the 7th day of omalizumab therapy. In the pulmonary medicine department, the second dose of omalizumab was administered 4 weeks after the first dose, followed by subsequent doses every 4 weeks. He was discharged on day 71.

Throughout this process, the patient did not experience any relapses, and his or her clinical condition returned to baseline levels. In the current geriatric examination, the patient was evaluated as having FRAIL: 2/5 (prefrail), MNA: 13/14 (normal), good appetite, ADL: semi-dependent, and IADL: independent.

Discussion

The most common obstructive lung diseases observed in medical practice are COPD and asthma. Both diseases are significantly heterogeneous, but they share significant similarities and clinical features. Differentiating asthma from COPD can be difficult, particularly in smokers and older patients [1]. Therefore, the term Asthma-COPD ACO was proposed to represent the intersection of these two disease groups in clinical use. ACO is a spectrum of overlapping features of asthma and COPD. Although defined as an obstructive lung disorder with the clinical and inflammatory features of asthma and COPD or predominantly COPD, with bronchodilator sensitivity and high peripheral eosinophil count, there is no consensus on a clear definition for ACO [2]. Estimating the prevalence of ACO is challenging because of differences in definitions between studies. Despite heterogeneity among studies, the estimated global prevalence of asthma +COPD was

Yalçınkaya et al. A rare geriatric case: Omalizumab As a Rescue Therapy

Eur J Geriatr Gerontol 2024;6(3):216-219

2.0%, compared with 6.2% and 4.9% for asthma and COPD alone in a meta-analysis by Hosseini et al. (3). In an Italian study, ACOs were 1.6 %, 2.1 %, and 4.5 % prevalent among 20-44, 45-64 and 65-84 year olds respectively (4). Identification of patients diagnosed with ACO is important because they represent a distinct clinical phenotype with increased disease exacerbations and hospitalizations, decreased health-related quality of life, and higher healthcare costs. Therefore, there is a need to better define the management and treatment of this syndrome (5).

In the management of patients with ACO, priority should be given to nonpharmacological methods. Identifying and limiting the patient's exposures and quitting smoking are especially valuable for patients with ACO. To prevent disease exacerbations, recommendations such as annual influenza vaccination and pneumococcal vaccination, avoidance of allergens in patients suspected of having an allergic contribution to ACO, and participation in pulmonary rehabilitation programs should be made for patients diagnosed with ACO (2).

In patients with ACO, treatment should follow a step-by-step approach based on the control of symptoms and exacerbation history. Inhaler therapies are essential for managing mild-to-moderate disease. Although there is no clear evidence on the initial treatment approach, it is recommended to avoid the use of single long-acting beta agonist (LABA) therapy and start therapy with ICS to target airway inflammation, and then add LABA or long-acting muscarinic antagonists (LAMA) to ICS for concomitant airway obstruction (2). Gershon et al. (6) reported that among older adults with COPD, specifically if they had asthma and were not using long-acting anticholinergics, the risk of COPD-related death and hospital admission was significantly lower with the addition of LABA+ICS compared with LABAs alone (6). Patients treated with ICS/LABA who continue to have symptoms may benefit from long-acting bronchodilator therapy, such as those receiving LAMA. The use of a combination of three inhalers (ICS/LABA/LAMA) has been shown to be efficacious in the treatment of individuals with either asthma or COPD, particularly in patients with a history of frequent exacerbations and increased symptoms (7). If these patients do not respond to inhalation therapy, more advanced treatments can be considered, including the use of phosphodiesterase inhibitors, macrolides, and biologics (8).

Omalizumab is a human monoclonal antibody that recognizes and binds to IgE, leading to a rapid decrease in free IgE levels in the serum (9). Omalizumab has been safely used for many years for the treatment of allergic asthma and chronic urticaria. For many allergic and non-allergic diseases, such as non-atopic asthma, nasal polyps, and allergic bronchopulmonary aspergillosis, some case reports suggest that omalizumab may also be an effective treatment option (10). A diagnosis of COPD

is usually an exclusion criterion for clinical trials on asthma, so there is limited clinical data on the effectiveness of these treatments in a population where asthma and COPD ACO, although case reports have been published regarding the use of omalizumab in patients with refractory status asthmaticus (11-13). Consequently, data on the efficacy of omalizumab in this patient group are also limited. In a study by Maltby et al. (14) using data from the Australian xolair registry, omalizumab was shown to improve asthma control and health-related quality of life in people with asthma-COPD ACO over a 6-month follow-up period, compared with responses seen in patients with severe allergic asthma alone (14). Similarly, in a retrospective study of 70 patients with a mean age of 56 years, Crowley et al. (15) reported that omalizumab treatment was effective and safe in patients diagnosed with asthma, COPD, and ACO, even in those with multiple comorbidities and a history of smoking during a 12-month follow-up period (15). Although evidence for the use of omalizumab in the over 65s is limited, several studies have shown that omalizumab is well tolerated and effective in the treatment of uncontrolled asthma and chronic spontaneous urticaria in patients over 65 years of age (16,17).

