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From The Editor In Chief

In an era where global populations are aging at an unprecedented rate, the importance of research in geriatrics and gerontology cannot be overstated. These fields are dedicated to understanding the complex biological, psychological, and social aspects of aging, aiming to improve the quality of life for older adults. With advances in healthcare extending life expectancy, there is a growing need to ensure that these additional years are characterized not just by longevity, but by vitality and well-being.

Geriatric research focuses on the medical care and management of older adults, addressing the unique challenges they face, such as multiple chronic conditions, polypharmacy, and increased susceptibility to diseases. Understanding these challenges enables the development of targeted treatments, preventative strategies, and personalized care plans that enhance the health and independence of older individuals.

Meanwhile, gerontology takes a broader approach, examining aging as a multifaceted process that affects individuals, families, and societies. Research in this field explores the psychological and social changes associated with aging, the impact of age-related diseases, and the societal implications of an aging population. Insights gained from gerontological research are essential for informing public policy, guiding the development of age-friendly communities, and fostering a societal understanding of aging that respects and values the elderly.

Together, geriatrics and gerontology play a crucial role in shaping a future where aging is not feared but embraced, where older adults are supported in living fulfilling lives, and where the wisdom and experience of the elderly are cherished as a vital societal resource.

Turkish Journal of Geriatrics has been indexed under Science Citation Index Expanded (Sci-Exp) and Social Sciences Citation Index (SSCI) since 2008 and plays a critical role advancing research in these fields. As we continue to explore these fields, we not only improve the lives of current older generations but also pave the way for future generations to age with dignity and grace.

Yeşim GÖKÇE KUTSAL

ORIGINAL ARTICLE

PRIVACY OF OLDER ADULTS

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Abstract

Introduction: In contrast to hiding specific things, privacy concerns protecting one's right to self-control and autonomy, which accompanies everyone's existence. In the healthcare sector, older adults' thoughts about privacy should be evaluated relative to those of nurses to understand how the concept of privacy is perceived and whether necessary attention is given to the subject.

Materials and Method: This was a descriptive study. A sociodemographic Information Form and Patient Privacy Scale were used. After the necessary institutional and ethical permissions were obtained, face-to-face data were collected from 926 older adults and 788 nurses from six public and four university hospitals.

Results: The mean scores of the Patient Privacy Scale were 4.78±0.14 for nurses and 3.78±0.32 for older adults, which were significantly different ($p \leq 0.001$). In addition, when the Patient Privacy Scale scores of the nurses were evaluated according to sociodemographic data, no significant differences were found between the Patient Privacy Scale scores and scale subdimensions and sociodemographic data ($p > 0.05$). In contrast, a significant difference was found between the scale and scale subdimensions in older adults ($p \leq 0.05$).

Conclusion: When nurses communicate with older adults, they create a healthier environment in terms of privacy by considering older adults' expectations of privacy, taking measures to protect privacy, and providing training on the subject.

Keywords: Privacy; Aged; Nurses; Ethics, Medical.

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INTRODUCTION

Although the concept of privacy is well known, it is difficult to define. While privacy includes hiding certain things, it also refers to a person's right to self-control and autonomy (1). Especially in healthcare, privacy is defined as protecting information that includes the fundamental determinants of the patient's past, current, or future physical or mental health conditions, including providing and paying for these services (2). The right to privacy, which is a fundamental human right, especially in healthcare institutions, is emphasized in many ethical and legal documents such as the declarations by the World Medical Association, the Rights of the Patient, the Hong Kong Declaration on Elder Abuse, the Declaration of Ethical Considerations on Health Databases, and the Council of Europe Convention on the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine (Oviedo Convention on Biomedicine) (2).

Securing the right to privacy and confidentiality is important in preventing shame, offense, discouragement, judgment, stigmatization, and discrimination in healthcare institutions and medical practices. Privacy enables patients to communicate honestly and openly with the healthcare team (3). With the right to privacy, human dignity is protected, communication between the patient and healthcare team is improved, and the relationship is based on trust, which is necessary for quality care and positive outcomes. When a patient's right to privacy is mentioned, the patient should understand that they may determine or limit the amount of disclosure required for medical intervention. Patients should have a private space where they are not forced to share information they do not want third parties to know (5).

Perceptions of privacy may vary according to age and sex. While privacy is a concept that determines a person's social relationships for the benefit of the person, the situation may differ for older adults. Unfortunately, the limitations of old age may distort the boundaries of privacy to the detriment of older adults. Several studies have reported situations in which patients think their privacy is not sufficiently protected or even violated (6-8). Many studies have reported the opposite, in which nurses and patients feel that their privacy is protected (9-11). Hajbaghery and Zehtabchi (2014) reported that up to 15.2% of older adults felt that their privacy was not respected and that 68.5% of patients felt moderately respected (12). While several studies have considered the privacy of nurses and patients separately, few studies have investigated both groups simultaneously.

The right to privacy in health care is related to the prevention of disclosure of personal health information about individuals to others and to ensuring confidentiality, physical privacy, respect for personal choices and independence (13). Especially in health care institutions, the right to privacy can be ignored for many reasons, such as rapid patient flow due to overcrowding, working principles of health care staff, visitor policy of the institution, physical inadequacy, insufficient staff, meeting the care needs of older patients, assumption that older adults are unconscious, making care difficult due to difficulties in understanding and comprehending older adults, reluctance of nurses to work with older patients due to high risk of multiple diseases and complications (9, 13). In addition, because it is generally accepted as normal to reveal patients' private areas and to access/share some private personal information during treatment-related practices, patients may mostly remain silent, and older patients in particular may not complain because of fear of not receiving health care services, or because of normalisation of practices during service delivery, or because they do not have enough information about patients' rights related to privacy (13, 14). As a result, health care workers may not be aware of the violation and undesirable practices may continue (9, 14). These are the main rationale for studying this subject.



In addition, studies focusing on older adults–the group in which the concept of privacy is discussed the most–are limited. Moreover, the self-assessment results of nurses are usually biased or overestimated. Therefore, evaluating the perceptions of older adults regarding privacy relative to those of nurses will provide more consistent results. Therefore, it is important to simultaneously evaluate whether the privacy of older adults is respected or neglected in nursing practices from the perspective of both patients and nurses.

MATERIALS AND METHOD

Sample

This was a descriptive study. Data were collected from six public hospitals and four university hospitals in different provinces between January 15, 2024, and May 10, 2024, after the necessary institutional and ethical permissions were obtained. A total of 926 older adults and 788 nurses participated in this study. Nurses who worked with older adults or who had at least one year's experience of working with older patients were included in the study, and the older patients who agreed to participate in the study were older adults who were hospitalised in different departments of the hospital at the time of the study. While collecting the data, the researcher and participants were allowed to meet alone. They were assured that their identity would be kept confidential by explaining the importance of reflecting on their true and sincere thoughts and the purpose of the study.

Data Collection Tools

Sociodemographic data form: The researchers created two sociodemographic data forms for nurses and older adults. The sociodemographic characteristics of the nurses included age, gender, income, marital status, number of children, years of employment, educational status, professional experience, whether they read the patient rights manual, whether they had received any previous training on privacy, their thoughts about working with elderly patients, and the hospital where they work. The sociodemographic characteristics of the older adults included age, gender, income, marital status, having children, educational status, and whether they had ever received information about patient rights or privacy from any health professional.

Patient Privacy Scale (PPS): To measure patient privacy, the Patient Privacy Scale developed by Öztürk et al. (2014) (9), which consists of five subdimensions and 27 items, including confidentiality of private life/personal information (CIPL), sexual privacy (SP), the privacy of those unable to protect themselves (PPT), physical privacy (PP), and providing a favorable environment (EFE), was used. The 5-point Likert-type scale was scored as follows: 5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree, and 1 = strongly disagree. The total score obtained from the scale varied between 27 and 135. A high score indicates high awareness of patient or personal privacy (9).

Ethical Dimension of Research

Before initiating the study, ethical approval was obtained from the Burdur Mehmet Akif Ersoy University Non-Interventional Research Ethics Committee (No: GO2024/50).

Statistical Evaluation

The data obtained from the study were analyzed using the SPSS software (version 20.0; IBM Corp., Armonk, NY, USA). The Kolmogorov–Smirnov test was used to determine the fit of normally distributed data, and frequency, percentage, and averages were used to examine the demographic characteristics of the nurses and patients. Kruskal–Wallis, Mann–Whitney U (MWU), and correlation tests were used to compare demographic variables as independent variables and Patient Privacy Scale

scores as dependent variables. Cronbach's alpha and item-total correlation analyses were used to test the reliability of the Patient Privacy Scale and its subscales. All the statistical tests were evaluated at a 95% confidence interval (CI) and $p<0.05$ significance level.

RESULTS

The average age of the nurses was 33.94±4.7 years, 87.1% were female, 59.3% were married, and 74.7% had an associate degree or a bachelor's degree. Nurses had a mean of 12.18 ± 9.6 years of professional experience. In addition, 51.5% of the nurses worked in university hospitals, and 72.9% had an income equal to their expenses. A total of 78% of them had read the patient rights manual at least once, 92.2% received training on privacy in the course content during their nursing education, 100% did not receive any special training on privacy after graduation, and 67.7% preferred not to work with elderly patients if they had a choice. Nurses did not want to work with older adults for the following reasons: 1) Working with older adults takes much time because they do not understand the interventions and instructions (78.9%). 2) Working with older patients was exhausting because of limited mobility and physical inadequacies (72.4%). 3) Many older adults have more than one chronic disease; therefore, their physiological status can be highly variable, and this situation is very stressful (63.3%). 4) Problems related to personal hygiene among older adults (51.4%).

The mean age of the older adults was 73.7±10.4 years, 62.2% were female, 37.8% were primary school graduates, 65.5% were married, 68.6% had an income equal to their expenses, 23.1% had read the manual on patient rights, and 86.2% had never been informed about patient rights and privacy by any healthcare staff.

The mean total scores of nurses and older adults on the PPS were 4.78±0.14 for nurses and 3.78±0.32 for older adults, and the mean scores of the scale subdimensions are shown in Table 1. When the total scale scores and scale subdimension scores for

Table 1. Comparison of total and subscale scores of nurses and older adults on the Patient Privacy Scale

Nurses (n=788)						
	CIPL	**SP**	**PPT**	**PP**	**EFE**	**Total**
Mean ± SD	4.82±0.18	4.68±0.12	4.79±0.12	4.78±0.16	4.76±0.12	4.78±0.14
Median	4.8	4.6	4.8	4.8	5.0	4.7
Q1, Q3 (IQR)	4.3–5.0 (0.7)	4.0–5.0 (0.9)	4.2–5.0 (0.8)	4.5–5.0 (0.6)	4.2–5.0 (0.8)	4.2–4.8 (0.6)
%95 CI	4.6–4.9	4.5–4.7	4.7–5.0	4.5–5.0	4.5–5.0	4.8–5.0
Older Adults (n=926)						
Mean ± SD	3. 88±0.48	3.63±0.58	3.68±0.52	3.76±0.42	3.87±0.46	3.78±0.32
Median	3.9	3.7	4.0	4.0	4.0	3.7
Q1, Q3 (IQR)	2.0–5.0 (0.7)	2.7–4,0 (0.1)	2.6–5.0 (0.1)	3.0–5.0 (1.1)	2.0–5.0 (1.0)	2.0–4.0 (0.3)
%95 CI	4.8–4.9	4.2–4.6	5.8–5.0	4.6–5.0	4.4–5.0	4.6–5.0
MWU;P	**9084.0 0.001**	**9352.0 0.001**	**9658.0 0.001**	**9837.0 0.001**	**10236.0 0.001**	**9999.0 0.001**

CIPL, confidentiality of private life/personal information; SP, sexual privacy; PPT, privacy of those unable to protect themselves; PP, physical privacy; EFE, providing a favorable environment; SD, standard deviation; IQR, interquartile range; CI, confidence interval; MWU, Mann–Whitney U



Table 2. Comparison of nurses' total and scale subdimension scores from the Patient Privacy Scale according to sociodemographic data (n= 788)

Socio-demographic data (Nurses)	n (%)	Patient Privacy Scale subdimensions				
		CIPL	SP	PPT	PP	EFE
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Age						
20–29	296 (37.6)	4.51±0.23	4.68±0.11	4.32±0.19	4.71±0.16	4.96±0.02
30–39	252 (32.0)	4.72±0.21	4.35±0.31	4.41±0.33	4.80±0.12	4.61±0.18
40 +	240 (30.4)	4.78±0.16	4.63±0.12	4.76±0.23	4.86±0.13	4.56±0.32
(p)		**(0.616)**	**(0.696)**	**(0.087)**	**(0.095)**	**(0.096)**
Sex						
Women	686 (87.1)	4.57±0.24	4.68±0.21	4.44±0.18	4.71±0.12	4.81±0.16
Men	102 (12.9)	4.68±0.22	4.61±0.38	4.54±0.32	4.84±0.11	4.75±0.12
(p)		**(0.762)**	**(0.153)**	**(0.404)**	**(0.513)**	**(0.235)**
Income						
Income less than expenditure	45 (5.7)	4.74±0.15	4.77±0.14	4.78±0.13	4.68±0.21	4.58±0.23
Income equals expenditure	575 (72.9)	4.65±0.16	4.85±0.13	4.64±0.32	4.76±0.22	4.64±0.31
Income more than expenditure	168 (21.4)	4.86 ±0.11	4.86±0.12	4.66±0.22	4.78±0.12	4.66±0.22
(p)		**(0.238)**	**(0.296)**	**(0.308)**	**(0.611)**	**(0.568)**
Marital status						
Married	467 (59.3)	4.74±0.22	4.68±0.22	4.72±0.14	4.24±0.35	4.88±0.08
Single	223 (28.3)	4.89±0.04	4.69±0.34	4.78±0.16	3.99±0.18	4.86±0.07
Divorced/Widow	98 (12.4)	4.78±0.18	4.64±0.31	4.71±0.26	3.68±0.27	4.84±0.08
(p)		**(0.404)**	**(0.615)**	**(0.216)**	**(0.412)**	**(0.635)**
Professional experience						
0–5 years	263 (33.4)	4.76±0.20	4.79±0.12	4.74±0.24	4.74±0.17	4.74±0.16
6–15 years	306 (38.8)	4.79±0.14	4.79±0.14	4.69±0.44	4.66±0.34	4.76±0.13
16 +	219 (27.8)	4.78±0.08	4.78±0.12	4.68±0.18	4.62±0.28	4.78±0.18
(p)		**(0.644)**	**(0.968)**	**(0.494)**	**(0.814)**	**(0.637)**
Hospital						
Public	382 (48.5)	4.74±0.12	4.72±0.13	4.64±0.28	4.74±0.19	4.74±0.06
University	406 (51.5)	4.72±0.16	4.78±0.16	4.68±0.32	4.82±0.14	4.80±0.08
(p)		**(0.459)**	**(0.654)**	**(0.214)**	**(0.619)**	**(0.426)**
Education						
High school	63 (8.0)	4.62±0.26	4.69±0.38	4.58±0.18	4.61±0.36	4.66±0.24
Associate/Undergraduate	589 (74.7)	4.64±0.16	4.75±0.36	4.87±0.11	4.74±0.12	4.72±0.16
Postgraduate	136 (17.3)	4.95±0.04	4.88±0.68	4.86±0.08	4.85±0.12	4.98±0.01
(p)		**(0.005)**	**(0.005)**	**(0.005)**	**(0.004)**	**(0.002)**
Total	788 (100.0)	4.82±0.18	4.68±0.12	4.79±0.12	4.78±0.16	4.76 ± 0.12

CIPL, confidentiality of private life/personal information; SP, sexual privacy; PPT, privacy of those unable to protect themselves; PP, physical privacy; EFE, providing a favorable environment

Table 3. Comparison of the total and subscale scores of the Patient Privacy Scale according to sociodemographic data (n= 926)

Sociodemographic data (Older Adults)	n (%)	Patient Privacy Scale Subdimensions				
		CIPL	SP	PPT	PP	EFE
		Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Age						
65–74	574 (61.9)	4.21±0.52	3.98±0.68	4.12±0.19	4.01±0.16	3.96±0.29
75–84	259 (27.9)	3.51±0.26	3.15±0.31	3.41±0.32	3.21±0.21	3.41±0.48
85 +	94 (10.2)	2.60±0.18	2.85±0.51	3.06±0.21	2.96±0.13	2.96±0.32
(p)		**(0.001)**	**(0.001)**	**(0.004)**	**(0.005)**	**(0.005)**
Gender						
Women	576 (62.2)	4.17±0.74	4.28±0.61	4.01±0.16	4.11±0.12	3.81±0.29
Men	350 (37.8)	3.08±0.22	3.01±0.38	3.24±0.52	3.04±0.19	3.01±0.42
(p)		**(0.001)**	**(0.001)**	**(0.004)**	**(0.001)**	**(0.005)**
Income						
Income less than expenditure	211 (22.8)	3.44±0.45	3.77±0.44	3.58±0.63	3.98±0.24	3.08±0.23
Income equals expenditure	635 (68.6)	4.05±0.46	3.95±0.48	4.04±0.52	3.86±0.32	3.94±0.41
Income more than expenditure	80 (8.6)	4.56 ±0.44	4.26±0.55	4.66±0.22	4.76±0.42	4.36±0.22
(p)		**(0.001)**	**(0.001)**	**(0.001)**	**(0.001)**	**(0.001)**
Marital status						
Married	607 (65.5)	4.14±0.52	4.18±0.62	4.32±0.69	4.24±0.35	4.18±0.56
Single	21 (2.3)	3.89±0.42	3.59±0.74	3.68±0.60	3.99±0.18	3.86±0.47
Divorced/Widow	298 (32.2)	3.58±0.26	3.39±0.71	3.51±0.41	3.68±0.27	3.28±0.28
(p)		**(0.004)**	**(0.005)**	**(0.005)**	**(0.005)**	**(0.005)**
Education						
Elementary school	350 (37.8)	3.21±0.26	3.09±0.88	3.46±0.63	3.31±0.56	3.66±0.54
Intermediate school	325 (35.1)	3.74±0.66	3.85±0.76	3.87±0.74	3.64±0.66	3.92±0.66
High school	156 (16.8)	4.55±0.38	4.18±0.68	4.46±0.57	4.75±0.42	4.78±0.48
Undergraduate and above	95 (10.3)	4.73±0.17	4.20±0.53	4.35±0.10	4.70±0.48	4.73±0.47
(p)		**(0.001)**	**(0.001)**	**(0.001)**	**(0.002)**	**(0.004)**
Total	926 (100.0)	3.88± 0.48	3.63±0.58	3.68±0.52	3.76±0.42	3.87±0.46

CIPL, confidentiality of private life/personal information; SP, sexual privacy; PPT, privacy of those unable to protect themselves; PP, physical privacy; EFE, providing a favorable environment



nurses and older adults were compared, a significant difference was found between the two groups (p≤0.001) (Table 1). The results show that nurses' total scores on the PPS were higher than those of older adults, it means that patients' privacy rights were respected and patients' privacy was protected by nurses. However, the PPS total score and the total scores of all subgroups of older patients were significantly lower than those of nurses. This is an important result that older patients think that the health care profesionals do not pay enough attention to their privacy.

When the nurses' PPS scores were evaluated according to sociodemographic data, no significant differences were found between the PPS scores and the subdimensions or sociodemographic data (p>0.05), except for education level (p ≤0.05)((Table 2).

When PPS scores of older patients were evaluated according to sociodemographic data, significant differences were observed between PPS subdimensions and sociodemographic variables (p≤0.01, Table 3). Accordingly, although privacy awareness decreased significantly with increasing age, total and subgroup scores of privacy awareness were found to be significantly higher in women (p ≤0.05). In addition, it was found that the privacy scores of married persons and those with higher education and income levels were statistically higher in all subgroups and in total (p ≤0.05).

DISCUSSION

Many studies have used the PPS to investigate nurses' awareness of privacy. Nevertheless, none have compared the perceptions of nurses and older adults, who are a vulnerable group, during health service delivery. In our study we found that nurses and older adults had significantly different scores on the PPS, with the nurses scoring higher. This study makes an important contribution to the literature in this context.

In a 2023 study conducted among 244 surgical nurses in Japan, the total score on the scale was found to be high. No relationships were found between nurses' age, education, marital status, years of work, or mean total score and PPS subdimensions (15). In a study conducted with 141 clinical nurses using the PPS, sociodemographic characteristics were not associated with the perceived importance of patient privacy. In contrast, the importance of privacy increased as education level increased (16). Another study involving 385 nurses and midwives using PPS reported that the perception of privacy increased with age and educational level (17). In a study targeting intensive care nurses, no significant difference was found between the median PPS scores according to the level of education, age, sex, marital status, duration of employment, intensive care unit in which the nurse was working, and duration of employment in the intensive care unit (18). In a study involving 105 intensive care nurses whose data were collected in 2018, the PPS score was 4.61±0.38 (19). In a study conducted with 110 nurses in a private hospital, most regarded privacy and personal confidentiality as fundamental rights. They showed care and respect for privacy and confidentiality, including the patient's privacy (20). No study has been conducted on nurses' perceptions of privacy when working with elderly individuals. However, in a study conducted with nursing home employees, the importance of patient privacy increased with increasing age and working time in nursing homes. No relationship was found with other sociodemographic variables (21).

In the literature, nurses generally have high total PPS scores, and, as mentioned above, some studies have described a relationship between sociodemographic characteristics and PPS scores. In contrast, other studies have reported that there is no relationship. In our study, the total PPS score was high, similar to that reported in the literature. However, PPS scores were not associated with sociodemographic characteristics. These findings are due to privacy being emphasized in nursing

education, and respect for privacy is internalized as a professional value. In fact, in studies conducted with nursing students, PPS scores were high (22, 23). For example, the mean PPS score (4.52±0.49) and the mean scores of all subdimensions were high in a study conducted with 190 final-year nursing students (24). Studies conducted among nursing students have confirmed that education effectively improves privacy perceptions.