Conclusion

In our case, despite standard treatments, the patient did not show improvement in clinical status, and extubation attempts were unsuccessful. Therefore, omalizumab therapy was initiated. Following treatment, the patient's clinical condition began to improve, and he was successfully extubated on the first day of treatment. Although there may be insufficient data in the literature regarding the use of omalizumab in frail older patients, our case demonstrated benefits the following omalizumab therapy. Omalizumab treatment in frail older patients diagnosed with ACO can be a potential rescue treatment option.

Ethics

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Eur J Geriatr Gerontol 2024;6(3):216-219

Yalçınkaya et al. A rare geriatric case: Omalizumab As a Rescue Therapy

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CASE REPORT

Dural Arteriovenous Fistula a Rare Cause to Dementia: a Case Report

🅾 Leise Elisabeth Hviid Korsager[1], 🅾 Lene Wermuth[2]

[1]Slagelse Hospital, Department of Geriatric Medicine, Slagelse, Denmark
[2]Slagelse Hospital, Department of Neurology, Slagelse, Denmark

Abstract

Dementia is estimated to affect 55 million people worldwide. Alzheimer's disease is the most common cause of dementia, but a variety of other conditions can also cause dementia. In this case report, we present a patient who experienced severe cognitive deterioration over 3 months. When we saw her at our clinic, she could barely remember her birthday, had trouble finding words, suffered from apraxia, was very tired, and her personality had changed. She was immediately hospitalized, and scan revealed dural arteriovenous fistula. The fistula was closed with endovascular surgery, and the patient regained most of her cognitive function.

Keywords: Alzheimer's disease, dementia, dural arteriovenous fistula, neurodegenerative diseases.

Introduction

Dementia is a common disease among older people, with 10 million new cases diagnosed every year worldwide. Fifty-five million people are living with the disease (1). The number is going to increase as a result of the increased number of older people. Alzheimer's disease is the leading cause of dementia and is responsible for 60-70% of all cases. However, a great variety of diseases and injuries can cause dementia, some of which are reversible. A thorough examination is therefore important (1). Herein, we present a patient with dementia caused by a rare but possible reservable condition.

Case Report

A 75-year-old female patient was admitted to our department with symptoms of dementia. Her symptoms were rapidly progressing. Over 3 months, her functional level had drastically decreased.

Her short-term memory was weak, and she could barely remember her personal identification number. Severe head turning was observed. The patient had trouble finding words and answered all questions with remarkably latency. The husband said that she had become very quiet. The patient had also got difficulties with practical tasks such as cooking. The level of initiative decreased. She would even forget to take a shower. The personality was changed. Finally, the patient became very tired and slept much more than usual. Apart from the above-mentioned symptoms, the patient had hypertension and cold thyroidea adenoma. Mini-mental state examination (MMSE) were 13/30 and Addenbrooke's Cognitive Examination were 38/100. Katz's activities of daily living were 2. The neurological examination was normal, except for an unsafe walk. Computed tomography (CT) scan showed a bit of cortical atrophy (global cortical atrophy 1) but no atrophy of the hippocampus (medical temporal lobe atrophy 0). The symptoms did not appear typical of Alzheimer's disease. The patient was hospitalized due to suspicion of encephalitis. Lumbar puncture excluded encephalitis.

A magnetic resonance (MR) scan was performed showing abnormal venous arteries in the fossa posterior bilaterally, abnormal signal in the left sinus transversus and sinus rectus obs fistula, possible thrombosis in the left sinus sigmoideus, and edema in the left cerebellar hemisphere. The subsequent MR angiography showed venous thrombosis in the sinus and arterial

flow in the sinus transversus. CT angiography showed venous thrombosis next to the sinus sigmoideus sinister and a defect in the left mastoid toward the sinus sigmoideus. The fistula was closed after endovascular therapy. Following surgery, the patient was admitted for physical therapy. Three weeks after the patient was hospitalized, the final result from the lumbalpuncture was obtained. The answer revealed that the patient also could suffer from Alzheimer's disease [425 beta-amyloid (>1100 ng/l), 415 tau protein (<250 ng/l) and 13 phosphorylated tau (<25 ng/l)]!

Six months after surgery, the patient was seen at our clinic. The patient has had experienced remarkably progress since the surgery. The initiative was back, and the patient again took part in daily house care without the husband having to remind her of the tasks. The tiredness had vanished. Although their memory had clearly become better, but remembering agreements could still be difficult. Her speech had improved, but she was still suffering from aphasia. She could still miss a word and sometimes say something wrong, although it is understandable. She was still attending a speech therapist. Katz's activities of daily living were now 6, which were in alignment with her remarkable improvement in anamnestic ability. The MMSE score was 13/30. The lack of improvement in the patient's MMSE score after treatment may be due to aphasia combined with underlying Alzheimer's disease.