In our study, unlike nurses, older adults' PPS scores differed significantly based on sociodemographic characteristics. We found that as participants' ages increased, their income and education levels decreased, and their perception of privacy decreased. Women's perceptions of privacy were also greater than those of men. We could not find any studies that used the PPS among older patients. However, in a study conducted with 400 people aged 20 years and over who applied to health institutions in Igdir and Aksaray with the data collection tool developed by Bostan and Ünal, perceptions of privacy and definitions of privacy violation changed with sociodemographic characteristics. Moreover, individuals from Aksaray who were older than 50 years, middle-income level, civil servants, and urban individuals had stronger perceptions of privacy and definitions of privacy violations. In addition, participants stated that, among healthcare professionals, nurses committed more privacy violations (8). Regarding our findings, we expected that the perception of privacy would increase as socioeconomic level increased. Similarly, it is understandable that women's perceptions of privacy are greater than those of men because of gender roles.

A study conducted in Greece compared nurses' perceptions of autonomy, informed consent, and privacy. According to this study, there were significant differences between nurses' and patients' perceptions of privacy. While patients strongly believe that their privacy is not protected, nurses feel the opposite (25). When the privacy perceptions of nurses and older adults were compared, we observed that nurses had higher PPS scores. Nurses are typically in a different position from patients in terms of knowledge, awareness, and practice because of their education.

LIMITATIONS

Our study might have yielded better results if it had been conducted over a longer period of time and with a larger sample. In addition, it is a limitation that the study was not conducted among older adults and nurses who provide health care to them. Another limitation of our study is the possibility that nurses who have been trained on privacy and older adults who have not had awareness and training on this issue may not understand the same thing.

CONCLUSION

Since the world's and Turkey's populations are aging, respecting and protecting the privacy of vulnerable older adults during health service delivery is the nurse's role in patient advocacy. Situations in which nurses who have close contact and an obligation to care for elderly patients according to their values and preferences have a perception of privacy that might conflict with those of patients may cause problems in practice. Although nurses argue that they respect privacy, patients may have the opposite view. Therefore, both parties must speak a common language.

Nurses create a healthier environment when communicating with older patients by considering their expectations about privacy, the measures taken to protect privacy, and providing training on the subject. Societal education to increase awareness of privacy is also essential. For more concrete conclusions, quantitative and qualitative studies should be conducted simultaneously with older patients and the nurses caring for them.

Conflict of Interest: The authors have declared no conflict of interest.

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ORIGINAL ARTICLE

DETERMINATION OF MALNUTRITION, FRAILTY, POLYPHARMACY, MULTIMORBIDITY, AND MORTALITY RISK IN HOSPITALIZED ELDERLY COVID-19 PNEUMONIA CASES WITH AND WITHOUT POSSIBLE SARCOPENIA

Abstract

Introduction: To evaluate elderly COVID-19 pneumonia hospitalizations via the presence of possible sarcopenia, hand grip strength measurements, malnutrition, frailty, polypharmacy, multimorbidity, mortality risk and 30th-day mortality after discharge.

Materials and Method: This observational study included geriatric patients in the COVID ward of Gaziosmanpasa Training and Research Hospital between March 1, 2022, and April 30, 2022. SARC-F screening test, hand grip strength measurement, CALL score for mortality risk, KATZ Index of Independence in activities of daily living, Mini Nutritional Assessment-Short Form, BORG dyspnea scale, and Frail scale were administered. 30th-day mortality after discharge was recorded during follow-up using phone calls.

Results: Distribution of 75 cases aged 76.6±8.2 years was as follows: 65.3% (n =49) possible sarcopenia, 49.3% (n =37) malnutrition, 49.3% (n =37) polypharmacy,70.7% (n =53) multimorbidities. 30th-day after-discharge mortality was 24.0% (n =18). The length of hospital stay, activities of daily living, frailty, D-dimer level, albumin, and oxygen requirement were significant in the possible sarcopenia group compared to non-sarcopenia group (p =0.003, p = 0.012, p =0.012, p =0.007, p =0.004, and p =0.015, respectively). Impaired hand grip strength was related to a higher CALL risk score (r =-0.343; p =0.003), higher drug use and disease counts (r =-0.387, p =0.001 and r =-0.321; p =0.005), prolonged length of hospital stay (r=-0.315; p=0.006), and higher oxygen requirement (r =-0.240, p =0.038).

Conclusion: COVID-19 pneumonia hospitalizations of geriatric patients are significantly accompanied by possible sarcopenia. The measurement of hand grip strength was emphasized to determine associations with the length of hospital stay, malnutrition, and 30th-day discharge mortality of hospitalized COVID-19 pneumonia in the elderly.

Keywords: Pneumonia; COVID-19; Sarcopenia; Frail Elderly; Malnutrition; Mortality.

INTRODUCTION

Sarcopenia is characterized by the acute or chronic loss of muscle mass and function due to a primary cause (ageing) or secondary etiology (chronic diseases, low protein intake, immobilization, etc.) (1). Muscle strength is easy to measure, and it is recommended for routine use when measuring hand grip strength related to possible sarcopenia (PS) (2). The prevalence of sarcopenia varies with location and definition; however, it is estimated to be up to 29% of older persons in the setting of community healthcare and 14%–33% for those in long-term care (3).

Social isolation and curfew restrictions during the COVID-19 pandemic in older adults led to decreased daily physical activity, accelerating the loss of muscle strength and function (4). In addition, because of the pandemic lockdown, it was difficult to evaluate sarcopenia as a significant risk factor for pneumonia in older adults. Decreased grip strength indicates a general loss of muscle mass and strength, including the respiratory and oropharyngeal muscles. Furthermore, cases of aspiration pneumonia linked to low muscle mass are associated with notably high rates of mortality (5). Respiratory muscle strength regulates the effectiveness of coughing to clear the airways, thereby preventing pneumonia (6). The CALL score has been observed to be strongly related to in-hospital mortality as a complementary diagnostic measure for treatment planning for COVID-19 pneumonia in a study by Akıllı et al. (7). Therefore, we preferred to use the CALL score to determine mortality risk during hospital stay.

The focus on older adults in this study stems from their heightened risk for both pneumonia and sarcopenia. The COVID-19 pandemic has exacerbated health challenges for this vulnerable group, with COVID-19 pneumonia presenting significant risks. Hand grip strength is a crucial measure of muscle strength and serves as a valuable tool for understanding and managing these health issues. This analysis explores the relationship between PS, COVID-19 pneumonia, and the utilization of hand grip strength as a predictive and diagnostic tool in the elderly. While previous studies have shown that sarcopenia is linked to prolonged hospital stays, increased mortality, and a higher need for ICU admission in COVID-19 patients, there is a lack of publications on PS. This study aims to identify PS, which is assessed quickly through hand grip strength in hospital wards. Secondly, it was aimed to assess malnutrition, frailty, polypharmacy, multimorbidity, mortality risk and 30th-day mortality after discharge in hospitalized elderly COVID-19 pneumonia cases with and without PS.

MATERIALS AND METHOD

Study design

This study was conducted as an observational study.

Sample and setting

The study population included patients older than 65 years old who were hospitalized in the COVID-19 ward of Gaziosmanpasa Training and Research Hospital. Two months after the study started recruiting patients, the pandemic ward of hospital was closed and new cases were redirected to other designated pandemic centers. As a result, the study included hospitalized patients from the final two months before the ward closure, specifically from March 1 to April 30, 2022. Consequently, the optimal sample size was not calculated, and all patients who met the inclusion criteria were enrolled.

The inclusion criteria for the study were as follows: hospitalization with COVID-19 infection, age over 65 years, and ability to cooperate with tests and computerized tomography. Patients were excluded if they had pretibial edema, amputation, severe dehydration, dialysis, uncontrolled thyroid function test results, rheumatic disease, nervous system diseases related to atrophies or demyelinating diseases, history of stroke, history

of chronic steroid use (≥ 5 mg/day for >3 months), diagnosis of chronic heart failure, diagnosis of severe chronic obstructive pulmonary disease which corresponds to clinical features of GOLD Stage 3 and GOLD Stage 4 or severe chronic asthma requiring systemic corticosteroid related to high frequency of exacerbations, or who were followed up with cancer or cancer treatment.

All measurements and laboratory tests were performed on the first day of hospitalization. During hospitalization, laboratory findings such as C-reactive protein (CRP), procalcitonin, leukocyte count, lymphocyte count, fibrinogen, lactate dehydrogenase, D-dimer, ferritin, albumin, and hemoglobin were analyzed. Patients were contacted by phone on the 30th day of hospital discharge during post-COVID follow-up. The total length of hospital stay and mortality were recorded.

Instruments

The researchers prepared a questionnaire consisting of sociodemographic data, SARC-F test, Mini Nutritional Assessment Short Form (MNA-SF), KATZ Index of Independence in Activities of Daily Living (ADL), Frail Scale (FS), and Modified BORG Scala. A face-to-face questionnaire was administered to older adults via face-to-face under mask protection. Dominant hand grip strength was measured three times with a calibrated digital hand dynamometer (CAMRY EH101 dynamometer 90 KG / 200 LBS, Certificate Standard: ISO 9001:2008, Issued By: SGS United Kingdom LTD) while the arms of the patients were parallel to the floor. The highest strength value among the three measurements was noted. The mortality risk was assessed using the CALL score.

Sarcopenia detection: PS was diagnosed with a SARC-F screening test score of over 4 points and confirmed with low hand grip strength. Muscle grip strength cut-offs were 16 kg for females and 27 kg for males, and those lower than these values were accepted. According to the criteria revised and published by the European Working Group on Sarcopenia in the Elderly (EWGSOP) in 2018, sarcopenia was diagnosed by evaluating muscle strength, muscle quantity or quality, and physical performance. When low muscle strength is detected using the SARC-F test and hand grip strength, it is evaluated as possible sarcopenia and low physical performance is considered severe sarcopenia (8). Since muscle mass measurement and sarcopenia severity evaluation, which are the third step according to EWGSOP criteria, could not be performed due to the isolation conditions, only the diagnosis of PS could be determined.

Mini Nutritional Assessment Short Form (MNA-SF): The risk of malnutrition was assessed using the MNA-SF, which consists of six items: involuntary weight loss, loss of appetite, mobility, psychological stress, neuropsychological problems (i.e., dementia), and low BMI. Based on the total score, individuals were identified as well-nourished (≥ 12 points), at risk of malnutrition (8–11 points), or malnourished (< 8 points) (9).

KATZ Index of Independence in Activities of Daily Living (ADL): KATZ ADL is a widely used tool to assess the level of independence in older adults by scoring 0 or 1 point on bathing, dressing, toileting, transferring, continence, and feeding questions (10).

Frail Scale: The Frail Scale was developed in 2004 by Morley et al.(11). A Turkish validity and reliability study was conducted by Hymabaccus et al. in 2017.The scale examines the variables of fatigue, resistance (inability to climb one floor of stairs), ambulation (difficulty in walking more than one block), illness (≥ five comorbid diseases), and weight loss (loss of ≥5% of actual weight). Scores ≥3 are accepted as frail, and scores 1-2 mean prefrail (12).

Modified BORG Scala (0-10 points): Modified BORG Scala describes dyspnea between 0-10 points to predict respiratory muscle weakness (13). While not specifically designed for infections like COVID-19, the Modified Borg Scale can still be a

useful tool in evaluating perceived breathlessness and exertion in COVID-19 patients. Since respiratory function tests could not be performed on hospitalized patients in this study, this test was preferred due to its simple applicability.

CALL Score: Scoring systems have been developed for COVID-19 disease progression, one of which is the CALL score by Ji et al., which was derived based on patient comorbidities (C), age (A), lymphocyte count (L), and serum lactate dehydrogenase (LDH) levels (L) at admission (7,14). Advanced age (>60 years), high LDH levels, and low lymphocyte counts are high-risk factors for the progression of COVID-19, and the CALL score contributes to its prediction (14).

Statistical Analysis

The data obtained from the study were analyzed in the SPSS 24 package program (IBM SPSS, New York, USA). Descriptive data are presented as means, medians, standard deviation values, frequencies, and interquartile range tables according to normality results via the Kolmogorov-Smirnov test and histograms. For statistical analysis of the data, the Chi-square test was used to compare groups, and F or T-tests were used to compare numeric data. Logistic regression analysis was performed to control for confounding variables that were found to be significant in the univariate analyses.

Ethical Considerations

This study was approved by the Ethics Committee of the University of Health Science Gaziosmanpasa Training and Research Hospital (decision no:16.02.2022-29) and was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants.

RESULTS

This study included 75 hospitalized elderly participants with COVID-19 pneumonia, consisting of 29 females (38.7%) and 46 males (62.3%). The average age of the participants was 76.6±8.2 years, ranging from 65 to 91 years. Comorbidity distribution was as follows: 53 participants (42.4%) had hypertension, 32 participants (25.6%) had diabetes mellitus, and 14 participants (11.2%) had asthma or chronic obstructive pulmonary disease (COPD) except cases with severe degree asthma/COPD before admission. The health status of the patients showed that 37 (49.3%) had malnutrition, 49 (65.3%) had PS, 37 (49.3%) had polypharmacy, 53 (70.7%) had multimorbidity, and 18 (24.0%) had a mortality rate within 30 days after discharge. Detailed sociodemographic data, initial laboratory test results, and comparisons between groups with and without PS are presented in Table 1. Relationships between hand grip strength and various study characteristics are shown in Table 2. Factors affecting 30-day post-discharge mortality were analyzed using logistic regression, as displayed in Table 3.

As shown in Table 1, the mean age, distribution of sex, education, income level, average COVID vaccine dose counts, and previous COVID disease history were statistically similar between groups with and without PS ($p = 0.299$, $p = 0.306$, $p = 0.094$, $p = 0.221$, $p = 0.735$, $p = 0.443$, respectively). During hospitalization, 79.6% of the PS group and 21.8% of the non-sarcopenia group received steroid treatment; however, there was no significant difference in steroid use between the groups ($p = 0.903$). In addition, 30th day mortality was similar in group with and without steroid use ($p = 0.787$) as similar results between CALL risk score with comparison of with and without steroid use ($p = 0.451$)

18.4% of PS group and 3.8% of non-sarcopenia group were admitted to the intensive care unit (ICU) ($p=0.078$). The average CALL mortality risk score was 9.65±1.82, with the PS group having a significantly higher score than the non-sarcopenia group (9.98±1.63 vs 9.04±2.03; $p=0.006$). Two

Table 1. The sociodemographic data, initial laboratory test results of the study participants and comparison of groups with and without probable sarcopenia

Characteristics	Total (n=75) (n,%)	Probable Sarcopenia (n=49, 65.3%) (n,%)	Non-Sarcopenia (n=26, 34.7%) (n,%)	P value
Age (years) (mean ± SD)	76.6±8.2	77.4±7.9	75.2±8.8	0.299
Sex (female)	29 (38.7%)	21 (42.9%)	8 (30.8%)	0.306
Education (illiterate)	17(22.7%)	14 (28.6%)	3 (11.5%)	0.094
Income (low)	39 (52.0%)	28 (57.1%)	11 (42.3%)	0.221
COVID vaccine dose (mean ± SD)	2.16±1.31	2.12±1.32	2.23±1.31	0.735
Previous COVID disease history	12 (16%)	9 (18.4%)	3 (11.5%)	0.443
30th-day discharge mortality	18 (24.0%)	16 (32.7%)	2 (7.7%)	**0.015***
CALL score (mean ± SD)	9.65±1.82	9.98±1.63	9.04±2.03	**0.006***
Multimorbidity	53 (70.7%)	37 (75.5%)	16 (61.5%)	0.190
Drug count (median, IQR)	4 (11)	4 (5)	5 (7)	0.541
Polypharmacy (≥5 drugs)	37 (49.3%)	23 (46.9%)	14 (53.8%)	0.569
Steroid use for COVID treatment	60 (80.0%)	39 (79.6%)	21 (21.8%)	0.903
Length of hospital stay (median, IQR)	8 (9)	10 (12)	6 (4)	**0.003***
Intensive care unit (ICU) admission during hospital stay	10 (13.3%)	9 (18.4%)	1 (3.8%)	0.078
KATZ ADL (median, IQR)	14 (6)	14 (6.5)	18 (12)	**0.012***
MNA-SF (median, IQR)	8 (5)	7 (5.5)	8 (4)	0.108
MNA-SF (≤7 points)	37 (49.3%)	27 (55.1%)	10 (38.5%)	0.170
FS (median, IQR)	3 (4)	4 (1)	3 (3)	**0.012***
Frailty (3-5 points)	60 (80.0%)	43 (87.8%)	17 (65.4%)	**0.021***
Hemoglobin (g/dL) (mean ±SD)	12.21±7.87	10.88±2.01	14.72±12.87	**0.044***
Leukocyte ($\times10^3$ / µL) (mean ± SD)	10.84±4.65	10.66±5.40	11.18±2.79	0.584
Lymphocytes, ($\times10^9$ /) (mean ± SD)	1.32±1.17	1.26±1.34	1.42±0.76	0.520
Fibrinogen (mg/dL) (median, IQR)	492 (246)	496 (268)	487 (220)	0.867
INR (mean ± SD)	1.22±0.48	1.28±0.58	1.10±0.17	0.134
Lactate dehydrogenase (U/L) (median, IQR)	284 (167)	320 (153)	275 (166)	0.570
D-dimer (mcg FEU/Ml) (median, IQR)	1260 (1210)	1500 (1434)	925 (1035)	**0.007***
Ferritin (mcg/L) (median, IQR)	297 (354)	267 (441)	300 (218)	0.929
Albumine (g/dL) (mean ± SD)	32.72±4.88	31.66±5.16	34.73±3.58	**0.004***
C-reactive protein (mg/dL) (median, IQR)	79 (121)	79 (105)	74.5 (136.5)	0.911
Procalcitonin (ng/mL) (median, IQR)	0.22 (0.57)	0.22 (0.93)	0.21 (0.52)	0.197
Borg scale (median, IQR)	4 (5)	4 (5)	2.5 (5.5)	0.646
SpO2 on admission (median, IQR)	89 (31)	89 (7)	91.5 (11)	0.141
O2 requirement, L/per min (median, IQR)	3 (15)	4 (6)	1 (4)	**0.015***

DL, activities of daily living; FS, Frailty Scale; IQR, interquartile range; MNA-SF, mininutritional assessment-short form; n, number; SD, Standard deviation., *p<0.05 significant

Table 2. Correlation between Hand Grip Strength and other characteristics of the study

Characteristics	Hand Grip Strength	
	Correlation Coefficient (r)	P value
Age	-0.371	**0.001***
Drug count	-0.387	**0.001***
Additional disease count	-0.321	**0.005***
COVID-19 CALL score	-0.343	**0.003***
SARC-F score	-0.552	**<0.001***
BORG score	-0.082	0.485
FS score	-0.361	**0.001***
KATZ ADL score	0.578	**<0.001***
MNA-SF score	0.388	**0.001***
Length of hospital stay (day)	-0.315	**0.006***
Albumine (g/dL)	0.100	0.392
D-dimer (mcg FEU/Ml)	-0.234	**0.043***
Hemoglobin (g/dL)	0.205	0.077
Steroid dose	-0.027	0.816
O2 requirement, L/per	-0.240	**0.038***

FS, Frailty Scale; ADL, activities of daily living; MNA-SF, mininutritional assessment-short form, *p<0.05 significant

Table 3. Regression analysis of risk factors on 30th-day mortality after discharge (Nonsurvivor)

Characteristics	OR	95% CI	P value
Hand Grip Strength	0.990	0.888-1.103	0.856
Probable Sarcopenia	2.997	0.383-23.439	0.296
COVID-19 CALL score	1.300	0.783-2.158	0.310
FS score	0.945	0.400-2.234	0.898
KATZ ADL score	1.136	0.936-1.379	0.197
MNA-SF score	1.107	0.823-1.490	0.502
Length of hospital stay	0.948	0.875-1.027	0.190
Intensive care unit (ICU) admission (+) during hospitalization	57.496	4.488-736.645	**0.002***

Model: Hand Grip Strength, Probable Sarcopenia, COVID-19 CALL score, FS (Frailty Scale) score, KATZ ADL (Activities of daily living) score, MNA-SF (Mini nutritional assessment-short form) score, Length of hospital stay, Intensive care unit (ICU) admission (+); OR, odds ratio ; CI,Confidence Interval , *p<0.05 significant

patients (one with PS and one without PS) died during their hospital stay.

The 30-day post-discharge mortality rate was 32.7% in the PS group and 7.7% in the non-sarcopenia group (p=0.015). Malnutrition was detected in 55.1% of the PS group compared to 38.5% in the non-sarcopenia group (p=0.170). The PS group also had significantly lower KATZ ADL scores and a higher frequency of frailty (p=0.012 and p=0.021, respectively).



Laboratory test results indicated that lower hemoglobin (Hg) and albumin levels, as well as higher D-dimer levels, were significantly associated with PS (p=0.044, p=0.004, and p=0.007, respectively). Additionally, the O2 requirement in the PS group was significantly higher (p=0.015). As shown in Table 2, stronger hand grip strength was correlated with KATZ ADL and MNA-SF scores (r =0.578; p <0.001 and r =0.388; p =0.001). However, lower hand grip strength was associated with a higher CALL mortality risk score (r =-0.343; p =0.003), higher drug and disease counts (r = -0.387; p =0.001 and r =-0.321; p =0.005), longer length of stay (r =-0.315; p =0.006), and higher amount of O2 requirement (r =-0.240; p =0.038).

In Table 3, the presence of ICU requirement showed a 57.5-fold higher risk of 30th-day mortality after discharge (Odds ratio =57.496; 95% Confidence Interval= 4.488-736.645; p =0.002).

DISCUSSION

The goals of this study were to investigate the presence of PS, emphasizing the importance of hand grip strength as a valuable tool, and to assess malnutrition, frailty, polypharmacy, multimorbidity, mortality risk scores, and laboratory test results in elderly patients hospitalized with COVID-19 pneumonia. The prevalence of PS was 65.3% and was associated with a higher mortality risk score. Impaired hand grip strength was related to a higher mortality risk score, increased drug use and disease counts, prolonged length of stay, and higher O2 requirements. Additionally, ICU admission during the hospital stay was identified as a significant risk factor for predicting 30-day mortality after discharge.

The prevalence of sarcopenia in patients with COVID-19 studies varies from 0.8 to 90.2%, and the pooled prevalence is 48.0% (15). Akıllı and Bilge reported that the CALL score was strongly related to in-hospital mortality due to COVID-19 (7). The CALL score was used to assess the predicted 30th day mortality of hospital discharge between the groups with and without PS in our study. Both CALL scores and frequency of 30th-day mortality after discharge in the present study were higher in the presence of PS.

The oxygen therapy requirement of patients with COVID-19 has shown different amounts of need during activities of daily living rehabilitation according to Tham et al. (16). Showering activity, which requires higher muscle strength and the longest duration of supplemental oxygen weaning, proved to be the rate-limiting ADL for discharge home (16). In our study, activities of daily living based on the KATZ score were impaired, and the frequency of frailty was higher in the PS group than in the non-sarcopenia group. Low ADL was related to lower hand grip strength, higher need for O2 support, and prolonged hospital stay.

Pucci et al. demonstrated that hand grip strength was a predictor of the risk of future adverse outcomes in patients hospitalized for COVID-19, independent of the etiology of muscular impairment (17). Low grip strength is also associated with impaired nutrition (18). Grip strength, including swallowing and chewing abilities, is essential for maintaining a balanced oral nutrient intake (18). Although no significantly increased risk of COVID-19 was observed in patients with malnutrition and sarcopenia in the study by Lengele et al. (19), COVID-19 in medical units dedicated to non-intensive care is associated with a high prevalence of malnutrition, especially for patients transferred from the ICU (20). Low grip strength in detecting sarcopenia may be both a cause and outcome of malnutrition. Uemura et al. showed that the low serum albumin alone, sarcopenia alone, and sarcopenia/low serum albumin groups had a higher risk of disability than the non-sarcopenia/normal serum albumin group (21). In our study, the frequency of malnutrition by MNA-SF scores was 49.3% and was higher in the PS group, based on the

distribution of 55.1% in the PS group versus 38.5% in the non-sarcopenia. There was a relationship between nutrition scores and handgrip strength values although no relationship was found between albumin level and handgrip strength. Therefore, we thought that MNA might be a better marker than albumin level for determining hand grip strength.

Gulec-Balbay et al. predicted mortality risk in hospitalized elderly patients with COVID-19 pneumonia related to corticosteroid use, especially pulse corticosteroid therapy (22). In our study, frequency of corticosteroid use was 79.6% in PS group and 21.8% in the non-sarcopenia groups and 30th day mortality rate and CALL risk scores were similar between groups with and without steroid use.

Galindo-Oseguera found that providing aggressive oxygen therapy during hospital admission decreased the mortality risk (23). In our study, the O2 requirement was higher in the PS group than in the other groups and had a negative relationship with hand grip strength. This result has been interpreted as sarcopenia also affecting the respiratory muscles and negatively affecting the disease prognosis.

Limitations

This study provides information on the factors associated with hospitalized COVID-19 pneumonia in elderly individuals with PS. Secondly, outpatients were not monitored for PS. Therefore, this small sample results of the study evaluated PS status only in hospitalized elderly and are not generalizable to all elderly COVID-19 pneumonia cases.

CONCLUSION

Detecting PS by hand grip strength as an easy tool may be helpful in the hospitalization of older patients with COVID-19 pneumonia caused by the associations of PS, frailty, daily living activity, length of hospital stay, malnutrition, multimorbidity, polypharmacy, steroid use, O2 need, and 30th-day discharge mortality. In addition, it was also highlighted that this research might be helpful in terms of revealing that there are simple tests that can be used to diagnose sarcopenia in primary health care and all specialities that accept geriatric patients.

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Conflicts of Interest: The authors have no conflict of interest to declare in connection with this article.

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ORIGINAL ARTICLE

DO LATENT TUBERCULOSIS AND AGE IMPACT THE POST-COVID-19 EXPERIENCE?

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Abstract

Background: There is not enough information about the long-term effects of COVID-19 infection in those who have recovered. According to epidemiological studies, COVID-19 progresses less severely in countries where the Bacillus Calmette-Guerin vaccine is regularly applied than in those where it is not. The purified protein derivative of tuberculin is an indicator of the Bacillus Calmette-Guerin vaccine's protective effectiveness against latent tuberculosis. In our study, we aimed to investigate the relationship between latent tuberculosisand the permanent effects of COVID-19.Our objective was to analyze the long-term relationship between latent tuberculosisand COVID-19.

Materials and Method: We included all clinical, laboratory, and radiological baseline data of patients who were hospitalised for COVID-19 pneumonia between 2020 and 2021 during the pandemic in our study and compared them with data from six months later.

Results: Although there was no statistically significant correlation between purified protein derivative of tuberculin positivity and the long-term effects of COVID-19 ($p = 0.084$), age exhibited a statistically significant relationship with the presence of post-COVID-19 sequelae ($p = 0.004$). Patients with chronic pulmonary disease displayed a significantly greater percentage of symptoms ($p=0.005$).

Conclusion: We could not find any relationship between purified protein derivative of -tuberculin latent tuberculosis infection and long COVID-19 symptoms. We observed sequelae lesions more frequently in the follow-up of elderly patients. Post-COVID-19 symptoms were more common in patients with chronic lung disease. Thus, it is recommended to prioritise radiological and clinical follow-up in elderly patients and those with chronic lung conditions.

Keywords: Post-Acute COVID-19 Syndrome, Latent Tuberculosis, COVID-19, Aged.

INTRODUCTION

According to data from the World Health Organization (WHO), as of July 2023, approximately 697 million patients with SARS-CoV-2 (COVID-19) have been reported. Additionally, seven million people have claimed to have contracted COVID-19(1). The development of vaccines and the influence of herd immunity have significantly mitigated this situation, leading to a substantial reduction in the number of fatalities. However, there is a lack of clear data about the long-term effects of COVID-19 in those who have recovered from infection, and new discussions are emerging concerning the pathologies caused by COVID-19.

Some epidemiological studies conducted during the pandemic have reported that in countries where the Bacillus Calmette-Guerin (BCG) vaccine is routinely administered, the course of COVID-19 infection is less severe, and mortality rates are lower than those in countries where it is not applied (2,3,4). The BCG vaccine enhances the resilience of the human immune system to viruses such as human respiratory syncytial virus (hRSV) and human papillomavirus (HPV) (4). In light of this, in studies conducted in countries where the BCG vaccine is not routinely administered, individuals aged older than 60 years received the BCG vaccine to determine how it impacts COVID-19 infection; nevertheless, its ability to prevent infection has not been conclusively proven (5-6).

Latent tuberculosis is a condition not associated with active tuberculosis; it is characterised by the absence of symptoms, laboratory results, or radiological findings. The diagnosis is made bythe use of a purified protein derivative of tuberculin (PPD) and the interferon gamma release test (QuantiFERON test) (7).

In our country, Türkiye where the BCG vaccine is routinely administered during childhood, tuberculosis is endemic. Hence, the PPD skin test, which serves as an indicator of cellular immunity, is employed for assessing latent tuberculosisand as an indicator of the BCG vaccine.

At the beginning of the pandemic, information regarding the outcomes of surviving patients was limited and a topic of curiosity. As time progressed, patients' follow-up results began to be reported, and the terms 'long COVID' and 'post COVID' started to be used.

The term 'long COVID-19' refers to the persistence of symptoms and complaints following COVID-19 infection (8,9,10). The most common long COVID-19 symptom in the respiratory system is dyspnoea(10,11). Emerging chronic inflammation leads to alveolar damage through the activation of cytokines and reactive oxygen products, resulting in the continuation of symptoms (11,12). In some cases where long COVID-19 was detected, post-COVID pulmonary fibrosis (PCPF) was observed; this condition negatively affected patients' quality of life and respiratory functions in a manner similar to idiopathic pulmonary fibrosis. Thus, even though the pandemic has ended, it is important to identify these patients and determine the factors leading to PCPF to guide treatment approaches.

Our main goal was to perform symptom, radiological, and biochemical evaluations of individuals who needed to be hospitalised due to COVID-19 infection to establish the duration of symptoms and persistence of the disease. Second, we investigated the relationship between PPD (LTBI), an indicator of the protective effect of the BCG vaccine, and the long-term and lasting effects of COVID-19after six months.

MATERIALS AND METHOD

This study was approved by the Clinical Research Ethics Committee of the Yedikule Chest Diseases and Thoracic Surgery Training Research Hospital at Health Education University (No: 2021-69/May 2021). This study was planned as a longitudinal cohort study.

Our study included patients admitted to the chest disease service due to COVID-19 pneumonia who were aged 18 to 85 years old between March 25, 2020 and February 16, 2021. Six months after discharge, these patients were contacted by phone and invited for follow-up visits. A total of 282 surviving patients were contacted by phone, and 92 agreed to take part in the study by participating in the follow-up visit.

Our patients consisted of those who tested positive for COVID-19 by PCR or who were likely infected with SARS-CoV-2 (those who were clinically or radiologically diagnosed with COVID-19 pneumonia despite receiving negative test results). Our study included both probable and confirmed cases of SARS-CoV-2 infection according to the WHO's classification (13).

The inclusion criteria were patients over the age of 18 who were admitted to our hospital with a definite or probable diagnosis of COVID-19 and who agreed to participate in a check-up and signed a voluntary consent form after 6 months.

We excluded the following patients from the study: those with active tuberculosis; those who had been in contact with a person diagnosed with activetuberculosis; those who had active tuberculosis in the past; those using immunosuppressant medication for any reason; and those who did not agree to participate in the study and did not come when called by phone.

Routine verification of COVID-19 cases in our country requires real-time reverse transcription, which involves specific detection of viral RNA by a Nucleic Asid Amplification Tests(NAAT) such as polymerase chain reaction (rRT-PCR) detection of viral sequences and, when necessary, by nucleic acid sequence analysis.

High-resolution computed tomography (HRCT) was performed on the patients during hospitalisation and at their 6-month follow-up. Radiological images were evaluated by two radiologists. HRCT images were recorded as reticular, honeycomb, fibrotic focus, and interseptal thickening ground glass.

Bronchiectasis, chronic obstructive pulmonary disease (COPD), and asthma were recorded as chronic lung diseases.

All patients received the BCG vaccine in accordance with the national vaccination programme.During the period of our study, the COVID-19 vaccination programme had not been initiated in our country. As a result, patients included in the study had not been vaccinated.

The PPD-tuberculin skin test is an indicator of BCG vaccination and latent tuberculosis. Hence, this method was applied to all volunteers in our study to explore the connection between the BCG vaccine and post-COVID-19 sequelae.The QuantiFERON test was not administered.

The PPD antigen, used for the tuberculin skin test, was administered by intracutaneous injection of 0.1 mL of a solution equivalent to 5 tuberculin units with a 27-gauge needle into the 2/3 upper inner part of the left forearm, after which the induration formed within 48 to 72 hours was measured with a ruler, and the results were recorded in millimetres (mm). The results were evaluated according to the National Tuberculosis Diagnosis and Treatment Guidelines (7). The indicator diameter was evaluated and recorded by chest disease specialists. Furthermore, all patients were examined for BCG vaccine scars on their left shoulders.

The initial 24-hour symptoms of patients upon admission to the hospital, their physical examination findings, oxygen saturation levels, biochemical parameters (glucose, urea creatine, C-reactive protein, hemogram, fibrinogen, D-dimer, ferritin,Aspartate aminotransferase(AST), Alanine Transaminase (ALT), Lactate dehiydrogenase(LDH), gama – glutamyl transferase(GGT), Na, K, protein, albumin), and radiological features (ground-glass, consolidation, focal, multifocal involvement, bilateral, unilateral involvement) were recorded in our database.



All patients who attended the 6-month follow-up visit were re-evaluated by chest disease specialists. Their symptoms were scrutinised, physical examinations were performed, and oxygen saturation, radiological, and biochemical evaluations were conducted. During the follow-up visit, radiological findings—including ground-glass opacities, consolidation, focal, multifocal, bilateral, and unilateral involvement as well as increased reticular density increase, fibrosis, tractional bronchiectasis, and honeycomb formation—were assessed.

Statistical analysis

We used SPSS 23.0 for Windows to performstatistical analysis. We present descriptive statistics as numbers and percentages for categorical variables and means, standard deviations, and as minima and maxima for scale variables. We made two independent patient group comparisons using Student's t-test. We made comparisons of patient conditions at the time of hospitalisation and at the time of the control using paired t-tests. We performed comparisons of ratios in independent and dependent groups with Pearson's chi-square test and McNemar's test, respectively.To examine the relationships, we employed Pearson's correlation. We determined the cut-off points using receiver operating characteristic (ROC) curves and tested them using the log-rank test of equality. The significance level, alpha, is accepted as $p<0.05$.

RESULTS

(1) Patients' conditions at the time of hospitalisation

Characteristics of the patient group are summarized in Table 1.

The study included a total of 92 patients (n=92), 39 of whom were female (42.4%) and 53 of whom were male (57.6%). Their average age was 51.97 years (ranging from 30 to 72 years). While 69% (n=75) tested positive for SARS-CoV-2 by PCR, 31% (n=17) were given negative test results.

The most common comorbidity among the patients was hypertension (30%), followed by diabetes mellitus (18%) and chronic obstructive pulmonary disease (COPD) (16%). The percentage of patients without comorbidities was 28.8% (n=27). The most common symptoms observed in patients during hospitalisation were cough and dyspnoea, reported as 67.4% and 69.6%, respectively (see Table 1).

The patients had the following average laboratory values at the time of hospitalisation: ferritin: 372.64±389.12, fibrinogen: 510.75±160.44, D-dimer: 1.65±4.37, CRP: 69.25±64.38, averageplatelet count: 250.38±123.83, lymphocyte count: 1.68±1.03, and neutrophil-to-lymphocyte ratio: 4.82±4.63 (Table 1).

The patients had an average oxygen saturation (SaO2) of 94.95%, ranging from 84% to 98%. Among the patients, 58.7% received oxygen support through a nasal cannula, while 5.7% required oxygen, delivered via an Ambu bag or reservoir mask (Table 1).

Among the 92 patients, 73 had HRCT images taken during hospitalisation. The remaining 19 were evaluated using chest radiography.

Among the patients who underwent chest HRCT imaging, ground-glass opacity was observed in 95.9%, while consolidation was detected in 47.9%. Multifocal and bilateral involvement was observed in 90.4% of patients (Table 1).

While hospitalised, 2 patients experienced pulmonary embolism, and pulmonary embolism worsened in 5 (5.5%) of them, necessitating immunosuppressive treatment. All other patients were treated with the current medications specified in the Ministry of Health's COVID-19 treatment guidelines (Table 1).

The patients' hospital stays ranged from a minimum of 1 day to a maximum of 30, with an average of 7 days. Among the patients, 4.3% (n=4)

required intensive care during their hospitalisation, while 7.6% were discharged with oxygen concentrator support (Table 1).

(2) Information on the patients' conditions at the follow-up visits (six months later)

During the follow-up visits, 42.4% of patients experienced dyspnoea, while 8.7% had cough. On the lung CT scans obtained during these visits, sequelae were observed in 50% of the patients (n=41). The most common sequela lesion was an increase in ground-glass opacity (28.3%, n=26), followed by fibrotic lesions (23.9%, n=22) and increased reticulation (20.7%, n=19). A total of 78% of the lesions (n=32) were bilateral or multifocal (Table 2).

(3) Changes in patients' conditions from the time of hospitalisation to the follow-up visits

During the follow-up visits, patients' average oxygen saturation (SaO2) was 96.98%±3.02%. Among the 7 patients who were given oxygen

Table 1. Demographical and clinical characteristics of the patient group

		Mean±SD	Min-Max
Age		51.97±10.22	30-72
		N	%
Gender	Female	39	42.4
	Male	53	57.6
Symptoms	Cough	62	67.4
	Dyspnea	64	69.6
	Fever	38	41.3
	Loss of smell	18	19.6
	Fatigue	60	65.2
Comorbid diseases	Hypertension	30	32.6
	Chronic pulmonary disease	16	17.4
	Chronic heart failure	12	13.0
	Coronary artery disease	11	12.0
	Chronic renal failure	0	0.0
	Malignity	2	2.2
	Diabetes	18	19.6
	Asthma	7	7.6
PCR	Positive	75	81.5
	Negative	17	18.5
PPD	Positive	32	34.8
	Negative	57	62.0
	Missing information	3	3.3
BCG	Yes	77	83.7
	No	12	13.0
	Missing information	3	3.3

Table 1. *continued...*

Test results at the time of hospitalization			
	Valid n	**Mean±SD**	**Min-Max**
WBC	92	8.27±3.15	2.86-17.77
HGB	91	13.25±1.60	10.0-19.2
MCV	92	82.88±5.14	57.0-93.0
PLT	92	250.38±123.83	75-1018
Lymphocyte	92	1.68±1.03	0.38-8.01
Neutrophil/Lymphocyte ratio	86	4.82±4.63	0.43-29.79
Glucose	92	129.93±39.96	78-273
Urea	92	28.66±13.12	12-116
Creatine	92	0.83±0.25	0.49-2.01
TGL	17	136.53±76.29	54-318
Total Cholesterol	19	163.95±43.64	69-230
LDH	57	330.51±166.59	31-1150
Ferritin	87	372.64±389.12	6.0-2000.0
ALT	92	41.47±43.19	7-369
AST	92	40.58±24.15	11-154
Sedimentation	31	47.65±25.75	4-104
CRP	92	69.25±64.38	0.3-252.0
D-dimer	87	1.65±4.37	0.12-36.48
Fibrinogen	84	510.75±160.44	191-983
Procalcitonin	89	0.14±0.42	0.01-3.52
SpO2	92	94.95±3.59	84-98

WBC: white blood cell, HGB: haemoglobin, MCV: mean corpuscular volume, PLT: platelet, TGL: triglycerides, LDH: lactate dehydrogenase, ALT: alanine transaminase, AST: aspartate transaminase, CRP: C-Reactive protein, SpO2: oxygen saturation

Summary of hospitalization process			
		N	**%**
Treatment	Enoksaparin Sodyum	88	95.7
	Faviravir	69	75.0
	Plaquenil	35	38.0
	Antibiotic	83	90.2
	Prednol	31	33.7
	Tocilizumab	1	1.1
	Pulsesteroid(metilprenizolon)	1	3.3
Oxygen support	Nasal cannula	54	58.7
	Ambureservoir	6	6.5
	Highflow	5	5.4
Problems arisen	Cardiac involvement	0	0.0
	Pulmonary embolism	2	2.2
	Clinical deterioration	5	5.4

Table 1. *continued...*

Findings of Chest X-ray and CT at the time of hospitalization			
		N	%
Chest X-ray (92 valid patients)	Yes	72	78.3
	No	20	21.7
CT (73 valid patients)	Ground glass opacity	70	95.9
	Consolidation	35	47.9
	Focal	5	6.8
	Multifocal	66	90.4
	Right	70	95.9
	Left	65	90.3
	Bilateral	66	90.4

Summary of discharge conditions			
		N	%
ICU	Yes	4	4.3
	No	88	95.7
Oxygen concentrator	Yes	7	7.6
	No	85	92.4
		Median	Min – Max
Length of hospitalization stay (LoS)		7 days	1 day – 30 days

Table 2. CT Findings and symptoms at control

		N	%
Symptoms	Cough	8	8.7
	Dyspnoea	39	42.4
	Fever	3	3.3
CT (91 valid patients)	Unifocal	11	12
	Multifocal	32	34.8
	Right	37	40.2
	Left	37	40.2
	Bilateral	32	34.8
	Reticular	19	20.7
	Honeycombing	1	1.1
	Fibrotic	22	23.9
	Interseptal thickening	6	6.5
	Ground-glass opacity	26	28.3
Oxygen concentrator (90 valid patients)	Yes	3	3.3



concentrators during discharge for oxygen therapy at home, only 1 still required oxygen. The average ferritin level, assessed during the follow-up visits, was 85.41±73.9, the D-dimer level was 0.34±0.38, and the CRP level was 3.93±5.12 (Table 3).

(4) Observations of PPD

During the follow-up visits, the tuberculin skin test (PPD) was conducted, and 34.8% of the patients (n=32) tested positive (Table 4). According to the independent t-test results, patients with a positive PPD had a longer hospitalisation than PPD-negative patients ($p<0.001$). According to Pearson's chi-square test, fever symptoms were more common in PPD-positive patients during hospitalisation ($\chi 2$ (1) =4.43, p=0.035). Apart from these findings, there was no statistically significant relationship between PPD positivity and other parameters during the hospitalisation of COVID-19 patients.

(5) Symptoms at the follow-up visits

At the follow-up visits, 32 patients still had at least one of the symptoms (cough, dyspnoea, or fever). We further analysed these 32 patients. For the next part, all the remaining symptoms were observed for different patient groups. Only significant results were recorded. Patients with chronic pulmonary disease had a significantly greater percentage of symptoms, especially dyspnoea, at follow-up (p=0.013 for symptoms, p=0.005 for dyspnoea) (Table 5).