Discussion

Rapidly progressively developing dementia is caused by many different conditions. The most common cause is prion disease, with Creutzfeldt Jakob's disease counting for 25-60% of the cases (2). Other common causes are neurodegenerative diseases, vascular diseases, toxic/metabolic conditions, infections, autoimmune diseases, and para- and neoplastic entities. Rapidly progressive dementia (RPD) caused by inflammatory and toxic/metabolic conditions recovers relatively well. RPD caused by neurodegenerative diseases is associated with some of the worst prognoses (3). A quick and careful investigation is important because some patients experience a good recovery. A Chinese retrospective study evaluated 149 patients with RPD. They found that age was negatively correlated with MMSE score and Glasgow outcome scale (3). A dural arteriovenous fistula is a very rare cause of RPD. Fistulas can occur in different places in the brain, but the most common place is the sinus sigmoideus, as in our patient (2). The fistulas cause edema and thereby high local pressure in the brain, which is believed to cause symptoms. Dementia is a rare symptom of a fistula. The most common symptoms of a fistula are headache and dizziness. Brito et al. (4) investigated 389 patients admitted to their clinic with a dural

arteriovenous fistula and found that only 1.4% of the patients had RPD as a symptom of the fistula. It is important to detect a fistula because it is curable and the patient's symptoms may resolve. Case reports have shown full or partial regression of dementia symptoms when the fistula is closed (5). Our patient regained almost all of her cognitive skills except for speech problems. The fact that the speech did not fully recover can either be explained by two things. First, the fistula might have caused irreversible damage because it was located in the left hemisphere, the same place as the language. Second, her Alzheimer's disease might have affected her speech skills.

Conclusion

With rapidly progressing dementia, other conditions other than Alzheimer's disease must be considered. In this case, our patient suffered from dural arteriovenous fistula and Alzheimer's disease. The fistula was closed with endovascular surgery, and the patient improved almost all cognitive symptoms that had worsened due to the fistula.

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Paying Direct Care Workers is a Huge Financial Burden for the Older Population in South Korea

Jenny Hyosun Kwon[1], Kisang Kwon[2]

[1]Miami University, Department of Sociology and Gerontology, Oxford, Ohio, USA
[2]Wonkwang Health Science University, Department of Clinical Laboratory Science, Iksan, Korea

Abstract

The government of the Republic of Korea (hereafter, Korea) introduced the National Health Insurance Service (NHIS) system in 2008. Due to the rapidly increasing number of individuals aged 65 years and over, the system requires reform to ensure its financial sustainability and reduce the financial burden on individuals. Thus, this study conducted an in-depth investigation of the financial burden on older individuals in Korea under the current NHIS system. The aims of this study were to present an overview of long-term services and support in Korea and to report on the challenges for older Koreans in receiving informal care. Based on the results, four suggestions were proposed to provide affordable long-term services and support: establish an integrated care and medical needs assessment system, introduce a comprehensive nursing service system, expand home and community-based care services (HCBS), and implement national-level long-term care workforce development and management.

Keywords: Aging, long-term services and supports, National Health Insurance Service (NHIS), home and community-based care services (HCBS), and direct care workers (DCWs)

Introduction

In the Republic of Korea (hereafter, Korea), the proportion of older populations is increasing rapidly because of rapid economic growth, improved living standards, and advances in disease prevention and medical technology. The older population is expected to increase annually, reaching 17.5% of the total population aged 65 years and over (hereafter, 65+) in 2022 and 40% in 2050 (1). Thus, Korea will become a super-aged society with an Aging Index (the ratio of individuals aged 65+ to 100 individuals aged 14 years and under) of 152 in 2022, 456.2 in 2050, and 620 in 2070 (1). The average life expectancy and healthy life expectancy in 2020 were 83.5 and 73.1 years, respectively (2). The average life expectancy minus the healthy life expectancy is approximately 10 years of living in an unhealthy state or requiring help from others (2).

The Ministry of Health and Welfare in Korea (hereafter, MOHW) has implemented various welfare schemes, but the number of individuals aged 65+ requiring care and support is increasing

rapidly (3). The MOHW operates three main welfare schemes for older individuals to help them fulfill their medical and non-medical needs due to geriatric diseases (e.g., dementia, cerebrovascular disease, Parkinson disease) or disabilities that prevent them from caring for themselves (3-5). 1) Personalized care service: this service provides personalized welfare, such as safety, life education, service linkage, domestic support, and activity support for older individuals and individuals living alone who have difficulty with activities of daily living. 2) Long-term care insurance system: this social insurance system provides long-term care benefits, such as support for physical activity and household activities, to individuals aged 65+ or under 65 years with chronic diseases. 3) Comprehensive nursing service system: in this system, hospitals provide professional services, including registered nurses and 24-hour daycare for individuals without the presence of caregivers.

Until today, in Korea, family was the primary source of caregiving for older adults, accounting for 90% of all caregivers. However,

owing to rapid changes in social environments (e.g., nuclear families; advances in women's social status; declining filial piety; increasing individualism), the difficulty of being a family caregiver is increasing (6). Moreover, the increase in geriatric chronic diseases, such as dementia, which affects more than 10% of older individuals, has led to a surge in demand for care (7). However, the decline in the number of children and changing values regarding supporting old parents has led to reliance on formal caregivers [e.g., direct care workers (DCWs)] to replace family caregivers.