Table 3. Test results for the control

	Valid n	Mean±SD	Min–Max
Glucose	91	115.81±40.75	11-323
Urea	91	22.78±14.99	0.50-80
Creatine	91	8.49±14.68	0.47-69
TGL	89	173.18±124.78	40-1129
Total cholesterol	89	194.73±40.14	93-289
LDH	90	218.40±78.78	38-579
Ferritin	86	85.41±73.91	0.90-391
ALT	91	23.74±21.06	9-181
AST	91	23.51±20.46	11-200
Sedimentation	36	15.44±15.83	2-62
CRP	89	3.93±5.12	0.19-31.80
D-dimer	85	0.34±0.38	0.01-2.58
Procalcitonin	91	0.04±0.02	0.003-0.14
ALB	86	44.66±5.71	0.80-52
Protein	2	42±7.1	37-47
SpO2	91	96.98±3.02	76-99

Table 4. Information on patient PPD results

PPD	Positive	32	34.8
	Negative	57	62.0
	Missing information	3	3.3

Table 5. Relationship between sequelae and demographic characteristics and Relationship with consolidation on CT and having sequelae at control

		P
Age		0.004
Sex		0.202
Symptoms	Cough	0.085
	Dyspnoea	0.972
	Fever	0.974
	Loss of smell	0.934
	Fatigue	0.588
Comorbid diseases	Hypertension	0.781
	Chronic pulmonary disease	0.734
	Chronic heart failure	0.126
	Coronary artery disease	0.109
	Malignity	0.912
	Diabetes	0.372
	Asthma	0.544
PCR		0.934
PPD		0.084

		CT_Sequelae		Total	p
		No	Yes		
CT_consolidation	No	27	11	38	
	Yes	15	20	35	
Total		42	31	73	0.015

Patients with dyspnoea and cough comprised a significantly greater percentage of patients with fibrotic sequelae at follow-up (p=0.007 and p=0.009, respectively). Likewise, patients with dyspnoea and cough at the time of hospitalisation comprised a significantly greater share of patients with interseptal thickening at follow-up (p=0.041 and p=0.001, respectively). Moreover, patients with cough at the time of hospitalisation comprised a significantly greater number of patients with GGOs at follow-up (p=0.028).

(6) Observations of having sequelae after the disease

The results of the independent samples t-tests suggest a significant difference (p=0.004) in the ages of the patients who had sequelae after the disease compared with those who did not have sequelae. The patients who had sequelae were older than the patients who did not.

The following tables provide all the information on the CT and subsequent conditions of the patients (Table 5).



The outcomes of Pearson's chi-square test imply a significant relationship between having consolidation of CT and having a sequela at the follow-up visit (Table 5).

DISCUSSION

We aimed to examine the course of COVID-19 infection in the presence of latent tuberculosisand its results in the post-infection period. We did not detect a relationship between PPD positivity and post-COVID-19 symptoms or radiological residual lesions. However, symptoms such as dyspnoea and cough were more common in patients with chronic lung disease (COPD, asthma, bronchiectasis, etc.) and in patients with radiological sequelae in the lung(s). Furthermore, post-COVID sequelae lesions were more common in elderly patients.

We included patients who were hospitalised due to severe pneumonia without intensive care admission; 57% were male and 43% were female, with an average age of 51.97 years. Although the sex distribution of our patients was like that in other studies, the average age was lower (14,15,16,17,18).

Our comorbidity rate was 71.2%. In other reports in the literature, the most common comorbidity rate was hypertension (30%), followed by that of diabetes mellitus (18%) and COPD (16%) (14,15,16,17,18).

At the 6-month follow-up visit, the most common persistent symptom was dyspnoea (42.9%). Various studies have reported persistent dyspnoea after COVID-19, ranging from 10.5% to 20% (15,16,17,18,19). Furthermore, these studies indicate a greater prevalence of persistent dyspnoea in hospitalised patients (15,16,17,18,19). In our study, like the study by Munblit et al., we identified a relationship between the presence of persistent symptoms and dyspnoea and the presence of chronic lung disease (18). Additionally, dyspnoea and cough were correlated with the detection of sequelae lesions at the follow-up visits in the thorax CT scans of our patients. Indeed, 50% of our patients had radiological sequelae in their thorax CT scans. The most common sequelae were an increase in ground-glass opacity (28.3%), followed by fibrotic foci (23.9%) and reticular findings (20.7%). Furthermore, 95% of residual lesions were bilateral and multifocal. Blanco JR et al. did not detect any imaging findings in 48% of patients via tomography after 45 days, which is quite early compared to our study (16). So et al. reported a percentage of 55.7% in their meta-analytic study examining follow-up CT scans taken at different time intervals (19). However, in the study of Balbi M et al., who investigated hospitalised patients, like our study, the rate of sequelae was 81% at the follow-up CT scans taken after an average of 105 days (20).

According to our study, we believe that the high rate of sequelae they detected is because CT control was performed at an earlier period. Like the results of Balbi et al., in our study, the occurrence of tomography sequelae was associated with age, while it did not show any correlation with comorbidity (20).

Epidemiological studies have reported that COVID-19 mortality is lower in countries with a high tuberculosis incidence where the BCG vaccine is routinely administered than in countries with a lower tuberculosis prevalence where it is not (2,3,4). This situation has necessitated the investigation of the potential impact of the BCG vaccine and latent tuberculosisinfection (LTBI) on the clinical course of COVID-19. Therefore, our study is significant because it explores the effect of LTBI on the persistence and sequelae of the disease during long-term follow-up of COVID-19 patients. We did not come across a study in the literature from this perspective. Nevertheless, in our study, we did not identify a statistically significant relationship between persistent PPD positivity and post-COVID-19 symptoms or lung sequelae.

Gao et al. conducted a meta-analysis of 2,383 COVID-19 patients and reported that COVID-19 infection appeared to be twice as severe in patients

with LTBI, but these patients did not have a significantly greater risk of mortality. However, there were inconsistencies in the clinical severity criteria of the studies included in their meta-analysis, and these studies focused on acute-stage COVID-19 patients (21). Mariotti et al. revealed that patients with LTBI experienced significantly greater rates of orotracheal intubation and mortality than did those without LTBI (22).In our study, we observed that the hospital stay was longer among patients with LTBI, and fever symptoms were more common in these patients. However, we did not detect significant relationships for the other parameters.

Erdem et al., from our country, found no significant relationship between QuantiFERON positivity and the clinical severity or mortality of acute-stage COVID-19 (23).

The limiting factors of our study are that it was not planned in a controlled prospective manner and that possible COVID-19 patients were included. The absence of a control group not receiving the BCG vaccine in our study could be considered a limitation. Due to the lack of routine implementation of the BCG vaccine in our country and its status as an endemic region for tuberculosis, it is challenging to identify unvaccinated patients. Furthermore, while PPD testing makes the most significant contribution to the detection of latent tuberculosis by demonstrating cellular immunity, clinical decisions are still limited by inconclusive findings such as uncertain contact and minimal radiological sequelae.During the early days of the pandemic, COVID-19 cases were frequently hospitalized and isolated. The cases in this study therefore consist of patients with mild and moderate pneumonia and include 6-month follow-up of these cases.Cases who survived intensive care couldn't be regularly followed up at the outpatient clinic level due to the difficult times they experienced afterwards. A limiting factor in our study is that cases with severe pneumonia who were even later admitted to intensive care were not included. Nevertheless, our study is significant for demonstrating the presence of sequelae findings even in mild cases.Our main objective was to determine the status of patients in our country's hospitals where the BCG vaccine is routinely administered. Nonetheless, our study—which is the first to investigate the relationship between latent tuberculosis and post-COVID-19 symptoms—may provide guidance for future research.

CONCLUSION

In conclusion, we did not detect a relationship between symptom persistence and the presence of radiological sequelae in post-COVID-19 patients with LTBI, who were followed up with due to PPD positivity and not having been intubated. Patients who were determined to have chronic lung disease and radiological fibrotic sequelae lesions during hospitalisation exhibited a significantly greater persistence of symptoms.Furthermore, the likelihood of residual radiological sequelae was greater in older patients.

The high incidence of idiopathic pulmonary fibrosis, a progressive pulmonary disease, in the elderly group indicates that age predisposes individuals to fibrotic mechanisms.We believe the inflammation caused by COVID-19 triggers these fibrotic mechanisms more in the elderly. Therefore, vaccinating the elderly population and implementing preventive measures are crucial to prevent the development of potential fibrotic sequelae. Besides, these cases should be followed up radiologically and clinically. Our study emphasizes the need to develop vaccines against new COVID mutations and other viral infections, as well as treatments to prevent the fibrotic process.

Declaration of authenticity about the figures: All figures submitted have been created by the authors, who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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ORIGINAL ARTICLE

RISK PROFILES IN GERIATRIC COVID-19 PATIENTS: VACCINATION IMPACTS ON HOSPITALIZATION AND SURVIVAL DURING THE OMICRON WAVE

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Abstract

Introduction: The Omicron variant causes less severe disease than other variants. Although most patients experienced a mild course, an increase in hospitalizations and intensive care unit follow-ups was observed. The course of the disease was more severe, especially in the geriatric population. This study investigated the factors leading to hospitalization, intensive care needs, and mortality in older patients.

Materials and method: Between October 2022 and March 2023, COVID-19 patients aged > 60 years were included in the study. Patients' demographic features, underlying diseases, initial symptoms, vaccinations, treatment, secondary bacterial infections, and COVID-19 history were investigated. Mortality rates at the hospital and after discharge were investigated.

Results: Adding three or more mRNA vaccines to the vaccination schedule was associated with a reduced risk of hospitalization and intensive care unit admission. Patients with repeated vaccine doses had no mortality or intensive care unit follow-up, whereas unvaccinated patients had 13.3% mortality and 46.6% intensive care unit follow-up. 80-year-olds and older had higher mortality. The mortality rate of patients admitted to the hospital with a deteriorating general condition was considerably higher (28.8%) than that of other patients (5.4%). Patients with a COVID-19 history had fewer intensive care unit visits (10.25%). The mortality rate among hospitalized patients who did not receive molnupiravir was higher (40%) than that of those who received treatment (14%).

Conclusion: Repeated vaccine doses, heterologus, and full-dose mRNA vaccination reduced mortality and hospitalization rates. Patients aged ≥80 have a higher risk of mortality. Molnupravir treatment significantly decreased the mortality rate.

Keywords: COVID-19; SARS-CoV-2; Vaccination; Mortality.

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INTRODUCTION

The advent of novel variants has significantly altered the course of the COVID-19 pandemic. The Omicron variant, with its high infection transmission and increased hospitalization rates, has triggered a pandemic (1, 2). The Omicron variant was associated with a less severe disease course. The elevated hospitalization rates were attributed to high infectiousness and a considerable number of infected individuals (1). A significant proportion of patients exhibited mild disease manifestations. However, older patients, patients with underlying diseases, and patients with missing vaccine doses experienced more severe disease with the Omicron variant (3, 4).

While the efficacy of vaccines has generally declined over time, the efficacy of vaccines against the Omicron variant has fallen significantly (5). Booster vaccinations with updated vaccines should be administered to protect against the new variants (5).

During the period of the Omicron variant, older patients had to cope with a particularly severe disease compared to other patients. Hospitalizations and deaths also occurred mainly in the geriatric patient group (3,4). Despite this, many older patients were able to overcome the illness without being hospitalized (3).

In this study, we aimed to examine older COVID-19 patients' hospitalization, intensive care unit (ICU) admission, and short- and long-term mortality during the Omicron wave, despite all vaccinations and changes in the pathogenicity of the virus. In addition to examining the risk-posing conditions of the older patients, we aimed to evaluate older patients with different numbers and types of immunizations in terms of mortality and the risk of intensive care hospitalization. This study analyzes the geriatric population with COVID-19 and contributes to the management of older patients in terms of risk factors, immunization, and treatment approaches.

MATERIALS AND METHOD

All patients with a diagnosis of COVID-19 between October 2022 and March 2023, when the Omicron variant was dominant, were retrospectively analyzed. The patients who were followed up in the ICU and COVID-19 clinic, who were older than 60, were included in the study. In order to select the same age group, only outpatients aged 60 years and older were included in the study.

A detailed analysis of the vaccination status of the patients was conducted during the study period. At the time of the vaccination initiation, only inactivated vaccines (CoronaVac (Sinovac, China)) were available in Turkey. Subsequently, mRNA vaccines (BNT162b; Pfizer/BioNTech, Germany) have been made available. However, an updated mRNA vaccine (bivalent BA.4/BA.5; Pfizer/BioNTech, Germany) is not available in Turkey. Most individuals received heterologous vaccinations. Those who received four doses of the vaccine were considered to have achieved full vaccination. The availability of booster doses in the last three months was examined. The study included an analysis of patients who died while hospitalized and those who died within one year of diagnosis. The presence of underlying diseases and a second diagnosis resulting in hospitalization were investigated. Additional secondary bacterial infections during the course of the patient's hospitalization and length of stay were examined. All patients were investigated for a history of COVID-19. Molnupiravir was the only antiviral treatment for COVID-19 during the Omicron wave, and only patients over 65 years of age or patients with underlying disease could receive molnupiravir treatment. Patients under 65 years of age, as well as patients with a long time since symptom onset at the time of hospitalization, were not able to receive molnupiravir treatment. Mortality rates were investigated in patients who received and did not receive the treatment.



Statistical Analysis

Statistical analysis was conducted using SPSS 29.00 software. We analyzed the differences in mean age between the groups using ANOVA. In addition to descriptive statistics for each group, we used the chi-square test and logistic regression to compare patients' immunization, hospitalization, and mortality. The Kruskal-Wallis test was employed to investigate the differences between the ICU and COVID-19 clinic lengths of stay for patients with different vaccinations.

RESULTS

A total of 249 patients who were followed up as outpatients or hospitalized were included in this study. Of these, 50.2% were female. The mean age was 72.38±5.9 years in 79 outpatients, 75.63±10 years in 92 patients in the COVID-19 clinic, and 78.77±9.5 years in 78 patients in the ICU. While the age difference between outpatients (p = 0.03, <0.001) and others was significant, the age distributions of the ICU and COVID-19 clinic (p = 0.1) patients were similar. No difference was observed in the sex distribution of the patients (p = *0.54).* The mean ICU hospitalization day of inpatients was 9.35±8.8, and the mean hospitalization day of patients in the COVID-19 clinic was 7.5±4.04.

A total of 55 (32.4%) patients were admitted to the hospital with upper respiratory symptoms; 70 (41.2%) patients were admitted with shortness of breath; and 45 (26.5%) patients were admitted with deterioration of their general condition. The most common underlying diseases among hospitalized patients were hypertension (55.7%), diabetes (33.7%), congestive heart failure (CHF) (29.3%), chronic obstructive pulmonary disease (COPD) (28.7%), and Alzheimer's disease (12%). A total of 35 patients had a secondary diagnosis, which was diagnosed at the time of hospital admission or while being followed up in the hospital with a diagnosis of COVID-19. Cerebrovascular events (CVE) were the most common second diagnosis.

The mortality rate was 18.87% among the patients with COVID-19. In the ICU, 29 (37.17%) patients died during follow-up, and 12 (15.38%) died within 1 year after discharge. In the COVID-19 clinic, 6 (6.52%) patients died within 1 year after discharge. Both in-hospital mortality and mortality in one year were significantly higher in patients aged 80 years and older (p=0.003, p <0.01). The patients 80 years of age and older were mostly hospitalized and fewer as outpatients (p <0.01). Mortality and total mortality did not differ between the sexes (p=*0.53*, p=0.4, respectively). Mortality was significantly higher in patients admitted to the hospital with a deteriorating general condition (28.8%) than lower respiratory distress (18.5%), and symptoms of upper respiratory tract infection (5.4%) (p=0.007). Among the hospitalized patients, only 20 did not receive molnupiravir treatment. The mortality rate was 40% for patients who were not treated with molnupiravir, whereas hospitalized patients treated with molnupiravir had a 14% mortality rate (p=0.008).

There were 168 (67.46%) full-dose vaccinated patients (Figure 1). The mortality rate within one year was statistically significantly lower in patients who were fully vaccinated (14.88%) compared to those who were not fully vaccinated (27.16%) (p=0.02).

Patients without a full dose of vaccination had an increased risk of hospitalization (OR 3.9 CI 0.6–6.1 p <0.01) and ICU admission (OR 4.9 CI 0.7–6.5 p<0.01) (Figure 2). The total mortality is higher in patients with only inactivated vaccines (34.78%) but lower in heterologous vaccinations (11.87%) and schedules with repeated mRNA vaccines (9.52%) (Table 1). Patients without three or more mRNA vaccines have an increased risk of hospitalization (OR 3.8 CI 1.4-9.7 p<0.01) and ICU admission (OR 4.6 CI 1.1-9.2 p<0.01) (Table 2). Patients who received a total of six doses of vaccine, mostly heterologous and booster mRNA doses, had no mortality (p <0.01) and no need for intensive care (p <0.01). The highest ICU needs

Table 1. Mortality rates and vaccine doses among the COVID-19 patients.

	Mortality at the hospital N (p) %	Total mortality in one year N (p) %	Total patient number N
Three mRNA vaccine doses	5 (0.28) 7.93%	6 (0.02) 9.52%	63
Three inactivated vaccine doses	11 (0.75) 12.5%	21 (0.13) 23.86%	88
Fully vaccinated	17 (0.27) 10.11%	24 (0.02) 14.28%	168
Heterologous Vaccination	14 (0.11) 8.75%	19 (0.00) 11.87%	160
Only inactivated vaccines	12 (0.11) 17.39%	24 (0.00) 34.78%	69
A total of six doses of vaccines	0 (0.00) 0%	0 (0.00) 0%	22
Booster in the last 3 months	2 (0.39) 6.89%	2 (0.07) 6.89%	29
No vaccine	2 (0.014) 13.33%	2 (0.01) 13.33%	15

Table 2. Vaccine doses and ICU and hospitalization needs of the patients.

	ICU N (%)	COVID-19 Clinic N (%)	Not hospitalized N (%)	Total patient N(*p*)
Three mRNA vaccine doses	10 (15.87%)	16 (25.39%)	37(58.73%)	63 (0.00)
Three inactivated vaccine doses	31(35.22%)	32(36.36%)	25(28.4%)	88 (0.56)
Fully vaccinated	42(25%)	57(33.92%)	69(41.07%)	168 (0.00)
Heterologous Vaccination	38(23.75%)	56(35%)	66(41.25%)	160 (0.03)
Only inactivated vaccines	32(46.37%)	27(39.13%)	10(28.98%)	69 (0.03)
A total of six doses of vaccines	0(0%)	7(31.81%)	15(68.18%)	22 (0.00)
Booster in the last 3 months	4(13.79%)	9(31.03%)	16(55.17%)	29 (0.01)
No vaccine	7(46.66%)	6(40%)	2(13.33%)	15 (0.00)

were in unvaccinated patients (46.66%) and patients vaccinated with inactivated vaccines (46.37%).

Of the patients, 38 (15.26%) had a history of COVID-19. There was no significant difference in mortality between patients with and without a COVID-19 history. While mortality during hospitalization was not different in patients with a second diagnosis (p=0.12), mortality within one year was statistically significant (p=0.007). Among the underlying diseases, CVE history and diabetes were associated with post-discharge mortality (p=0.04,

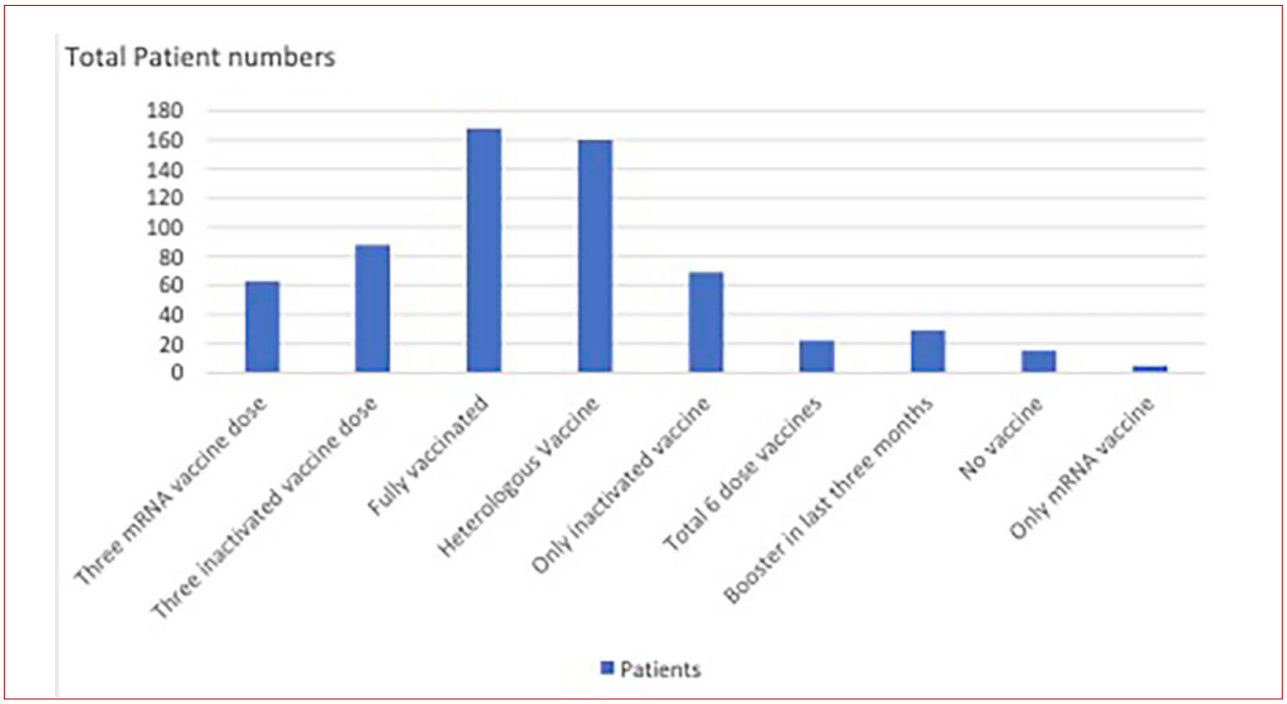


Figure 1. Vaccination types and administered total patients.

Table 3. Mortality among the patients with COVID-19 history, second diagnosis, and underlying diseases.

	Mortality at the hospital N(p)	**Total Mortality N(p)**
COVID-19 history	4 (*p* 0.8)	8 (*p* 0.7)
Second diagnosis	20 (*p* 0.12)	31 (*p* 0.007)
The Most Common Underlying disaeases among the hospitalized patients		
Hipertension	14 (*p* 0.66)	21 (*p* 0.15)
Diabetes	6 (*p* 0.21)	9 (*p* 0.03)
Chronical obstructive pulmonary disease	6 (*p* 0.41)	10 (*p* 0.25)
Alzeimer	5 (*p* 0.25)	8 (*p* 0.16)
Concestive heart failure	8 (*p* 0.97)	12 (*p* 0.64)
Cerebrovascular event	3 (*p* 0.57)	7 (*p* 0.04)
Chonic renal failure	2 (*p* 0.73)	4 (*p* 0.21)

0.03, respectively) (Table 3). The mortality rate of 28 patients who developed secondary bacterial infection while being followed up in the ICU (71.4%) was statistically significantly higher compared to patients who did not develop secondary bacterial infection ($p<0.01$).

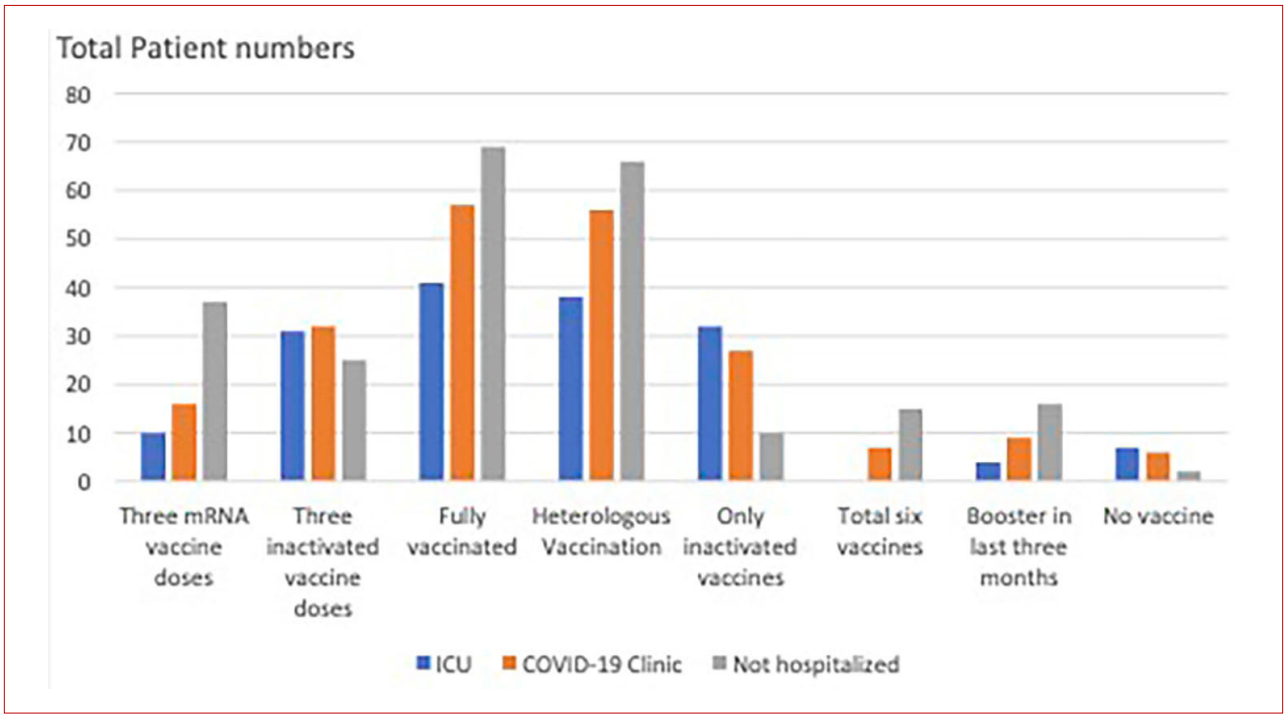


Figure 2. Vaccinations and hospitalizations among COVID-19 patients.

DISCUSSION

Although we included only patients aged over 60 years in our study design, hospitalized patients' mean age was higher than outpatients. Mortality increased with age > 80 years. Most patients received heterologous vaccinations, whereas 69 patients received homologous vaccinations using inactivated vaccines.

Mortality is known to increase in older patients and those with underlying medical conditions (6). Increased mortality has been associated with congestive heart failure, chronic kidney failure, and cirrhosis (3, 6). During the early stages of the pandemic, underlying diseases and age were associated with a poor prognosis (7, 8). Researchers have linked age, particularly 80 years and older, and dementia to a poor prognosis in patients infected with the Omicron variant (4). On the other hand, some studies reported no relationship between the underlying disease and a poor prognosis (9). In our study, patients aged 80 years and older had a higher mortality rate, but no underlying disease or second diagnosis increased in-hospital mortality. In one year, diabetes and CVE increased total mortality. However, some studies have reported no association between long-term mortality and underlying diseases (10). Secondary bacterial infections increase mortality in COVID-19 patients (11). Our study demonstrates that secondary bacterial infections are one of the primary causes of ICU mortality in patients with COVID-19.

Studies have shown that patients initially admitted to the hospital with respiratory distress symptoms have a poor prognosis (8). Respiratory distress was the most common symptom reported during the early stages of the pandemic (74%) (7). In our study, 41.2% of the older patients presented to the hospital with respiratory distress. Patients

admitted to the hospital with deterioration in their general condition had the highest mortality rates.

It is well known that SARS-CoV-2 can cause long-term negative effects on patients, particularly those who are elderly and have several underlying diseases (12). The all-cause mortality rate following hospital discharge ranges from 0% to 37%. A systematic review and meta-analysis reported a mortality rate of 7.5% within one year. The results of our study are comparable to those of the aforementioned study, with a mortality rate of 7.2%. Our study also identified a correlation between age and post-discharge mortality. A higher post-discharge mortality rate was observed in patients aged 80 and older (12). Patients with moderate or severe disease have a higher risk of post-discharge mortality (10, 13). In our study, while patients in the ICU exhibited the highest post-discharge mortality, those who were not hospitalized demonstrated no mortality for over one year.

Vaccination, particularly booster doses, reduces mortality (3, 6). Full-dose vaccination regimens reduce mortality, the need for ICU admission, and intubation requirements (14). Some studies have reported a mortality reduction of up to 10-fold among patients receiving the full vaccination dose (14). In contrast, in other studies, in-hospital mortality was not reduced in critically ill patients (15). The observed mortality rates were similar among fully vaccinated, unvaccinated, and partially vaccinated patients. In our study, only patients who received six doses of the vaccine and those who did not receive any vaccine exhibited statistically significant differences in in-hospital mortality. Our results are comparable with those of several studies in terms of post-discharge mortality up to one year and vaccination. These studies reported that vaccination reduced post-discharge mortality rates (13). Repeated doses, especially with mRNA, have been shown to reduce post-discharge mortality, and patients administered six vaccine doses showed no mortality in our study.

Vaccination with three doses of the mRNA vaccine reduced mortality and hospitalization risks in elderly patients infected with the Omicron variant (4). A study from Japan reported 74% vaccine efficacy against the Omicron variant after the 3rd dose of the vaccine (16). Another study reported no significant waning immunity for more than 120 days with three doses of the vaccine against emergency room visits and hospitalization (17). Patients receiving three or more doses of the mRNA vaccine had lower mortality and hospitalization rates in our study; however, almost all were part of the heterologous vaccination.

A study comparing vaccines found that mRNA vaccines were more effective than inactivated vaccines, especially among older people (18). Two or even three doses of the inactivated vaccine did not affect mortality in the later stages of the pandemic; however, the addition of the mRNA vaccine had a positive effect (19, 20). Some studies have reported improved immunity after repeated doses of heterologous vaccinations (20). We observed higher mortality rates among patients with only inactivated vaccines (23.86%) than among heterologously vaccinated patients, who had lower mortality rates (11.87%).

Even after receiving a full vaccination, elderly and immunocompromised patients may experience poor prognosis and hospitalization, particularly when infected with new variants. Therefore, studies have emphasized the importance of booster doses (18, 21). In our study, patients receiving the six-dose, mostly heterologous vaccination showed no mortality and no ICU requirement. Previous studies have found that a fourth dose of mRNA vaccines reduces mortality, particularly in the elderly, immunosuppressed, and high-risk individuals (22). One study revealed that individuals who received a booster dose of the vaccine experienced fewer symptoms and disease severity than those who did not receive the vaccine or booster dose (23).

Some studies have suggested that prior COVID-19 infection, especially in vaccinated individuals, protects against disease, particularly severe disease (22). According to them, the Omicron wave was less severe in nations with widespread prior infections than in nations with widespread vaccination but fewer infections (22). Our mortality rates were similar in patients with a history of COVID-19; however, these patients required less ICU care.

During the pandemic, antiviral treatments significantly reduced COVID-19 mortality rates, (24). In our study, the mortality rate was lower in patients who received molnupiravir treatment. A study of patients aged > 65 years showed that molnupiravir treatment significantly reduced mortality and hospitalization rates, regardless of other factors such as age, vaccination, previous infection, and underlying diseases, during the Omicron wave (25).

The study was able to examine many of the existing risk factors, especially in elderly patients who continue to be a risk group. In particular, it was able to compare heterologous vaccination with booster doses of mRNA and vaccination with inactivated vaccine. One of the limitations of this study is that the majority of our study group consisted of patients who received heterologous vaccinations. The number of patients who received only the mRNA vaccine was too low. Therefore, we could not compare patients who received only full-dose mRNA vaccines with other patients. To fully analyze some risk factors, such as underlying comorbidities, it would have been more efficient to compare with younger patients, but since all inpatients were elderly patients with many comorbidities, younger patients could not be included in the study.

CONCLUSION

The advent of the SARS-CoV-2 variants led to an increase in hospitalizations and mortality rates, particularly among individuals aged 80 and above. Underlying diseases did not influence the mortality rate of hospitalized patients. Administration of molnupiravir has been shown to result in a significant reduction in mortality rates. The acquisition of resistant bacterial infections during hospitalization has been found to increase mortality. The administration of heterologous vaccinations, adding mRNA vaccinations, and repeated doses was shown to reduce mortality and lessen disease severity.

Conflict of Interest: The authors declare no conflict of interest.

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Ethics approval: The study was approved by the Ethics Committee of the YBU Yenimahalle Training and Research Hospital on 13.10.2023 with an E-2023-53 registration number.

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ORIGINAL ARTICLE

PERCEPTION OF NURSING CARE AND SATISFACTION LEVELS OF ORTHOPEDICS AND TRAUMATOLOGY PATIENTS

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Abstract

Introduction: Aging adversely impacts the functioning of the organs of the human body and the musculoskeletal system. Orthopedics and traumatology clinics are a speciality area where services are provided for health issues requiring long-term care and multi-disciplinary teamwork. Consequently, patient–nurse interaction occurs for an extended period.

Materials and Metod: This descriptive study aimed to determine the perception of nursing care and satisfaction levels of orthopedics and traumatology patients. The data were collected after face-to-face interviewswith patients who had applied to an orthopedics and traumatology clinic between May 2022 and April 2023 and had undergone surgical procedures. The patient information form, Newcastle Nursing Care Satisfaction Scale, and Patient's Perception of Nursing Care Scale were used for data collection.

Results: The mean age of the study participants was 65.83±15.90 and 47.6% (n=137) of the participants were catagorized as elderly. The mean score on the Newcastle Nursing Care Satisfaction Scale was 85.01±16.85 and on the Patient's Perception of Nursing Care Scalewas 64.47±13.26. There was a moderate positive significant relationship between the scores on the Newcastle Nursing Care Satisfaction Scaleand Patient's Perception of Nursing Care Scale ($r_s=.391$; $p<.01$).

Conclusion: Patients' satisfaction with nursing care and perception of care were positive. Additionally, as the patients' satisfaction with nursing care increased, their perception of nursing care also increased.

Keywords: Nursing; Perception; Personal Satisfaction; Orthopedics; Patients.

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INTRODUCTION

Surgical interventions induce many physiological and psychological changes in the human body (change in homeostatic balance, fear, susceptibility to infection, pain, etc.). In the post-operative period, patients need effective and individualized nursing care to cope with these changes (1). Nurses are the healthcare professionals most needed by surgical patients before and after surgery. Orthopedics and traumatology nursing plays a crucial role in minimizing dependence and maximizing independence in the case of issues related to the musculoskeletal system of individuals. To achieve this goal, care should be individualized and planned in a multi-dimensional manner to encompass the emotional, social, and physical aspects of the individual (2,3).

The quality of nursing care is directly related to how the care service is perceived by the service recipients (1,4,5). In addition to the individual characteristics of the patients, the support received from the nurse, respect and courtesy shown by the nurse, access to the nurse whenrequired, and unambiguous and satisfactory information are also extremely effective in the formation of perception of care (1,4). Akey indicator in the evaluation of the service and quality of care provided by healthcare professionals is the patient's satisfaction with the care provided (6). Patient satisfaction is determined based on the level of perception of the care provided in line with the expectations of the patients (7). According to the definition commonly applied in the field of nursing, patient satisfaction refers to the degree of closeness between the patient's ideal nursing care expectation and the actual nursing care perception (8).

Orthopedics and traumatology clinics, as a speciality providing services for health issues requiring long-term care and requiring multi-disciplinary teamwork, are health care organizations where patient–nurse cooperation is experienced for an extended period. Thus, it is evident that nurses play a key role in improving the quality of nursing care provided in orthopedics and traumatology clinics and making the necessary arrangements for patient satisfaction/expectations in nursing practices. In this context, this descriptive study was conducted to determine the perception of nursing care and satisfaction levels of orthopedics and traumatology patients.

Hypotheses of the Research

- H_0: There is no relationship between orthopedics and traumatology patients' perception of nursing care and their satisfaction levels.
- H_1: There is a relationship between orthopedics and traumatology patients' perception of nursing care and their satisfaction levels.

MATERIALS AND METHOD

This descriptive and cross-sectional study aimed to determine the perception of nursing care and satisfaction levels of orthopedics and traumatology patients. The study population comprised patients who had applied to the Orthopedics and Traumatology Clinic of the Karabuk University Training and Research Hospital and underwent orthopedic surgery. The study sample included patients who had no problem in reading, writing, and speaking Turkish; who were older than 18 years of age; who accepted the research; and who had no problem in understanding and answering the questions (N=288). The data were collected based on face-to-face interviews with patients who had applied to the Orthopedics and Traumatology Clinic between May 2022 and April 2023 and underwent surgical procedures. Data were collected in the patient's room after the patient's discharge decision was made and before they left the clinic.Before commencing the study, an informed consent form was completed by the patients. Participants were informed that they could withdraw from the study at will.



Data-collection Tools

Patient identification form: This form, which was prepared by the researchers based on the literature, included 11 questions about the patient's personal information (age, gender, educational status, marital status, etc.), income status, place of residence, chronic disease, hospitalization experience, duration of hospitalization, and type of surgery.

Newcastle Nursing Care Satisfaction Scale (NNCCS): It was developed by Thomas et al. in 1996, and Turkish validity and reliability studies were conducted by Uzun in 2003 and by Akın and Erdoğan in 2007. This Likert-type scale comprises 19 items scored on a scale of 0–100 points by adding the scores of all items marked and converting them to 100. A total score of 100 indicates satisfaction with all dimensions of nursing care. The Cronbach's alpha of the satisfaction scale is 0.96(9-11).

Patient's Perception of Nursing Care Scale (PPNCS): The scale was developed by Dozier et al. in 2001 in the USA. This Likert-type scale comprises 15 statements related to the quality of nursing care. The Turkish validity and reliability study of the scale was conducted by Çoban (2006). A minimum of 15 and a maximum of 75 points could be obtained from the scale. An increase in the total score obtained from the scale indicates that the patient is satisfied with nursing care. A score of 45 or above indicates that the perception of care is good. The Cronbach's alpha of the scale is 0.92 (12,13).

Statistical Analysis

The research data were analyzed using the SPSS 23v package program. The reliability of the scales used in the study were tested based on the Cronbach's Alpha reliability coefficient. An alpha coefficient higher than 0.70 indicates that the test is reliable. To decide on the analysis of the data, the Kolmogorov-Smirnov Test was applied to both the general scale scores and the scale scores based on the categories. The normal distribution of the data was questioned. As the scale scores did not show normal distribution, the relationship between the scales was analyzed based on the Spearman Rank Difference correlation coefficient. A correlation coefficient between 0 and 0.30 indicates a low level of relationship; that between 0.30 and 0.70 indicates a medium level of relationship; and that between 0.70 and 1 indicates a high level of relationship (14). Significant differences in scale scores based on groups were analyzed via the Mann Whitney U Test in pairwise comparisons and the Kruskal Wallis H Test in comparisons of three or more groups. A value of $p<0.05$ was accepted for the significance level of the tests.

Limitations of the Study: The limitations of the study are that the research was conducted in a single center and was conducted with all patients who underwent orthopedic surgery rather than a single patient group. The number of surgical procedures performed and the variety of surgeries performed in the hospital where the research was conducted are limited. Therefore, the results cannot be generalized to all patients. The fact that the research is one of the first studies conducted in this field can be considered as a strength of the study.

Ethical Approval: Before commencing the study, permission was obtained from the Karabuk University Non-Interventional Research Ethics Committee (Date: 04.25.2022, Number: E-77192459-050.99-123169 Decision No: 2022/888). Additionally, institutional permission was obtained from the Karabuk University Training and Research Hospital where the study was conducted (Date: 05.18.2022, Number: E-34771223-774.99).

RESULTS

The mean age of the patients participating in the study was 65.83±15.90. Based on the World Health Organization(WHO) age classification, 47.6% (n=137) of the participants were elderly when age groups were analyzed. Among the study

Table 1. Sociodemographic characteristics of the participants (n=288)

Variable	Category	n	%
Age (Mean±SD)	65.83±15.90		
	Young (18-44)	30	10.4
	Middle age (45-59)	58	20.1
	Elderly (60-74)	137	47.6
	Old age (75-89)	53	18.4
	Advanced old age (90 and above)	10	3.5
Gender	Female	183	63.5
	Male	105	36.5
Education level	Illiterate	46	16.0
	Literate	48	16.7
	Primary school	131	45.5
	Middle school	25	8.7
	High school	25	8.7
	University and above	13	4.5
Marital status	Single	97	33.7
	Married	191	66.3
Place of residence	Village	70	24.3
	District/town	83	28.8
	Province centre	135	46.9
Profession	Retirement	43	14.9
	Housewife	162	56.3
	Shopkeeper	18	6.3
	Self-employment	42	14.6
	Not working	13	4.5
	Private sector	4	1.4
	Officer	6	2.1
Income status	Income less than expenses	82	28.5
	Income equal to expenditure	189	65.6
	Income more than expenditure	17	5.9
Hospitalization experience	Yes	222	77.1
	No	66	22.9
Chronic illness	Yes	156	54.2
	No	132	45.8
Type of surgery	Total joint replacement	107	37.2
	Amputation	22	7.6
	Infection	36	12.5
	Fracture/hemiarthroscopy	75	26.0
	Other	48	16.7
Duration of Hospitalization (Mean±SD)	10.06±15.84		



participants, 63.5% were female (n=183), 45.5% were primary school graduates (n=131), and 66.3% were married (n=191). A total of 46.9% of the patients resided in the city centre (n=135), 56.3% were housewives (n=162), and 65.6% had equal income and expenses (n=189). Of the patients, 77.1% (n=222) had hospitalization experience and 54.2% (n=156) suffered from a chronic disease. Regarding the type of operation, 37.2% of the patients had undergone total joint replacement (n=107). The mean hospitalization duration was 10.06±15.84 days (Table 1).

The mean scores of the study participants on the NNCCSwas 85.01±16.85 and on the PPNCS was 64.47±13.26. A total of 91% of the participants (n=262) showed a positive attitude on the scale of perception of nursing care. The Cronbach's alpha coefficient for the NNCCS was 0.972 and for the PPNCS was 0.962. These coefficients show that the scales are reliable at a good level (Table 2).

Although not presented in the table, the scores obtained by the participants on the NNCCS showed a significant difference based on their level of education (χ2=16.058; df=5; p<.05). The scores of the participants with university and higher level of education were significantly lower than the scores of those with secondary school education, primary school education, and illiterate participants (p<.05). The scores obtained on the scale by literate participants were significantly lower than the scores of the participants with primary school education and illiterate participants(p<.05). Additionally, the scores obtained by the participantson the NNCCS showed a significant difference based on the place of residence (χ2=13,273; df=2; p<.05). The scores of the participants residing in villages were significantly higher than the scores of those residing in the district/town and in the city centre (p<.05). Furthermore, the scores obtained by the participants on the NNCCS show a significant difference based on income status (χ2=7,221; df=2; p<.05). The scores obtained by participants whose income exceeded their expenses were significantly lower than the scores of those whose income was equal or less than their expenses (p<.05). Finally, the

Table 2. Distribution of the scores obtained by the participants from the Newcastle Nursing Care Satisfaction Scale and the Patient's Perception of Nursing Care Scale

	Mean±SD	Min	Max	Cronbach's Alpha
NNCCS	85.01±16.85	33.68	100.00	0.972
PPNCS	64.47±13.26	15.00	75.00	0.962

Newcastle Nursing Care Satisfaction Scale: NNCCS,Patient's Perception of Nursing Care Scale: (PPNCS)

Table 3. Correlations between the Newcastle Nursing Care Satisfaction Scale and the Patient's Perception of Nursing Care Scale in the research group

		Patient's Perception of Nursing Care Scale (PPNCS)
Newcastle Nursing Care Satisfaction Scale (NNCCS)	r_s	.391**
	p	.000
	N	288

**p<.01

scores obtained by the participants on the NNCCS showed a significant difference based on the type of surgery ($\chi 2$=11.114; df=4; p<.05). The scores of participants with infectionswere significantly higher than the scores of those with fracture/ hemiarthroscopy and total joint replacement. Additionally, the scores of participants with amputation were significantly higher than the scores of the participants with fracture/hemiarthroscopy and total joint replacement patients (p<.05).