DCWs are directly employed by clients (older individuals or their caregivers) to provide personal care (e.g., bathing, grooming, dressing), medication management, meal preparation, housekeeping, transportation, and companionship) (8-10). The MOHW pays DCWs USD 2,153 per month, spending approximately USD 6 billion per year, or approximately USD 8.5 billion per year, if the loss cost of DCWs is included. However, the actual pay for DCWs in the field is approximately USD 85-115 per day, including food provision, which requires approximately USD 2,885 per month (11,12). In 2023, the pay range for DCWs in the U.S. was USD 104-120 per day (13). The pay for DCWs in Korea is approximately equivalent to that in the United States. Because entry-level public officials in Korea earn approximately USD 2,000 per month, the cost of a DCW is unaffordable for many potential clients. Recently, the pay of DCWs has increased to USD 3,000 per month. Notably, an increasing number of family members are quitting their jobs or shortening their working hours because of caregiver responsibilities. Currently, the main sources of DCWs in Korea are nursing service agencies and employment agencies, and the supply is unstable, which contributes to the increasing caregiving costs (14). There is no well-controlled care education or management of DCWs by the MOHW. This large gap between actual caregiving costs and care seekers' willingness to pay leads to increased financial burden on family members.

Current Issues

The most notable limitation regarding the pay for DCWs in Korea is that the National Health Insurance Service (NHIS) system does not recognize these costs as medical expenses, directly leading to poor quality care services and financial burden on care recipients. The cost of DCW accounts for a high proportion of total caregiving costs. The most obvious way to reduce client paid DCWs will be for all caregiving services to be institutionalized in the NHIS, allowing all citizens to receive benefits. However, the cost might be higher than the current NHIS budget allows, indicating the need for additional funding (15,16).

Moreover, hospitals cannot train, supervise, or manage DCWs because DCWs are not hospital employees. DCWs are managed by the nursing service agency that referred them to the hospitals. Therefore, the DCW work manual is unclear.

For example, the tasks of DCWs range from performing basic care services to providing nursing tasks, such as suctioning, administering oxygen, and changing urine lines. Furthermore, DCWs are susceptible to physical and/or psychological injuries and even sexual harassment because DCWs are unprotected by hospital supervisors (17).

Although caregiving costs are not covered by the NHIS, most caregiving costs are paid for DCWs. Korea has many family caregivers because many individuals cannot afford to pay for DCWs, and the demand for high-quality care services is higher than the supply. Various side effects of family caregiving are emerging in Korea (18). For example, younger family caregivers sacrifice education and employment to care for their old parents. Old parents also provide care for children with disabilities. These family caregivers become fatigued and stressed so that they can no longer provide care, resulting in social tragedies such as "caregiver murder", where a caregiver kills the individual they care for and/or commits suicide. The unaffordability of DCWs can also lead to clients becoming "medical poor". The Seoul Times (July-August 2018) surveyed 325 family caregivers in Korea about the difficulties of caregiving (19). The respondents reported mental and physical limitations (60.2%), increased financial difficulties (50.6%), anxiety about the future (45.8%), and thoughts of killing or dying with the patient (5.4% very often and 23.8% often). Moreover, negative thoughts intensified when the duration of caregiving was more than 7 years and the average caregiving time exceeded 8 hours per day.

Thus, resolving the problem of unaffordable pay for DCWs is an urgent task. In the following section, four solutions are suggested.

Suggestions

Establish An Integrated Care and Medical Needs Assessment System (Provisional Designation)

Nursing homes are social care where older individuals receive care in the facilities and may be eligible for pay for DCWs from care. In this situation, the NHIS covers the pay for DCWs if the Long-term care insurance system determines that the client is eligible. Nursing hospitals are open to any individual who wants to be admitted, staffed by physicians and nurses, and intended for therapeutic purposes. Notably, the NHIS does not cover nursing hospital fees (20). Thus, a suggestion to solve the problem of unaffordable pay for DCWs is to re-establish the functions of nursing homes and nursing hospitals. To achieve this objective, the pseudonym "integrated care and medical adjudication system" was created to garner public confidence. Based on a comprehensive assessment of medical needs, care needs, and living conditions, older individuals with high medical needs would be placed in nursing hospitals, older individuals with high care needs would be placed in nursing homes, and older

Kwon and Kwon. Paying Direct Care Workers in Korea is a Huge Financial Burden

Eur J Geriatr Gerontol 2024;6(3):222-225

individuals with low medical needs and low care needs would be placed in the personalized care service for the older adults. This change would reduce confusion regarding the services provided by nursing homes and nursing hospitals. In addition, the savings that NHIS would gain from relocating older individuals could be used to pay for DCWs (in the context of nursing homes, nursing hospitals, and personalized care services for older individuals). As previously mentioned, reducing clients' cost of DCWs would result in many benefits. Notably, for the integrated care and medical needs assessment system to operate smoothly, the complex issues between nursing homes and nursing hospitals, such as deflection to nursing hospitals, maintaining the quality of care, training and management of care personnel, and the institutionalization of DCWs (e.g., their scope of task), should be carefully approached to create a reasonable complementary system that does not compromise the quality of care at nursing homes or nursing hospitals.

Introduce A Comprehensive Nursing Service System

To reduce the burden of paying for DCWs, Korean government introduced the comprehensive nursing service system in 2015 (5). The program provides 24-hour professional caregiving and nursing services through nursing staff in hospitals without family caregivers or DCWs. Older individuals living in nursing homes and general hospitals can receive long-term care benefits from the long-term care insurance system, which includes caregiving costs. Korea has more than 5,800 nursing homes (2021) and more than 6,300 beds in 600 hospitals (2022) (21). With such a good service system, why are many individuals worried about paying for DCWs? The answer is that the comprehensive nursing service system does not apply to nursing hospitals but to general hospitals. However, in most general hospitals, this service is available but is not provided by the hospitals because of low profit. Thus, critically ill patients who require nursing care are not covered. To operate this system rationally and substantially reduce the burden of unaffordable pay for DCWs, a new version of the comprehensive nursing service system should be created for nursing hospitals such that the NHIS pays for DCWs.

Expand Home-Community-Based Care Services (HCBS)

The trend in social care for older individuals is shifting from institutional care where individuals are isolated to the place, they feel most comfortable. Home-community-based care services (HCBS) enables older individuals with care needs to receive the services they need in the community, including in their homes, and maintain their lifestyles. The government provides a comprehensive range of supportive living services to help older individuals live independently, remain healthy, and integrate into the community. For example, nutritional care (e.g., congregate meals and meal delivery), preventive healthcare, and chronic disease self-management are provided. The system aims to ensure that older individuals remain in their communities and maintain their existing lifestyles with high levels of satisfaction as an alternative to entering nursing facilities. Measures should be implemented to actively support and protect family members, mostly women who are often mothers and wives who play a vital role in providing informal care in Korea. In 2018, South Korea announced "elderly community care" to build a foundation for an integrated care system (housing, health and medical care, nursing and care, and integrated service provision) (22). Thus, efficient management of HCBS will reduce the burden of long care hours and unaffordable pay for DCWs that accompany institutional care.

Develop and Manage the Long-Term Care Workforce at the National Level

Korea is experiencing an imbalance in the supply and demand of DCWs. Currently, DCWs can work as caregivers without a national certificate. A systematic management system for DCWs through national examinations should be established. In other words, it is the responsibility of the national Korean government to train DCWs for nursing homes and hospitals to prepare for the rapid increase in demand for DCWs. A stable supply of DCWs is essential for maintaining affordable pay for DCWs. Many foreigners work as DCWs in Korean nursing homes and hospitals, but no institutional framework, including qualification requirements, has been established (23). To ensure an adequate supply of foreign DCWs, Korea should expand visa issuance and relax qualification standards, including the Korean language proficiency test. In the "mutual caregiver system", one DCW is jointly employed by several care seekers to reduce the cost of paying for DCWs; however, this system does not apply to foreign DCWs. As previously mentioned, many foreign DCWs perform care work; thus, including them in the mutual caregiver system could result in savings in the cost of DCWs. In addition, a new approach to caregiving for older individuals is using well-being support devices based on the internet of things and artificial intelligence technologies (24). Introducing technologies will reduce the demand for DCWs and reduce their number of work hours, thus reducing the overall costs to clients.

Conclusion

Korean society has not been well prepared for the definition, roles, and responsibilities of DCWs and is experiencing the challenges of a super-aged society. This paper suggests that the MOHW should proactively prepare for the super-aged society by establishing and institutionalizing a "DCWs service system" that supports the cost, supply, training, and management of DCWs by defining care tasks, role divisions, and responsibilities. Not comprehensively identifying and resolving the problem of unaffordable pay for DCWs could result in worsening the quality of life of older Koreans.

Footnotes

Authorship Contributions

Concept: J.H.K., K.K., Design: J.H.K., K.K., Data Collection or Processing: J.H.K., K.K., Analysis or Interpretation: J.H.K., K.K., Literature Search: J.H.K., K.K., Writing: J.H.K., K.K.

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The Social Pandemic of Ageism: Exploring Ageism Toward Older Americans During COVID-19 Using Stereotype Embodiment Theory (SET)

Jenny Hyosun Kwon, Reese Moore

Miami University, Department of Sociology and Gerontology, Ohio, USA

Abstract

During the Coronavirus disease-2019 (COVID-19) global pandemic, a social pandemic, followed. Ageism, which is as viral and fatal as the former, rapidly spread and extensively affected older adults' lives. The purpose of this study was to closely examine the impact of ageism during the pandemic on internalized ageism among older Americans. Four examples of ageism were manifested in the United States during COVID-19 toward older adults: 1) the mass media framing older individuals as a vulnerable population, 2) tolerance and acceptance of harmful ageist commentary on social media, 3) the appearance of ageism in diverse settings and within policies, and 4) ageist remarks from leaders in American society. These four characteristics were interpreted using stereotype embodiment theory as the guiding theoretical framework. In the short term, age discrimination against older people resulted in decreased social connection. In the long term, the overall quality of aging, including self-perceptions of aging, self-efficacy, resilience, and intergenerational relationships, may be negatively influenced due to internalized ageism. In conclusion, three recommendations on combating ageism are provided. Specifically, raising awareness, altering the use of chronological age, and utilizing intergenerational programs are proposed.

Keywords: Social gerontology, internalized ageism, institutional ageism, vulnerability framing, age discrimination, coronavirus

Introduction

When Coronavirus disease-2019 (COVID-19) swept across the world in March 2020, the social pandemic of ageism (i.e., discrimination based on one's age) followed. The most striking ageism came from mass media, as television, magazines, and newspapers consistently frame American older adults (i.e., individuals aged 65+) as vulnerable due to their chronological age (1-3). Social media users mocked the high mortality rates among older adults, while policymakers segregated them from society in the name of protection and economic recovery (3-5).