Although it is not presented in the table, the scores obtained on the PPNCS show a significant difference based on the place of residence ($\chi 2$=8.804, df=2, p<.05). The scores of the participants residing in the village and those residing in the city centre were significantly higher than the scores of those residing in the district/ town (p<.05). Additionally, the scores obtained on the PPNCS show a significant difference based on income status($\chi 2$=15.855; df=2; p<.05). The scores of the participants whose income was equal to their expenses were significantly higher than the scores of those whose income was less than their expenses (p<.05). Furthermore, the scores obtained on the PPNCS show a significant difference based on age ($\chi 2$=9.491; df=2; p<.05). The scores of the participants in the middle age group were significantly higher than the scores of those in the younger, older, and old age groups (p<.05).

Analysis of Table 3 revealed a moderate positive significant relationship between the scores obtained on the NNCCS and the PPNCS (r_s=.391; p<.01). As the patients' satisfaction level with nursing care increases, so does their perception of nursing care.

DISCUSSION

Technological and scientific innovations in the field of health, developments in the diagnosis and treatment of diseases, and improvements in the standard of living due to better knowledge and education increase the proportion of the elderly in the total population. The incidence of chronic diseases, mobility issues, and degenerative joint diseases is increasing in parallel with the increase in elderly population worldwide (15-17). Musculoskeletal problems are among the most common complaints by the elderly,adversely impacting their quality of life (2). Therefore, individuals experience difficulty in meeting their basic human needs and may become dependent on others. A study examined the post-operative nursing care needs and affecting factors in elderly patients and reported that 45.5% of the participants were in the orthopedics and traumatology clinic (18). Similarly, in our study, the mean age of the participants was 65.83±15.90 years and 69.5% of them were in the elderly and advanced old-age categories based on the WHO classification.

The mean score of the study participants on the NNCCSwas 85.01±16.85. In other studies conducted with patients hospitalizedin surgical clinics, mean satisfaction scores ranged from 62.30±16.09 points to 82.6±14.8 points (3,19,20). In a study that investigated the relationship between perioperative care quality and patient satisfaction in patients undergoing orthopedic surgery, the mean total score on the NNCCS was 94.65±7.73 (21). In this context, our study is in line with the literature. The paramount health quality indicator is patient satisfaction. As in all fields, the quality of health services is changing and developing in parallel with ever-changing science and technology. Additionally, both the characteristics of the nurses providing care (education, experience, communication, etc.) and the characteristics of the patient receiving care (level of expectation, dependency status, post-operative complications, etc.) impact the level of satisfaction (15). Especially in orthopedics clinics, which is one of the surgical interventions with high pain levels, patient satisfaction should be measured at regular intervals using tools with proven validity and reliability, nursing care should be planned according to patient expectations, and quality of care should be improved (7).



Orthopedics and traumatology clinics, as a speciality area where services are provided for health problems requiring long-term care and multi-disciplinary teamwork, are health care centres where patient–nurse cooperation is experienced for an extended duration. After orthopedic surgery, issues such as pain, limitation of movement, risk of bleeding, and anxiety increase the care needs of patients. In the study, the mean score of the patients on the PPNCS was 64.47±13.26. A total of 91% of the study participants had a positive attitude (n=262) on the scale of perception of nursing care. In a study examining the perception of nursing care and satisfaction levels of surgical patients, the mean score on the PPNCSwas 68.03±9.87 (1). In another study examining the perception of nursing care in Turkey, the mean score on the PPNCS was 60.44±9.41 (4). Twayana and Hari Adhikari (2015) stated that the nursing care of patients was positive in their study (22). Our study is in line with the literature. Factorsthat induce a positive perception of nursing care include patients' dependence on nursing care-albeit brief-after orthopedic surgeries; increase in the care needs of the patients; greater care provided to meet patients' needs; frequent post-operative follow-ups; and patients feeling safer during this critical period.

The study participants' scores on the NNCCS show a significant difference based on the type of surgery ($\chi 2=11.114$; df=4; $p<.05$). The scores of infection patients are significantly higher than the scores of fracture/hemiarthroscopy patients and total joint replacement patients; the scores of amputation patients are significantly higher than the scores of fracture/hemiarthroscopy patients and total joint replacement patients ($p<.05$). Thus, satisfaction with care is higher among patients with greater care needs, extended hospitalization, and deeper patient–nurse interaction compared to other patient groups.

Currently, with the increase in the elderly population, the number of elderly patients undergoing surgical intervention is increasing. Aging-induced changes have biopsychosocial impacts on individuals, increasing their care needsand dependency on others. Akyüz and Büyükyılmazdetermined that elderly patients who underwent surgery in orthopedics and traumatology clinicsconsidered themselves more dependent on others in meeting their care needs (18). In our study, the scores obtained on the PPNCSshow a significant difference based on age ($\chi 2=9.491$, df=2, $p<.05$). The scores of the study participants in the middle-age group are significantly higher than the scores of those in the younger, older, and old age groups ($p<.05$). According to Kol et al., patients' agedoes not affect their perception of nursing care (4). In contrast to our study, Özcan and Kurşun, who conducted a study with 134 elderly patients hospitalized in the surgical clinic of a university hospital,identified that patients' perceptions of quality of care were high (23). We believe that with age, the patient feels more dependent on the nurse, buttheir perception of care decreases. Additionally, longer-term care expected by the elderly patients cannot be provided because of high clinical density, high number of patients per nurse, high frequency of patient follow-up, and age-related cognitive changes.

The quality of nursing care is directly related to how the care service is perceived by the service recipients (1,5). Our study identified a moderate positive significant relationship between the scores of the study participants on the NNCCS and the PPNCS(=.391, $p<.01$). A study examining the perception of nursing care and satisfaction levels of surgical patients reported a statistically significant positive relationship between the scores obtained on the nursing care satisfaction scale and the nursing care perception scale ($r=0.665$; $p=0.001$) (1). Akça Doğan et al. reported a statistically positive relationship between the care behaviors perceived by the patients and the satisfaction score (0.591; $p<0.01$) (5). Similarly, studies conducted in surgical

clinicsdetermined that the care satisfaction score increased as the care behaviors perceived by the patients increased (24,25). Our study is in line with the literature. In addition to the individual characteristics of the patients treated in the orthopedics and traumatology service, the support received from the nurse, the respect and courtesy shown by the nurse, access to the nurse in case of need, and unambiguous and satisfactory information have a positive impact on the perception of care and satisfaction.

CONCLUSION

This study was conducted to determine the perception of nursing care and satisfaction levels of orthopedics and traumatology patients. Patients' nursing care satisfaction and care perceptions were positive. Additionally, as their satisfaction level with nursing care increased, their perception of nursing care also increased. While the scores obtained on the NNCCS showed statistical significance depending on education level, place of residence, income status, and type of surgery, the PPNCS scores revealed statistical significance based on place of residence, income status, and age. Future research and strategies should focus on the approaches that could be applied to increase the care behaviors and satisfaction level perceived by patients. It is also recommended that the study should be conducted as a mixed method study with patients who have undergone major orthopedic surgery. In the case of orthopedics and traumatology clinics, the average age of patients is generally high. Therefore, it is recommended that in such cases, care needs of elderly patients should be addressed on priority-for example, providing support related to social life, ensuring mobility, and meeting basic needs in the post-operative period. Additionally, it is crucial that nurses determine these needs from the perspectives of type of surgery and surgical unit, and plan, implement, and evaluate the results of the care required by and provided to individuals.

Conflict of Interest: There is no conflict of interest.

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ORIGINAL ARTICLE

POTENTIALLY INAPPROPRIATE ANTIDEPRESSANT USE IN OLDER PEOPLE COMPARED WITH THE ADULT POPULATION IN TÜRKIYE

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Abstract

Introduction: The prevalence of polypharmacy in older people contributes to potentially inappropriate prescribing, which is evaluated using various criteria. Depressive disorders are serious issues for older adults. In this study, the prescribing rates of potentially inappropriate antidepressants in older age groups in Türkiye were compared with younger age groups.

Materials and Method: All electronic prescriptions including those for antidepressants, in Türkiye, issued by family physicians in 2019 were obtained using the Prescription Information System. Data were analyzed using the Beers Criteria 2019 update.

Results: Of all prescriptions, 0.63% written for older people (65 years and over) were "Potentially Inappropriate Medication" classified antidepressant medications. A significantly lower percentage of "Potentially Inappropriate Medication" classified prescriptions, was observed for older people compared to the rate of total prescriptions (30.6% vs 32%). Paroxetine and amitriptyline had the highest prescription rates for older people. Older people received significantly more "Drugs to be Used With Caution" (35.6% vs. 32%). The top five most frequently prescribed "Drugs to be Used With Caution" for older people were escitalopram, sertraline, duloxetine, citalopram, and mirtazapine.

Conclusions: There was a lower rate of prescribing of "Potentially Inappropriate Medication" for older people (65 years and over) than for younger (between 18-65 years) people. This suggests that family physicians are aware of the potential inappropriateness of specific antidepressants and prescribe them less frequently. Additionally, increased prescribing of "Drugs to be Used With Caution" in elderly can be associated with the limited availability of completely safe drugs in this population.

Keywords: Antidepressive Agents; Geriatrics; Potentially Inappropriate Medication List; Prescriptions.

INTRODUCTION

While 9.7% of the worldwide population was aged 65 and older in 2022, according to United Nations data, it is expected to increase to 11.7% in 2030 and 16.4% in 2050 (1). According to the 2023 statistics of the Turkish Statistical Institute, this age group constitutes 10.2% of the total population in Türkiye and it is estimated to increase to 12.9% in 2030, 16.3% in 2040, 22.6% in 2060, and 25.6% in 2080 (2).

Depression and other psychiatric disorders are serious issues in older people. These disorders can also mimic dementia and other neurological disorders, or simply coexist with them. The incidence of depressive disorders was found to be 12.3% in a meta-analysis that examined older people in nine European nations, whereas the prevalence of a depressed mood ranged from 26% to 40%, in the same study (3).

Several criteria have been devised to improve the safety of medication use for "Potentially Inappropriate Medications" (PIMs) in older people. The Beers Criteria, first published by the American Geriatrics Society (AGS) in 1991 and subsequently revised, were one of the earliest and most widely used sets of criteria (4). The Beers Criteria is a list of prominent PIMs that physicians typically avoid prescribing to older people, in most circumstances, except for specific diseases or conditions.

The main aim of this study is to evaluate the differences in the use of drugs considered potentially inappropriate for the elderly across different age groups. Identifying the differences in the usage of these drugs, especially between the elderly and younger individuals, is important. This evaluation will provide guidance on whether there is sufficient awareness among primary care physicians regarding the use of these drugs in the elderly.

MATERIALS AND METHOD

Research Authorization and Data Collection

This study was conducted in collaboration with the Rational Drug Use Department of the Turkish Medicines and Medical Devices Agency. The study protocol was signed for data sharing with the Ministry of Health (MoH). Before commencing the study, permission was obtained from the Gazi University Clinical Research Ethics Committee. (07.12.2020, Decision no: 818). All prescriptions written electronically by family physicians to patients aged 15 years and older in Türkiye in 2019 and registered in the Prescription Information System (PIS) were accessible. An analysis of antidepressant drugs prescribed electronically by family physicians to patients aged 15 and older was performed on data obtained through the PIS, which is under the administration of the MoH. The evaluation of the "appropriateness" of prescriptions for antidepressant medication in the database was performed using the "Beers Criteria 2019 update" (4). The prescription data utilized in this research pertain to the year 2019; thus, the prescribed medications from that year were assessed based on the 2019 version of the Beers Criteria. Anatomical Therapeutic Chemical Classification (ATC) codes for PIMs were determined, and data were extracted from the prescription pool accordingly.

Study Groups

According to the Beers Criteria, PIMs in older people are grouped under five headings: "1" medications that are potentially inappropriate in most older adults, "2" those that should typically be avoided in older adults with certain conditions, "3" drugs to be used with caution, "4" drug-drug interactions, and "5" drug dose adjustment based on kidney function (4). In this study, only the drugs classified under headings "1" and "3" were analyzed because detailed clinical information for the other headings could not be obtained from the PIS. Accordingly, the study groups were evaluated under two headings: "Potentially Inappropriate Medication (PIM)" and "The Drugs To be Used With Caution (DUC)".

PIM Group: As this study focused only on

antidepressant medications, herafter PIM refers to "Potentially Inappropriate Antidepressant". PIMs include amitriptyline, amoxapine, clomipramine, desipramine, doxepine (> 6 mg/day), imipramine, nortriptyline, paroxetine, protriptyline, and trimipramine. The criteria for defining these drugs as potentially inappropriate were: highly anticholinergic, sedating, and cause orthostatic hypotension; safety profile of low-dose doxepin (≤6 mg/day) comparable to that of placebo. A high level of evidence suggests that these antidepressants should not be prescribed for older people (4). Among the medications listed in this category, only amitriptyline, clomipramine, imipramine, and paroxetine were licensed and available for prescription in Türkiye in 2019.

DUC Group: Antidepressant Drugs to be Used with Caution" (DUC) according to the Beers Criteria are: mirtazapine, Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs), Selective Serotonin Reuptake Inhibitors (SSRIs), and Tricyclic Antidepressants (TCAs). The purpose of establishing this group by the AGS was to identify drugs for which there is some cause for concern but for which the evidence and/or clinical context is still insufficient to merit inclusion in the PIM group. In this study, the medications evaluated in this category (licensed and prescribed in Türkiye) were: citalopram, escitalopram, duloxetine, fluoxetine, fluvoxamine, maprotiline, milnacipran, mirtazapine, sertraline, and venlafaxine. These drugs are reported as "to be used with caution". It should be noted that duloxetine, venlafaxine, and mirtazapine can only be prescribed by family physicians if a "drug report" has previously been issued by a specialist physician.

Evaluation of Prescriptions Containing PIMs

Evaluations were performed based on the ratio of PIM-containing prescriptions to the total number of prescriptions (for all indications) in the study cohort. However, a PIM may have been prescribed to a patient more than once in the year. Additionally, a single prescription may contain more than one PIM. In this scenario, each PIM was analyzed as a separate prescribing event. However, since this study aimed to determine the number of times an antidepressant PIM was prescribed, the PIS provided appropriate data.

In the study, the prescription rates of the PIMs were analyzed by four patient age groups: 15-24 years; 25-64 years; 65-79 years; and 80 years and older. Differences in the prescription rates of PIMs for older people between the older and younger age groups were determined.

Statistics

Descriptive statistics are expressed as frequencies and percentages for categorical variables. Analyses were performed using SPSS software (version 23.0; IBM software). Statistical significance was set at $p < 0.05$. Differences between groups were compared using the chi-square test with the Yates continuity correction method.

RESULTS

General prescribing characteristics

A total of 139,288,644 electronic prescriptions (for all indications) were issued by family physicians to the people aged 15 and older in Türkiye in 2019. Nine percent of these prescriptions were issued to people aged 15-24 years, 59% to people aged 25-64 years, 25% to people aged 65-79 years, and 7% to people aged 80 years and older. However, 20% of the population was aged 15-24 years, 68% was aged 25-64 years, 10% was aged 65-79 years and 2% was aged 80 years and over (Figure 1). The demographic population distribution of the relevant age groups was compared with the distribution of the overall prescription rates across age groups. Prescriptions for people under 65 years were lower

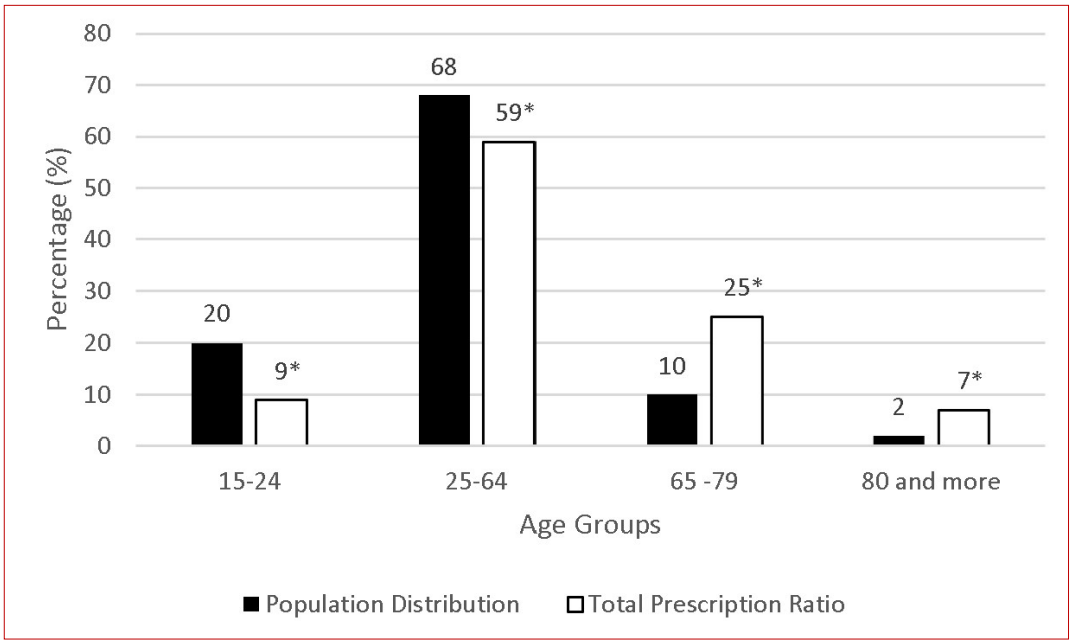


Figure 1. Distribution of total prescription ratios by age groups and comparison with population distribution. The black bars show the population distribution and the white bars show the total prescription ratios issued to individuals in the relevant age group (*p<0.05, different from the population distribution group, Chi-square).

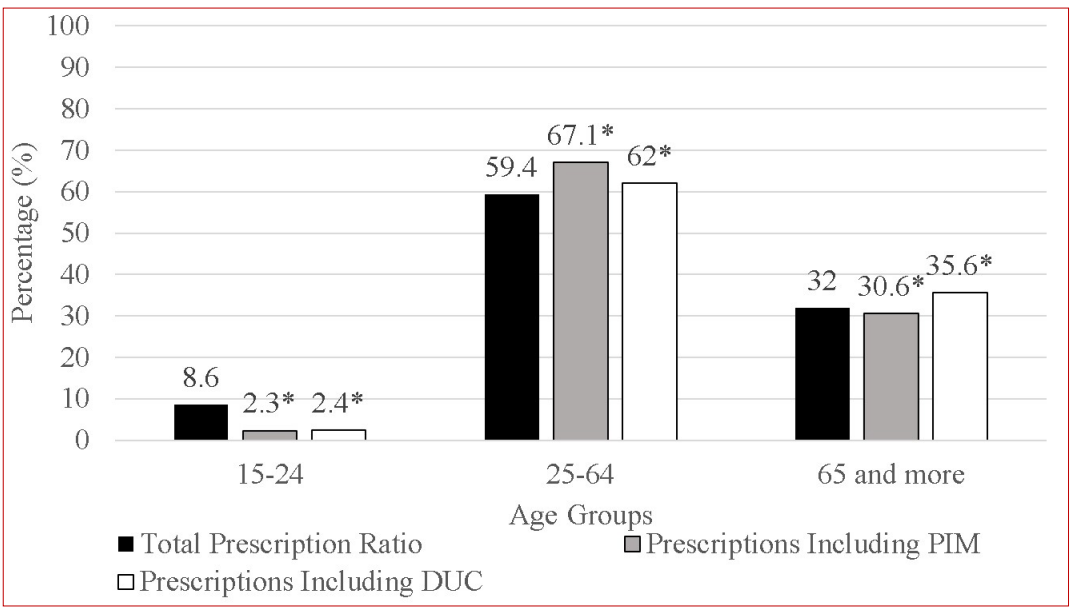


Figure 2. Comparison of the prescription rates of PIM and DUC containing prescriptions by age group with the ratio of total prescriptions by age group. The black bars show the percentage of total prescriptions issued, the gray bars show the percentage of prescriptions including a PIM, and the blank white bars show the percentage of prescriptions including a DUC in the respective age group (*p<0.05, different from total prescriptions, Chi-square). PIM: Potentially Inappropriate Medications, DUC: Drugs Used with Caution

Table 1. Comparison Of The Prescription Rates Of PIM And DUC Containing Prescriptions By Age Group With The Ratio Of Total Prescriptions By Age Group

	15-24	25-64	65 and more	Total	p-value
Total presccriptions ratio	11.921.951 (8.6%)	82.745.090 (59.4%)	44.621.603 (32%)	139.288.644	<0.05
Prescriptions Including PIM	20.788 (2.3%)*	615.427 (67.1%)*	281.128 (30.6%)*	917.343	<0.05
Prescriptions Including DUC	118.839 (2.4%)*	3.070.017 (62%)*	1.762.784 (35.6%)*	4.951.640	<0.05

** p<0.05; different from total prescriptions ratio, chi-square*

PIM: Potentially Inappropriate Medications, DUC: Drugs Used with Caution

and prescriptions for people 65 years and older were significantly higher than prescriptions for the overall cohort (p<0.05, different from the population distribution group, Chi-square).