Age discrimination has extensively impacted older adults' lives during the pandemic (3,6). Older adults struggle with health issues (e.g., high rates of infection and mortality) and decreased social connection (7,8). Additionally, the overall quality of their aging, including self-efficacy, resilience, intergenerational relationships, and self-perceptions of aging, is negatively impacted (7,9). Furthermore, age-based discrimination can be internalized by older adults, adding another layer to the

negative impact ageism can have. Internalized ageism occurs when an individual embodies or internalizes the ageist imagery appropriated in popular culture, effectively self-stereotyping and creating false assumptions about their abilities and true value (10). To examine the impact of ageism during the pandemic on internalized ageism among older adults in the United States (U.S.), the present article aims to: 1) review key points of SET with an emphasis on internalized ageism, 2) examine and interpret four examples of ageism toward older adults that manifested during COVID-19 using SET, and 3) suggest three ways to combat ageism.

Theoretical Framework: Stereotype Embodiment Theory (SET)

SET explains a lifetime process through which age stereotypes are internalized by absorbing the social norms and cultural values surrounding individuals (10). SET has four tenets: 1) a lifelong exposure to age-stereotypes, 2) unconscious internalization, 3) facilitating by self-relevance, and 4) a wide range of impact.

First, older adults are continuously exposed to age stereotypes throughout their lifespan. Second, older adults internalize these stereotypes unconsciously. Third, the internalization process is facilitated by self-relevance. For example, older adults might wonder "are those ageist remarks toward me?" or "do they treat me in this way because of my age?" Lastly, the result of stereotype embodiment influences all aspects of older adults' lives. Specifically, the internalization of negative aging stereotypes limits older adults' physical abilities and cognitive function (7,10,11) and negatively impacts their life expectancy (10,12). Self-perception and self-efficacy also deteriorate as a result of internalized ageism (10,11,13,14). Similarly, Swift et al. (15) argued that stereotype embodiment prevents older adults from maintaining autonomy, independence, and quality of life in later life. Older adults' psychological, behavioral, and physiological aspects are simultaneously impacted by the internalization of ageism (14). For example, a person could decide not to go see a doctor because they do not want to feel age-discriminatory behavior toward them in a hospital. This behavior may worsen their health status. Then, they would begin to perceive that they would more frequently be subjected to ageist remarks because of their poor health status. The scope of internalized ageism was expanded to include age-discriminatory language toward not only themselves but also their loved ones (e.g., old age parents or spouse) (16). With this theoretical background in mind, four characteristics of ageism that manifested during COVID-19 among the U.S. older adults were identified and examined using SET.

Four examples of ageism during COVID-19

The Mass Media's Vulnerability-framing

From the early stages of the pandemic, the mass media framed older adults as vulnerable groups in three ways. First, newspapers lumped people aged 65 and over into categories such as "aged," "the elderly", "seniors", and "boomers" (1,2,6). Second, the media consistently described older adults as "fragile", "weak", "vulnerable", or "at risk" (1,6). Finally, older adults who were less affected by the virus were celebrated as "survivors", implying that recovering from the virus at an old age is an unachievable thing (2). The negative language (e.g., frail or at risk) used to describe older adults during the pandemic ignored the diversity within the aging population and bothered it by grouping all older adults into a single category, which excluded them from the rest of society.

Ageist language can be embodied by older adults who internalize the negative framing of their age. Older adults may begin to believe the messages spread from the mass media, thus affecting their self-esteem, well-being, social identity, and even health status (15). Emerging evidence proves that U.S. older adults who have been exposed to media coverage during COVID-19 have reported deteriorated physical status and increased loneliness

(7). These side effects from exposure to ageism from the mass media are supported by Levy (10) arguments that older adults who have been repeatedly exposed to negative age stereotypes are likely to internalize the stereotypes, and ultimately, their physical and mental health will be negatively influenced. Furthermore, the implications of the media's framing of vulnerability are not limited to older adults. Life-long exposure to ageist expression impacts the perception of aging across the lifespan among individuals at any age (10). The point is that one's later life perception of aging varies by one's accumulated exposure to ageism from an early life stage. Indeed, U.S. citizens aged 18 and over prefer to belong to a younger generation to avoid being framed as vulnerable groups during the pandemic situation (17). People fear being labeled as an old age group (18). These beliefs highlight that the media's framing of vulnerability toward older adults can facilitate internalization of ageism among even young Americans.

Social Media Ageism and Social Approval

Ageism was also ubiquitous on social media (e.g., Facebook, Instagram, and TikTok) (3-5,19). Due to social distancing policies and lockdowns, social media usage skyrocketed, as it provided an outlet for people to express and share their thoughts during the pandemic (20). Consequently, ageism has been explicitly and implicitly expressed online much more than it was pre-pandemic and has gained support through replies, reproduction, likes, and shares (3,6,16). Social media users made fun of older adults' high mortality rate and expressed relief that they were not members of this age group using hashtags such as #BoomerRemover, #Boomer, and #OkBoomer (3-5,19). As the hashtags imply, ageist discourse on social media has intensified intergenerational conflicts and tensions between the so-called the "baby boomer generation" and the other age groups (19). Furthermore, social media users have described negative experiences they have had with older adults, mimicked older adults' gestures, behaviors, and speaking, and even complained about the wealth gap among generations (5,19). Through this discourse, society members showed their consent to comply with ageism, which can reinforce intergenerational feuds. With an approval for ageism in social media, people think the exclusion of people aged 65 and older from society is acceptable, and othering older adults have become normalized.

Given the increasing number of older social media users, ageism in social media can have a severe impact on older adults in the future (21). Older adults have an increased likelihood of observing the ageist language and myth surrounding their age, as well as the accompanying social acceptance of ageism. This imagery may be internalized by older social media users, acting as a social cue for older adults to believe that they are insignificant in society, which can negatively impact their self-perception, self-efficacy, self-esteem, health, and life

expectancy (10). Older adults may become used to being treated like others without resistance. Given the rapid, extensive, and sensationalizing characteristics of social media, the impact of ageism will become more apparent among older adults, thus increasing the likelihood of internalizing ageist messages and the associated adverse side effects.

Ageism in Diverse Social Settings

Ageism is intensified in long-term care facilities, workplaces, and the community. Older residents in nursing homes did not receive timely and adequate resources (e.g., daily temperature check-ups, personal hygiene equipment, or financial support), resulting in a high mortality rate. Furthermore, strict quarantine policies were implemented, which did not allow residents to meet their family members and obtain the necessary emotional support (3,4,22). Older laborers were forced to leave the workplace, retire early, or be paid less (3). Although older workers were still able to work, they received insufficient support to work remotely and were not given timely preparation to transition to a new working environment (3). The lack of workplace preparation forced older workers to continue commuting to their workplaces, risking exposure to the virus; otherwise, they were pushed to retire voluntarily. Simultaneously, some people regarded older adults as a target to be nurtured and patronized, which led to unwanted help and expressed unnecessary concerns for older adults (3,6). For example, community members deliver food and hygiene products to older adults' homes (23). Grocery stores have assigned a certain time slot for older adults to shop, calling this "senior shopping hours" (24).

Ageism in diverse social settings can serve as a societal cue for older adults (10). Even older adults who do not think they are weak can learn to become dependent if the societal environment and system continue to overprotect them (25). Older adults may become unconsciously familiar with such ageism and self-approve of it. For example, older individuals may doubt their capability and competence, begin to believe that they need help, or view themselves as helpless. Even well-intentioned protection policies (e.g., senior shopping hours) for older adults have resulted in older adults being excluded from society by limiting their social connections, which leads to increased loneliness, depression, and altered perceptions of aging (3). These negative experiences may have made them feel both excluded from and not worth our society. Older adults may blame themselves for not being physically strong enough to shop with other age groups, thus reinforcing the self-relevance of ageism highlighted in SET. Social isolation has led to negative health outcomes among older adults who might have preferred active social interaction (e.g., conversations and gatherings) to stay home safely alone (9). Furthermore, younger adults can have the incorrect perception that older

adults are weak, frail, and dependent. This distorted view can lead people to distance themselves from aging, which can ultimately intensify the process of othering older adults from our society, intergenerational discord, and misunderstanding of aging.

Ageist Remarks by Leaders of Our Society

During the pandemic, some political leaders expressed support for ageist ideals and age segregation (4,6,26,27). For example, in line with the Trump administration's "opening up America again" policy (28), Dan Patrick, the Lieutenant Governor of Texas, suggested that older adults should sacrifice themselves to help the nation recover from economic recession and support future generations (26,27,29). As a person in his 70s, Patrick demonstrated his own internalized ageism (16). Furthermore, he suggested that older adults are a societal burden and that they should risk being infected by the virus, which shows his negative perception of aging. Patrick's remarks sparked a discussion of targeted lockdowns for people aged 65 and over (30). Some economists have proposed that all older adults are vulnerable to the virus and do not contribute as much to the economy as their younger counterparts. Thus, to achieve greater economic gains, policymakers suggested continuing older adults' social isolation-a discussion that lacks consideration for older adults' freedom and choice, as it could have increased their social disconnection, and subsequently, feelings of loneliness and depression (9).

Public ageist discourse is a prime example of how negative perceptions of aging are reinforced within institutional settings (10). Leaders in our society have the power and authority to influence others' behaviors and opinions. Given authority figures' positions in society, their remarks could have fostered a social atmosphere that supported ageism and made other social demographics feel less guilty about expressing ageist beliefs. The general public can easily accept such ageist remarks without doubt. People, including older adults, can wrongly accept that the young are equal to good; and old is equal to bad. This social consent to ageism may provide self-relevance among older adults, which fosters a negative self-perception of aging (10). Living in a youth supremacy culture where aging equals futile, unproductive, or impotent, individuals might try not to be perceived as old. This normalized ageism can cause older adults to fear being regarded as old and even deny their ability to age.