PIMs

There were 281,128 PIM-containing prescription for people 65 and older. Of all prescriptions (44.621.603), 0.63% prescriptions written for older people were PIM-classified antidepressant medications. The prescription rates of these drugs, which are not recommended for use in older people, were 0.17% (20.788 out of 11.921.951 prescriptions) for those in the 15-24 years group and 0.75% for those in the 25-64 years group (615.427 out of 82.745.090 prescriptions). When the distribution of "PIM" group prescriptions and total prescriptions by age groups were compared, the 65 years and older group were presecribed a significantly lower percentage of PIMs (30.6% vs. 32%) (Figure 2, Table 1).

Table 2. Prescription Rates of PIM Group Drugs. (A) Number and Rates of Prescription of PIM Group Drugs for Older People, (B) Prescription Rates of PIM Group Drugs by Age Group

(A) Number and Rates of Prescription of PIM Group Drugs for Older People					
Drugs	Prescription number		Percentage (%)		
Paroxetine	178.831		63.6		
Amitriptyline	83.754		29.8		
Clomipramine	15.891		5.7		
Imipramine	4.200		1.5		
Total	281.128		100		
(B) Prescription Rates of PIM Group Drugs by Age Group					
Drugs	15-24 (%)	25-64 (%)	65 and older (%)	Total (%)	P
Total	8.6	59.4	32	100	
Paroxetine	2.0*	68.0*	30*	100	<0.05
Amitriptyline	1.8*	61.9*	36.3*	100	<0.05
Clomipramine	4.6*	76.8*	18.6*	100	<0.05
Imipramine	7.4*	56.9*	35.7*	100	<0.05

** p<0.05; different from total prescriptions ratio, chi-square*

PIM: Potentially Inappropriate Medications

Paroxetine (63.6%) and amitriptyline (29.8%) had the highest prescription rates among the four PIMs (amitriptyline, clomipramine, imipramine, and paroxetine) in the older age group (Table 2A). Amitriptyline (36.3%) and imipramine (35.7%) were more frequently prescribed for the 65 years and older group compared to the total prescription rate (32%). Amitriptyline (61.9%), clomipramine (76.8%), and paroxetine (68%) were prescribed significantly more frequently for the 25-64 years group compared to the overall prescription rate (59.4%). All drugs were prescribed less frequently in the 15–24 years group compared to the overall prescription rate (Table 2B).

Medications prescribed to the older age groups were internally re-evaluated. The prescription rates of amitriptyline (25.1%) and imipramine (25.2%) for the 80 years and older group were significantly higher than the total prescription rate (22.2%) for this group. In the 65-79 years group, the prescription rates of clomipramine (85.6%) and paroxetine (80.5%) were higher compared to the total prescription rate (77.8%) for this group (Figure 3).

DUC

For all prescriptions issued to people aged 65 years and older, DUCs accounted for 3.95%. The prescription rates of DUCs were compared with the overall prescription rates within each age group. Older patients received significantly more DUC prescriptions than the total prescription rate (35.6% vs. 32%). Additionally, it was higher in the 24-64 years group (62% vs. 59.4%); however, it was lower in the 15–24 year group (2.4% vs. 8.6%) (Figure 2, Table 1).

The top five most frequently prescribed DUCs for older people were: escitalopram (40.2%), sertraline (25.7%), duloxetine (11%), citalopram (7.5%), and mirtazapine (7.4%) (Table 3A). When the percentage distributions of prescriptions containing these drugs among age groups were compared with the percentages of all prescriptions for the relevant age groups, it was observed that the prescription rates of escitalopram (26.3%), sertraline (24.8%), citalopram (26.4%), and mirtazapine (33.6%) for those in the 80 years and older group were higher than the total prescription rate (22.2%).

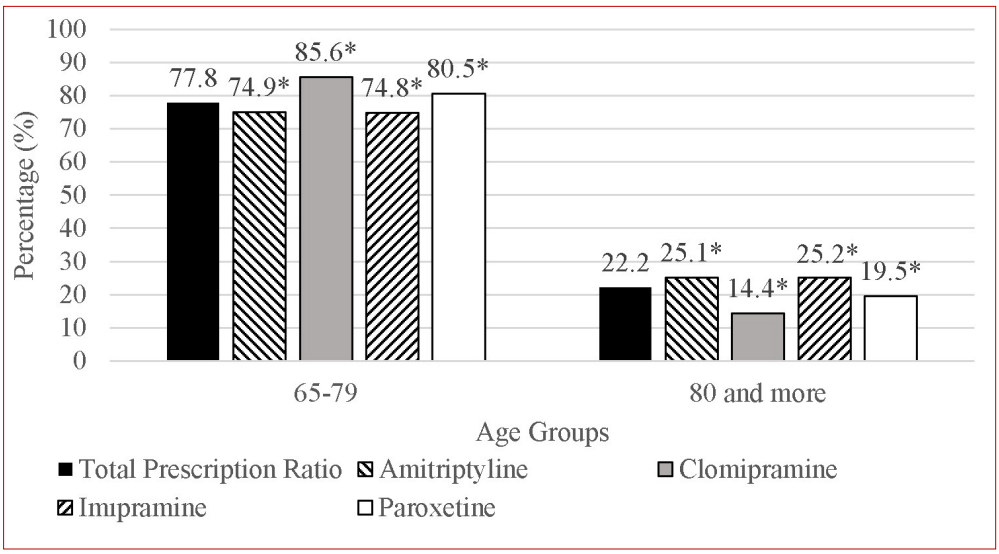


Figure 3. Distribution of prescriptions, including PIM in the older age group and comparison with the total prescription ratio. (*p<0.05; different from total prescription ratio, Chi-square) PIM: Potentially Inappropriate Medication

However, in the 65-79 years group, this pattern was reversed ($p<0.05$; chi-square). The prescription rates of DUCs based on each age group showed that the prescription rates of DUC for the 65 years and older group were higher for escitalopram (42.8%), maprotiline (42.2%), mirtazapine (46.5%), sertraline (37.8%), and citalopram (47.7%) than for the total prescription rate (32%). In contrast, in the 25-64 years group, they were lower than the total prescription rate. Moreover, in the 25-64 years group, the prescription rates for duloxetine (69.8%), fluoxetine (77.6%), fluvoxamine (73.3%), milnacipran (73.3%), and venlafaxine (77.6%) were higher than the total prescription rate (59.4%) (Table 3B).

Prescriptions containing DUCs were evaluated in older age groups. Prescriptions containing DUCs were prescribed to 75.8% of the 65-79 years group, and 24.2% of the 80 years and older group.

Table 3. Prescription Rates of Drugs to be Used With Caution. (A) Number and Rates of Prescription of Drugs to be Used With Caution fro Older People, (B) Prescription Rates of Drugs to be Used With Caution by Age Group

(A) Number and Rates of Prescription of Drugs to be Used With Caution for Older People					
Drugs	Prescription Number			Percentage	
Escitalopram	709.027			40.2	
Sertraline	453.383			25.7	
Duloxetine	201.651			11.4	
Citalopram	132.768			7.5	
Mirtazapine	130.929			7.4	
Venlafaxine	93.194			5.3	
Fluoxetine	81.695			4.6	
Fluvoxamine	5.936			0.3	
Maprotiline	3.446			0.2	
Milnacipran	3			0.001	
All Drugs	1.762.784			100	
(B) Prescription Rates of Drugs to be Used With Caution by Age Group					
	15-24 (%)	25-64 (%)	65 and (%)	Total	p
Total	8.6	59.4	32	100	<0.05
Essitalopram	1.4*	55.8*	42.8*	100	<0.05
Sertraline	3.6*	58.6*	37.8*	100	<0.05
Duloxetine	0.7*	69.8*	29.5*	100	<0.05
Sitalopram	1.0*	51.3*	47.7*	100	<0.05
Mirtazapine	2.4*	51.1*	46.5*	100	<0.05
Venlafaxine	1.8*	77.6*	20.6*	100	<0.05
Fluoxetine	6.3*	77.6*	16.1*	100	<0.05
Fluvoxamine	5.5*	73.3*	21.2*	100	<0.05
Maprotiline	1.6*	56.2*	42.2*	100	<0.05
Milnacipran	6.7*	73.3*	20.0*	100	<0.05

** p<0.05; different from total prescriptions ratio, chi-square*

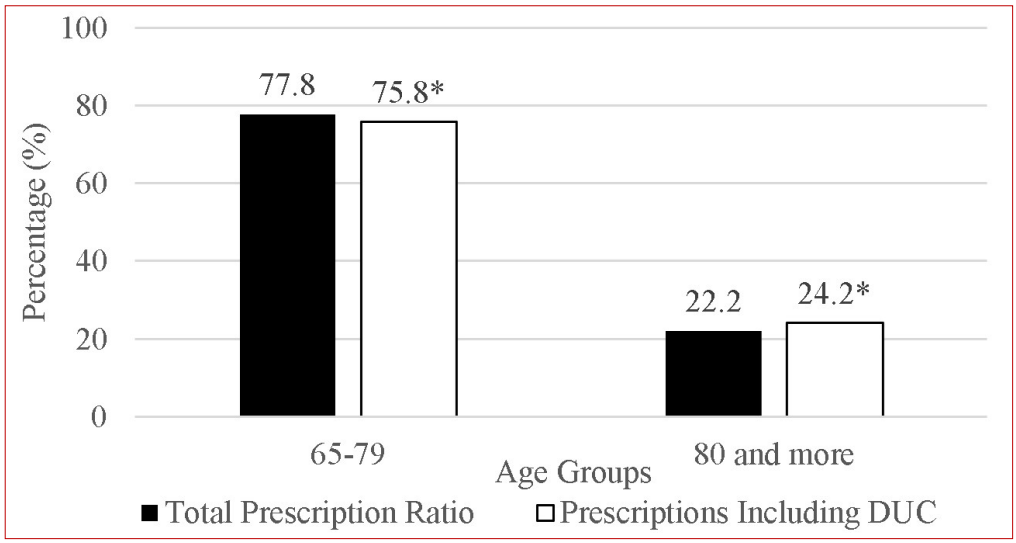


Figure 4. Distribution of prescriptions, including DUCs by age group and comparison with total prescription ratios. The black bars show the total prescription ratio, and the blank white bars show the percentage of prescriptions containing a DUC issued to individuals in the relevant age group (*p<0.05; different from the total prescription group, Chi-square). DUC: Drugs Used with Caution.

Compared with the total prescription rate, there was a lower percentage of prescriptions containing DUCs in the 65-79 years group (75.8% vs 77.8%) and a higher percentage in the 80 years and older group (24.2% vs 22.2%) (Figure 4).

DISCUSSION

The findings of this study show the prevalence of the use of PIMs among people aged 65 years and older. Furthermore, comparative data on the use of these drugs across various age groups have been presented. When interpreting these results, the following approach should be taken into account. The percentage-based data obtained in our results have been compared with the overall prescribing rates. The results demonstrated that the PIM prescription rate for older people was lower than the overall prescription rate. This suggests that family physicians are aware of the potential inappropriateness of specific antidepressants and prescribe them less frequently.

Tseregounis et al. demonstrated that prescription rates increased with patient age (5). According to the findings of our study, family doctors in Türkiye tended to write more prescriptions for patients aged 65 years and older relative to their percentage of the population. This finding is consistent with the literature and holds true even when people 80 years and older are considered separately.

A study highlighted that the prevalence of inappropriate medication prescriptions among general practitioners was initially 37.3%, which improved to 23.6% after training on the Beers criteria, demonstrating the potential for education to enhance compliance (6). Despite this improvement, the overall rates suggest that a substantial proportion of prescriptions remain inappropriate, indicating a need for ongoing education and adherence to the criteria.

In our study, the rate of PIMs prescriptions according to the Beers Criteria was 0.63%. In a 2008 study conducted in Brazil, PIMs prescription rates according to the Beers Criteria were 0.9% among

5,732 individuals aged 60 years and older (7). In another study conducted in France between 2008 and 2010 involving 2,350 individuals aged 70 years and older, the prescription rate for PIMs according to the Beers Criteria was 5%. (8). When these studies were evaluated together, the prescription rate for PIMs for older people ranged from 0.9% to 5%, which is higher than the 0.63% reported in the present study.This study presents, for the first time, on a national scale for the Turkish population, the prescription rates of PIMs by family physicians. In addition, a comparison of data within different age groups of the population was performed. The results demonstrated that the PIM prescription rate for older people was lower than the overall prescription rate. Furthermore, as age increases (particularly older than 80 years), the rate of PIM prescriptions continues to decrease. This suggests that family physicians are aware of the possibility of prescribing PIMs for older people. Moreover, considering the comparison with earlier studies, the lower rate is encouraging.

However, that amitriptyline, clomipramine, imipramine, and paroxetine, which fall under the PIM category, are still being prescribed to individuals aged 65 years and older is of concern. This could be due to the drugs being included in the depression treatment guidelines in Türkiye and worldwide, as well as the possibility that they are used rarely due to inadequate responses with safer alternatives, except for paroxetine, among other SSRIs (9).

In this study, the use of drugs classified as PIMs for those 65 years and older by the Beers Criteria was analyzed among people between the ages of 15 and 65 years. When compared to the percentage of total prescriptions, the use of these drugs was significantly lower in the 15–24 years group and significantly greater in the 25–64 years group. The lower prevalence of depression and the presence of special warnings for all antidepressant medications in this age group may be responsible for the reduced use of these drugs in the 15–24 years group (10, 11).

Paroxetine, is a PIM that is most frequently prescribed to older people (63.6%), followed by amitriptyline (29.8%). As a member of the SSRI class of antidepressants, paroxetine is used to treat depression. However, SSRIs are frequently used for conditions other than major depression, including Post-Traumatic Stress Disorder, Obsessive-Compulsive Disorder (OCD), generalized anxiety disorder, and social anxiety disorder (11). Furthermore, SSRIs are not only recommended as first-line drugs in national and international treatment guidelines but are also considered to have a safer adverse effect profile compared to other medications (12). This explains the continuation of paroxetine use for older people, despite its considerable anticholinergic effects.

In this study, prescriptions for drugs such as clomipramine and imipramine were prescribed to people aged 65 years and older at relatively low rates (5.7% and 1.5%, respectively). Apart from its off-label use for stress incontinence in the older age group, imipramine is not widely used in this demographic. It is mostly used to treat nocturnal enuresis in young people (10). Clomipramine, on the other hand, is primarily used in the treatment of OCD, and its prevalence in the 25-64 years group is higher than that in the older age group (13). Additionally, while the prevalence of OCD in older people is approximately 0.6%, the prevalence of major depressive disorders is high, ranging from 28.4% (14, 15). Therefore, it is not surprising that amitriptyline, which is FDA approved only for major depressive disorders, was the second most frequently used PIM after paroxetine in this study. Amitriptyline is known to be used off-label in diseases such as insomnia, migraine prevention and ADHD (16). However, family physicians may avoid using it in this way. In the United States, it has been shown that among the PIMs prescribed to those aged 65 years and older, paroxetine (68%) and amitriptyline (18%) are similar to the findings in this study (17).

The potential to trigger or worsen Syndrome of Inappropriate Antidiuretic Hormone (SIADH)



necessitates a careful assessment of the use of antidepressant medications in older people. If these medications are to be used, it has been advised that close monitoring of the serum sodium level be performed before initiating therapy or adjusting the dosage.

The prevalence of SSRI-induced hyponatremia in patients with a history of depression appears to be significant, particularly among older adults. A study reported that out of 21 patients treated with SSRIs, 9 developed hyponatremia within an average of 2.5 weeks, with a mean sodium level of 126 mEq/L, indicating a notable risk associated with these medications (18). Additionally, a retrospective cohort study found a significant decrease in serum sodium levels (mean change of -1.00 mmol/L) within 30 days of initiating SSRIs (19).

In this study, DUC-containing prescriptions constituted 3.95% of all prescriptions for older people. These drugs are prescribed more frequently to older people relative to the population size. However, in the 15-24 years group, they were prescribed less frequently relative to the population size. The drugs that were prescribed more frequently to older people include escitalopram, citalopram, maprotiline, and mirtazapine. The preference for escitalopram and citalopram may be due to their lower drug interactions (20). Nevertheless, the QT-prolonging deleterious effects of escitalopram have garnered significant attention, particularly in recent literature (21). In addition, maprotiline, a TCA, should be used with caution for older people due to its anticholinergic effects (22). Despite the possible adverse effects, there has been no decrease in the prescription rates of these medications for older people. However, from another perspective, it is also a reality that there is not a definitive "gold standard" antidepressant that can be safely used for older people. The choice of medication for older people should be evaluated specifically based on the patient and drug selection (23). Therefore, owing to the limited availability of alternative and safer drugs, physicians prescribing these medications at higher rates than expected based on their knowledge of the literature of these indications should not be negatively evaluated.

In this study, among the drugs that require cautious use for older people, the prescription rates of duloxetine, fluoxetine, fluvoxamine, milnacipran, and venlafaxine were lower than those in the 25-64 years group. Venlafaxine may not be the drug of choice for older people because of its potential to increase blood pressure and its adverse arrhythmic effects (24). Duloxetine does not have a significantly higher efficacy than SSRIs but carries a higher risk of severe hyponatremia (25). Fluoxetine and fluvoxamine are known among SSRIs because of their inhibitory effects on cytochrome P450 enzymes, which lead to more frequent drug interactions. Therefore, they may not be preferred for older people, where polypharmacy is a common issue (20). Although milnacipran is more tolerable than TCAs, it does not have a significant advantage over SSRIs in terms of efficacy (26). All of these drugs mentioned, evaluated under the "DUC" category for older people, are not considered inappropriate for the 25-64 years group. In line with this information, our data indicate that these drugs are prescribed more frequently for younger people. Furthermore, considering the indications, duloxetine is used not only for major depressive disorders but also for generalized anxiety disorder and treatment of fibromyalgia. These conditions are less frequently encountered with increasing age (27).

Fluoxetine is commonly used in the treatment of obsessive-compulsive disorders and its prevalence decreases with age. (28).

This study is the first nationwide study conducted in Türkiye that evaluated the prescription of PIMs for older people issued by family physicians. The study also compared the rate of medication use with that of younger people based on the Beers criteria. This study observed a remarkably low rate

of prescription of antidepressant PIMs for older people by family physicians. Furthermore, the use of these medications among older people was lower than that among younger people. This suggests that family physicians are aware of the potential inappropriateness of specific antidepressants for older people and prescribe them less frequently.

LIMITATIONS

As prescription data were obtained from the PIS, only the number of medication prescriptions could be accessed, and detailed clinical information was not available. This study exclusively evaluated prescriptions from primary care physicians, and access to prescriptions from healthcare institutions in secondary and tertiary care settings was not possible. Another significant limitation is that, in Turkiye, family physicians can prescribe duloxetine, milnacipran, mirtazapine, and venlafaxine only to patients with the approval of specialist physicians.

Therefore, the prescription of these medications by family physicians should only be considered as represcriptions because of the requirement for a specialist physician report.

Conflict of Interests: The authors declare no conflicts of interest.

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ORIGINAL ARTICLE

PREDICTORS OF OUTCOMES IN ELDERLY ACUTE STROKE PATIENTS UNDERGOING ENDOVASCULAR THROMBECTOMY

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Abstract

Introduction: The aging population is one of the main reasons for the increase in stroke cases.The aim of this study was to evaluate the predictors of 3-month outcomes in patients aged ≥65 years who underwent mechanical thrombectomy for acute ischemic stroke and compare patients aged 65–79 years with those aged ≥80 years in terms of demographic characteristics, workflow, functional outcomes, and complication rates.

Materials and Method: This retrospective cohort study included 169 consecutive patients aged ≥65 years who underwent mechanical thrombectomy for acute ischemic stroke due to large vessel occlusion between April 2020 and May 2023.

Results: Recanalization was successful for 148 (87.57%) patients.According to multivariable logistic regression analysis results, low (≤9) Alberta Stroke Program Early Computed Tomography score (odds ratio: 4.217, 95% confidence interval: 1.209–14.715, and p=0.024), high National Institutes of Health Stroke Scale score at 24th hour (odds ratio: 1.192, 95% confidence interval: 1.087–1.306, and p<0.001), high Acute Physiology and Chronic Health Evaluation score (odds ratio: 1.127, 95% confidence interval: 1.016–1.250, and p=0.023), and intubation need (odds ratio: 15.055, 95% confidence interval: 2.087–108.612, and p=0.007) were independent predictors of poor outcome.

Conclusion: The lack of significant differences in workflow, functional outcomes, and complications among patients >80 years of age indicates that MT is effective in this age group. Considering the aging population, identifying the predictors of 3-month outcomes after mechanical thrombectomy will help predict outcomes, better identify elderly patients who may benefit from the procedure, and guide treatment decisions.

Keywords: Aged; Ischemic Stroke; Endovascular Procedures; Thrombectomy.



INTRODUCTION

With the advancement of healthcare services and technology, the average human lifespan is increasing, which is leading to a rapid rise in the proportion of elderly individuals within the population. Population aging is one of the main reasons for the global increase in the number of stroke cases. According to the World Health Organization, stroke is the second leading cause of death worldwide, with 15 million people suffering from stroke each year. Of these, 5 million die, and 5 million are permanently disabled (1), which creates a burden on families and communities. Approximately 33% of all acute ischemic strokes (AISs) occur in patients aged ≥80 years. According to the projections of the Turkish Statistical Institute, the estimated proportion of elderly people in the total population in Turkey will be 12.9% in 2030, 16.3% in 2040, 22.6% in 2060, and 25.6% in 2080 (2).