Recommendations

With the outbreak of COVID-19, ageism, which is deep-rooted in our society, rapidly rose to the surface. Thus far, this paper has analyzed examples of ageism in the context of COVID-19 based on SET. The paper concludes with three recommendations to fight against the ubiquitous social pandemic of ageism.

Raising Awareness of Ageism

The first and most important step is to increase awareness of ageism. In many cases, people who express ageism are not aware that they are engaging in ageism, or even what ageism is. An international campaign would be a great way to problematize ageism. The World Health Organization launched a global campaign to combat ageism in 2016, and the United Nations joined this movement (31,32). Building on these collective efforts, an international day for combating ageism can increase awareness of ageism and its seriousness. While October 1st is the International Day of Older Persons (33), much of the discussion is based on "healthy aging" and aims to share general information about the older population. Thus, an official day for combating ageism and collaborative actions from researchers, social workers, policymakers, and practitioners around the world are necessary. This day would promote collective actions on a large scale, similar to actions taken to fight other types of social discrimination, such as the International Day for the Elimination of Racial Discrimination observed on March 21, 2020 (34).

Using Chronological Age Wisely

At the national or state level, decision makers must use chronological age more wisely. Chronological age is a convenient age marker, but it does not communicate all aspects regarding one's age. It has been widely used in industrialized modern society as the basis for distributing public wealth (e.g., social security) and determining social norms (e.g., marriage, childbirth, voting, and education). However, the validity of chronological age has been challenged in recent decades due to increased life expectancy, medical and technological advancement, heterogeneity in each individual's life, and subjective feelings about one's age (35). The first step in using chronological age wisely is to stop unnecessarily depending on chronological age in the process of policymaking, employment, and medical triaging. Before using chronological age as a criterion, decision-makers should think critically about whether it is necessary to identify one's chronological age. If the answer is yes, other factors to supplement chronological age, such as functional capability, physical environment (e.g., climate, geographical regions, and exposure to certain conditions), lifestyles (e.g., alcohol and tobacco consumption), genetics, pre-existing conditions, social interaction, need for assistance, and any other factors that might be relevant need to be considered. For example, in the context of COVID-19, pre-existing conditions have played an important role. The vulnerable group was officially defined as not only individuals aged 65 and over but also those with certain medical conditions (e.g., asthma, cancers, or tuberculosis) and pregnant people as well (36).

Positive Intergenerational Interactions

Lastly, at the local level, community members must build an age-inclusive social and cultural context. One tangible approach is to encourage intergenerational programs (10,37,38). Sharing commonality and mutual interests is a key strategy to foster positive intergenerational relationships (39,40). Particularly, in a crisis situation, such as a global pandemic, diverse generations are empathized by sharing experiences on how they persevere through difficulties. Furthermore, younger adults can be relieved by older adults' positive perspectives (41). Although intergenerational conflicts have occurred during the pandemic, the pandemic may provide an opportunity to build intergenerational solidarity. It is important that intergenerational interactions develop into long-term relationships. To do so, both parties need to feel reciprocity and mutual benefits (42). Having a meaningful time and exchanging gratitude or compliments to each other can make participants feel that the program is valuable. Although these solutions are proposed separately, they are interconnected and cannot work without support from one another. Thus, all three recommendations should be taken together to reduce the misunderstanding of aging and older people.

Conclusion

Aging is a biological experience, but how we interpret and treat it is a social phenomenon. We now are making a successful transition from a pandemic era to an endemic era; however, the homework the virus gave us is still incomplete. Being on the verge of the post-COVID era, this is the time to ponder how to fight against the social pandemic of ageism.

Footnotes

Authorship Contributions

Concept: J.H.K., Design: J.H.K., R.M., Analysis or Interpretation: J.H.K., R.M., Literature Search: J.H.K., R.M., Writing: J.H.K., R.M.

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2024 Referee Index

Abdulrazzak Abyad
Ahmet Yalçın
Alper Döventas
Arzu Okyar Baş
Aslı Kılavuz
Ayşe Daylan
Bahar Bektan Kanat
Bilal Katipoglu
Birkan İlhan
Büşra Can
Büşra Haktanıyan
Cansu Atbas
Cemile Kütmeç Yılmaz
Cemile Özsürekci
Çağatay Çavusoglu
Çağlar Cosarderelioglu
Çağlar Ozer Aydin
Çiğdem Alkaç
Dae-Hyun Seog
Deniz Mut Sürmeli
Didem Karaduman
Doha Rasheedy
Dr. Javier Benıtez Rıvero
Ekin Oktay Oğuz
Elif Güngör

Emin Taşkıran
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Fadime Üstuner Top
Fatma Sena Dost
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Gönül Düzgün
Gülsüm Gedik Karaahmetli
Günes Arik
Hande Selvi Öztorun
Helin Yesin
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Merve Güner
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Nezahat Müge Çatıkkaş
Nezihan Ulusoylar Erken
Nurdan Şentürk Durmuş
O-Yu Kwon

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Özgür Kara
Pelin Ünsal
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Seher Yiğit
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Tahir Belice
Tuğçe Emiroğlu Gedik
Veysel Suzan
Yasemin Kalkan Uğurlu
Yasin Yıldız
Yelda Öztürk
Zeynep İclalturgut
Zeynep Kahyaoglu