The efficacy of mechanical thrombectomy (MT) in AIS due to large vessel occlusion has been demonstrated in selected patients in randomized controlled trials (RCTs) (3). However, the patients in these RCTs were relatively young and maintained good pre-stroke activities of daily living (ADL). The current guidelines provided by the American Heart Association/American Stroke Association indicate that although there is no age limit, the benefits of MT are uncertain in patients with a pre-stroke modified Rankin score (mRS) >1 (4). Conversely, some patients with large vessel occlusion have poor pre-stroke conditions, such as advanced age and poor ADL in the real world(5). In a rapidly aging society, the number of elderly patients undergoing MT is increasing significantly, yet they have been excluded from recent RCTs. It therefore remains unclear whether these patients may benefit from MT for AIS. The availability of data on the incidence and prognosis of stroke in the elderly and information on resource utilization is important for health services planning and the development of treatment strategies.

In this study, we aimed to evaluate the predictors of the 3-month outcomes in patients aged ≥65 years who underwent MT for AIS and to compare the patients aged 65–79 years with those aged ≥80 years in terms of demographic characteristics, workflow, functional outcomes, and complication rates.

MATERIALS AND METHOD

A total of 169 consecutive patients aged ≥65 years who underwent MT for AIS caused by large vessel occlusion in our tertiary center between April 2020 and May 2023 were included in the study. Since January 2020, our hospital has had a comprehensive stroke center. The patient data were analyzed retrospectively using prospectively maintained AIS records. The data of the patients aged 65–79 years and ≥80 years who underwent MT were compared in terms of workflow, functional outcomes, and complication rates. Additionally, the predictors of the 3-month outcomes in the patients aged ≥65 years were evaluated. We assessed the patients' medical histories with respect to heart disease, diabetes mellitus, hypertension, hyperlipidemia, cerebrovascular disease, transient ischemic attack, smoking, and alcohol use. To determine the onset of symptoms, we used the time when the symptoms began or when the patient was last observed as healthy.

Recanalization after thrombectomy was evaluated according to the modified thrombolysis in cerebral infarction (mTICI) score (6), and the scores 2b, 2c, and 3 were considered good outcomes. The severity of ischemic stroke was assessed using the National Institutes of Health Stroke Scale (NIHSS) (7). Clinical outcomes were evaluated using the mRS (8).

An mRS score of ≤2 at 3 months was considered a good clinical outcome and a score of 3–6 a poor clinical outcome. The etiological classification of ischemic stroke was determined based on the Trial of Org 10172 in Acute Stroke (TOAST) criteria (9). Symptomatic intracerebral hemorrhage (sICH) was defined according to the European Cooperative Acute Stroke 3 (10).

The occlusion site was classified as anterior or posterior circulation based on neck–brain computed tomography angiography (CTA), neck–brain magnetic resonance angiography (MRA) imaging, or digital subtraction angiography. Each MT procedure was undertaken based on the joint decision-making of neurologists and neurointerventional radiology specialists and was performed using a stent retriever, thrombo-aspiration, or a combination of both. This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Bursa City Hospital (Decision date: 07.02.2024, decision no: 2024-1/1).

Statistical Analysis

All analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov–Smirnov test was used to determine whether the variables were normally distributed. The descriptive statistics were presented using the median (25th percentile–75th percentile) for the continuous variables, as these were not normally distributed, and frequency (percentage) for the categorical variables. The between-groups analysis of the continuous variables was performed using the Mann–Whitney U test, while the chi-square test, Fisher's exact test, or Fisher–Freeman–Halton test was used for the between-groups analysis of the categorical variables. Logistic regression analyses were performed to determine the independent predictors of a poor outcome in the 3rd month. The variables were analyzed using univariable logistic regression analysis, and statistically significant variables were included in the multivariable logistic regression analysis. Two-tailed p-values less than 0.05 were considered statistically significant.

RESULTS

We included 169 patients (68 men and 101 women) in this study. While their median age was 76 years (interquartile range 70–81 years, range 65–95 years), 114 (67.46%) patients were aged between 65 and 79 years, and 55 (32.54%) patients were 80 years or older. We found no significant differences between the age groups in terms of sex, comorbidities, smoking status, alcohol use, first applied hospital, etiology, Alberta stroke program early CT (ASPECT) scores, affected location, and diffusion MR percentages.

The NIHSS score at the 24th hour was significantly higher in the 80 years and older group than among younger cohort. We found no significant differences between the age groups in terms of the NIHSS scores on admission, changes in NIHSS scores, symptom-to-door time, door-to-neurologist time, door-to-CT time, door-to-CT angiography time, door-to-diffusion MR time, and door-to-groin time.

Recanalization was successful for 148 (87.57%) patients. In addition, 52 (31.90%) patients had hemorrhage, 15 (9.20%) were symptomatic, 37 (22.70%) were asymptomatic, and 56 (33.94%) patients needed intubation/mechanical ventilation. With respect to outcomes, 47 (28.48%) patients had good outcomes at discharge, while 59 (34.91%) patients had good outcomes in the 3rd month. In contrast, 41 (24.85%) patients were exitus in hospital and 55 (32.54%) in the 3rd month. We found no significant differences between the age groups in terms of TICI classification, successful recanalization, acute physiology and chronic health evaluation (APACHE) scores, intubation, duration of intubation, mRS at discharge, outcomes at discharge, mortality in hospital, mRS in the 3rd month, outcomes in the 3rd month, and mortality in the 3rd month (Table 1).

In the 3rd month, 59 (34.91%) patients had good outcomes (mRS ≤2). According to the results of the multivariable logistic regression analysis, a low (≤9) ASPECT score (OR: 4.217, 95% CI: 1.209–14.715, p=0.024), high NIHSS score at the 24th hour (OR: 1.192, 95% CI: 1.087–1.306, p<0.001), high APACHE score (OR: 1.127, 95% CI: 1.016–1.250, p=0.023), and the need for intubation (OR: 15.055, 95% CI: 2.087–108.612, p=0.007) were independent predictors of a poor outcome (Table 2).



Table 1. Summary of variables with regard to groups

	All patients (n=169)	Age groups		p
		65 - 79 (n=114)	80 or above (n=55)	
Age (n=169)	76 (70 - 81)	72 (68 - 77)	83 (81 - 86)	<0.001
Sex (n=169)				
Male	68 (40.24%)	51 (44.74%)	17 (30.91%)	0.121
Female	101 (59.76%)	63 (55.26%)	38 (69.09%)	
Comorbidities (n=169)				
Heart diseases	105 (62.13%)	75 (65.79%)	30 (54.55%)	0.158
Diabetes mellitus	59 (34.91%)	44 (38.60%)	15 (27.27%)	0.202
Prior cerebrovascular disease	34 (20.12%)	27 (23.68%)	7 (12.73%)	0.144
Prior transient ischemic attack	5 (2.96%)	5 (4.39%)	0 (0.00%)	0.175
Hypertension	130 (76.92%)	88 (77.19%)	42 (76.36%)	1.000
Hyperlipidemia	21 (12.43%)	17 (14.91%)	4 (7.27%)	0.245
Smoking (n=169)	15 (8.88%)	12 (10.53%)	3 (5.45%)	0.390
Alcohol use (n=169)	2 (1.18%)	2 (1.75%)	0 (0.00%)	1.000
Applied hospital (n=169)				
Without stroke center	58 (34.32%)	44 (38.60%)	14 (25.45%)	0.130
With stroke center	111 (65.68%)	70 (61.40%)	41 (74.55%)	
Etiology (n=165)				
Large artery atherosclerosis	46 (27.88%)	35 (31.53%)	11 (20.37%)	0.198
Cardioembolism	74 (44.85%)	49 (44.14%)	25 (46.30%)	
Other determined reasons	1 (0.61%)	0 (0.00%)	1 (1.85%)	
Undetermined reasons	44 (26.67%)	27 (24.32%)	17 (31.48%)	
ASPECT (n=169)	10 (10 - 10)	10 (10 - 10)	10 (9 - 10)	0.065
≤9	36 (21.30%)	19 (16.67%)	17 (30.91%)	0.055
10	133 (78.70%)	95 (83.33%)	38 (69.09%)	
Affected location (n=169)				
Posterior	16 (9.47%)	11 (9.65%)	5 (9.09%)	1.000
Anterior	153 (90.53%)	103 (90.35%)	50 (90.91%)	
Diffusion MR (n=169)	113 (66.86%)	81 (71.05%)	32 (58.18%)	0.136
NIHSS				
Admission (n=169)	15 (10 - 18)	14 (10 - 18)	16 (11 - 19)	0.193
24th hour (n=162)	11 (5 - 18)	9.5 (4 - 16)	13.5 (8 - 19.5)	**0.027**
Change (n=162)	-2 (-6 - 0)	-2 (-8 - 0)	-1 (-4 - 0)	0.129
Symptom to door time, min (n=169)	120 (58 - 210)	120 (58 - 200)	120 (53 - 238)	0.924
Door to neurologist time, min (n=169)	20 (10 - 45)	20 (10 - 45)	24 (9 - 45)	0.972
Door to CT time, min (n=146)	19 (11 - 27)	18 (10 - 26)	21 (13 - 27)	0.218
Door to CT angiography time, min (n=153)	29 (19 - 59)	30 (18 - 60)	27 (20 - 46)	0.872
Door to diffusion MR time, min (n=92)	32 (17.5 - 50)	34 (17.5 - 51.5)	28 (16 - 38.5)	0.225
Door to groin time, min (n=169)	100 (70 - 148)	99 (67 - 150)	100 (71 - 148)	0.633

Table 1. *continued...*

TICI (n=169)				
TICI 0	11 (6.51%)	8 (7.02%)	3 (5.45%)	0.531
TICI 1	8 (4.73%)	4 (3.51%)	4 (7.27%)	
TICI 2A	2 (1.18%)	1 (0.88%)	1 (1.82%)	
TICI 2B	30 (17.75%)	21 (18.42%)	9 (16.36%)	
TICI 2C	5 (2.96%)	5 (4.39%)	0 (0.00%)	
TICI 3	113 (66.86%)	75 (65.79%)	38 (69.09%)	
Successful recanalization, TICI≥2b (n=169)	148 (87.57%)	101 (88.60%)	47 (85.45%)	0.740
Hemorrhage (n=163)	52 (31.90%)	37 (33.64%)	15 (28.30%)	0.613
Symptomatic	15 (9.20%)	10 (9.09%)	5 (9.43%)	0.718
Asymptomatic	37 (22.70%)	27 (24.55%)	10 (18.87%)	
APACHE score (n=164)	11 (7 - 15)	11 (7 - 15)	11 (6 - 15)	0.954
Intubation (n=165)	56 (33.94%)	35 (31.53%)	21 (38.89%)	0.446
Duration of intubation, days (n=165)	0 (0 - 4)	0 (0 - 3)	0 (0 - 6)	0.320
mRS, Discharge (n=165)	4 (2 - 5)	4 (1 - 5)	5 (3 - 6)	0.119
Good outcome, mRS≤2, Discharge (n=165)	47 (28.48%)	35 (31.53%)	12 (22.22%)	0.289
Mortality, in hospital (n=165)	41 (24.85%)	23 (20.72%)	18 (33.33%)	0.117
mRS, 3rd month (n=169)	4 (1 - 6)	4 (1 - 6)	5 (2 - 6)	0.118
Good outcome, mRS≤2, 3rd month (n=169)	59 (34.91%)	42 (36.84%)	17 (30.91%)	0.558
Mortality, 3rd month (n=169)	55 (32.54%)	32 (28.07%)	23 (41.82%)	0.107

Descriptive statistics were presented by using median (25th percentile - 75th percentile) for continuous variables due to non-normality of distribution and frequency (percentage) for categorical variables. NIHSS National Institutes of Health Stroke Scale, mTICI modified Thrombolysis in Cerebral Infarction. ASPECTS Alberta Stroke Program Early CT Score. APACHE score Acute Physiology And Chronic Health Evaluation mRS modified Rankin Scale.

Table 2. Odds ratios for bad outcome at 3rd month (MRS>2), logistic regression analysis results

	Univariable		Multivariable	
	OR (95% CI)	**p**	**OR (95% CI)**	**p**
Age, ≥80	1.304 (0.656 - 2.592)	0.449		
Sex, Female	0.923 (0.483 - 1.762)	0.808		
Heart diseases	0.686 (0.353 - 1.335)	0.267		
Diabetes mellitus	1.526 (0.771 - 3.019)	0.225		
Prior cerebrovascular disease	3.016 (1.170 - 7.776)	**0.022**	3.474 (0.850 - 14.193)	0.083
Prior transient ischemic attack	0.799 (0.130 - 4.921)	0.809		
Hypertension	1.619 (0.779 - 3.366)	0.197		
Hyperlipidemia	1.395 (0.511 - 3.809)	0.516		
Smoking	1.080 (0.351 - 3.321)	0.893		
Alcohol use	882527923.409 (0 - N/A)	0.999		
Applied hospital, Without stroke center	1.029 (0.528 - 2.005)	0.933		
Etiology (1)				
Large artery atherosclerosis	1.143 (0.473 - 2.762)	0.767		
Cardioembolism	0.733 (0.338 - 1.591)	0.432		



Table 2. *continued...*

ASPECT, ≤9	2.660 (1.086 - 6.514)	**0.032**	4.217 (1.209 - 14.715)	**0.024**
Affected location, Posterior	2.502 (0.683 - 9.159)	0.166		
Diffusion MR	1.184 (0.608 - 2.307)	0.619		
NIHSS at admission	1.124 (1.054 - 1.198)	**<0.001**	0.980 (0.885 - 1.085)	0.699
NIHSS at 24th hour	1.255 (1.167 - 1.350)	**<0.001**	1.192 (1.087 - 1.306)	**<0.001**
Symptom to door time, min	1.001 (0.999 - 1.004)	0.234		
Door to neurologist time, min	1.000 (0.993 - 1.006)	0.906		
Door to CT time, min	0.997 (0.977 - 1.018)	0.810		
Door to CT angiography time, min	0.995 (0.988 - 1.002)	0.196		
Door to diffusion MR time, min	0.993 (0.982 - 1.003)	0.167		
Door to groin time, min	1.002 (0.997 - 1.008)	0.447		
Recanalization, Unsuccessful	3.652 (1.029 - 12.961)	**0.045**	3.418 (0.603 - 19.379)	0.165
Hemorrhage (2)				
Symptomatic	11.065 (1.406 - 87.078)	**0.022**	6.790 (0.569 - 80.996)	0.130
Asymptomatic	2.459 (1.062 - 5.691)	**0.036**	2.343 (0.753 - 7.288)	0.142
APACHE score	1.215 (1.120 - 1.317)	**<0.001**	1.127 (1.016 - 1.250)	**0.023**
Intubation	18.667 (5.498 - 63.374)	**<0.001**	15.055 (2.087 - 108.612)	**0.007**
Duration of intubation, days	1.119 (1.032 - 1.214)	**0.006**	0.959 (0.898 - 1.024)	0.206
Nagelkerke R2	-		0.607	

OR: Odds ratio, CI: Confidence interval, (1) Reference category is undetermined reasons, (2) Reference category is no hemorrhage

DISCUSSION

In the present study, no significant differences were observed with regard to the demographic characteristics, workflow, functional outcomes, and complication rates between the patients aged 65–79 years and those ≥80 years who presented to the emergency department and underwent MT for AIS. The results showed that MT was effective in the patients aged >65 years. A low (≤9) ASPECT score, high APACHE score, high NIHSS score at 24 hours, and the need for intubation were independent predictors of a poor outcome.

Many studies have focused on the efficacy and safety of MT in elderly patients with AIS. Previous clinical studies have generally focused on the age groups <80 and ≥80 years and have reported that in patients aged ≥80 years who underwent MT for AIS, favorable clinical outcomes were less frequent and mortality rates were higher compared to younger patients.

A systematic review conducted from 2014 to 2019, which comprised 16 studies and 3954 patients, reported that in the patients aged ≥80 years who underwent MT, the functional independence rates were lower and the mortality rates higher compared to the patients aged <80 years (11). In another systematic review that included 26 studies and 9492 patients, the functional independence rates were lower and mortality rates higher in the patients aged ≥80 years who underwent MT compared to those aged <80 years. Furthermore, the rate of functional independence in the patients aged ≥80 years at 90 days after MT was 26.3% (12).

In a nationwide study conducted by Mehta et al. in the United States, 1540 patients aged ≥80 years who underwent MT were compared with 4639 patients aged <80 years who underwent the same procedure. The patients aged ≥80 years had lower good outcome rates (discharge to home or acute rehabilitation center) and higher mortality rates (13).

In the present study, we did not find any significant differences in the mRS scores at discharge or 3 months, in-hospital mortality, and 3-month mortality between the patients aged 65–79 years and ≥80 years who underwent MT. Moreover, 21.07% of the patients who underwent MT were aged ≥80 years, and the rate of functional independence at 3 months in these patients was 30.91%, which is consistent with the results of previous meta-analyses (13-16).

Studies have shown lower revascularization rates in elderly patients than younger patients. In two large meta-analyses conducted by Zhao et al. and Jiang et al. (11,12), the patients aged ≥80 years had lower recanalization rates compared to those aged <80 years. In a study conducted by Kim et al., 20 very elderly (≥80 years) patients and 93 elderly (60–79 years) patients who underwent MT were compared, and the rate of TICI 2b–3 reperfusion in the elderly patients was significantly higher than that in the very elderly group (75.3% versus 40%, respectively; p=0.002) (17).

In the present study, no significant differences were found between the patients aged 65–79 years and ≥80 years in terms of mTICI classification and successful recanalization rates (mTICI 2b–3). Furthermore, 87.57% of the patients aged ≥65 years, 88.60% of the patients aged 65–79 years, and 85.45% of the patients aged ≥80 years had successful recanalization.

No significant difference was found in the rate of intracranial hemorrhage after MT when the patients aged 65–79 years and ≥80 years in our study were compared. While studies such as that of Alawieh et al. (18) have reported a higher incidence of intracranial hemorrhage associated with MT in patients aged ≥80 years, some studies and meta-analyses have not found a difference in the rate of post-MT intracranial hemorrhage between young and elderly patients (12,19).

In our study, the sICH rate in the patients aged ≥80 years was 9.43%. In a study conducted by Zai et al., the rate of sICH in the patients aged ≥80 years was 8.6%, while in a meta-analysis by Jiang et al., which included 8388 patients from 21 studies, this rate was 6.7% (12, 19).

Although we did not find initial stroke severity to be associated with a poor outcome in the patients aged ≥65 years who underwent MT for AIS, some studies have reported a higher NIHSS score on admission as a factor associated with worse outcomes in patients undergoing MT (15, 20, 21).

A high NIHSS score at 24 hours was identified as an independent predictor of a poor clinical outcome after MT in our study. Similarly, Chen et al. reported a higher NIHSS score at 24 hours after MT as a predictor of 30-day mortality (21). Consistent with the results of other studies (19, 22, 23), a low ASPECT score (≤9) was also identified as a predictor of a poor outcome in the present study.

Burke et al. reported a 44% higher risk of death in acute stroke patients who were intubated compared to those who were not (24), while Feng et al. noted that intubation was a factor associated with a poor prognosis in AIS patients undergoing MT (25).In our study, the need for intubation was an independent predictor of a poor outcome at 3 months in the patients aged ≥65 years who underwent MT.

Better functional outcomes have been reported in elderly patients with AIS who underwent MT compared to those who did not undergo MT (3). Recent studies on the outcomes of MT in elderly patients have consistently demonstrated significant rates of successful recanalization and functional independence, thereby supporting the use of MT in this age group.

The present study provides evidence of the outcomes of patients aged 65 years and over treated with MT due to AIS. The data obtained are significant, as they represent one of the two major stroke centers in the Southern Marmara region, serving as a reference for acute stroke patients.

In the present study, we observed that a significant proportion of patients aged 65 years



and over benefited from MT, with a high rate of successful recanalization achieved in those patients. A low ASPECT score (≤9), a high APACHE score, a high NIHSS score at 24 hours, and a need for intubation were associated with poor long-term outcomes. Moreover, MT was as safe and effective for patients aged ≥80 years as for those aged 65–79 years, with the results being similar in regards to workflow, complications, and successful recanalization between the two groups. Additionally, similar mortality rates and functional outcomes were observed between the two groups at the three-month follow-up.

LIMITATIONS

However, this study has some limitations. It is a retrospective, single-center study. Moreover, as some patients were referred to our institution from external centers, the mRS, which indicates the functional status of patients before the stroke and whether they lived independently, was missing in some cases. Therefore, we were unable to include the pre-stroke mRS in our study. Another limitation of the present study is that patients over 65 years of age were not compared with younger patients.

CONCLUSION

In conclusion, to achieve positive outcomes in patients aged 65 years and over, the decision to perform MT should be made on a case-by-case basis, taking into account the ASPECT and APACHE scores. We believe that these patients should not be deprived of MT based solely on their age.

Further prospective and multicenter studies must be performed to identify elderly patients who may benefit from MT, incorporating data on factors such as infarct size, collateral status, pre-MT intravenous thrombolytic therapy, anesthesia and thrombectomy techniques, the number of passes for recanalization, and complications such as pneumonia or urinary tract infections during follow-up.

Considering the aging of the global population, the number of patients aged 65 and over undergoing MT is steadily increasing.Thus, identifying factors associated with long-term outcomes after MT in elderly patients will not only help predict outcomes in these patients, but also guide us in better identifying those who may benefit from MT and assist informed decision-making.

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ORIGINAL ARTICLE

THE RELATIONSHIP BETWEEN FRAILTY AND CAREGIVERS' CLOSENESS IN ELDERLY PATIENTS IN TURKEY

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Abstract

Introduction: Being cared for by family members is very important in Turkish society. We aim to evaluate the relationship between the frailty index and caregivers' closeness to patients aged 65 years and older.

Materials and Method: Four hundred people aged 65 and over living in the Çumra district of Turkey's Konya Province were included in our research. A sociodemographic data form consisting of 50 questions and the Tilburg Frailty Scale which consisted of 25 questions completed by all participants.

Results: The prevalence of frailty was found to be 60.0%. A statistically significant difference was found in the Tilburg Frailty Scale among age groups ($p < 0.0001$). A statistically significant difference was also found in the Tilburg Frailty Scale between the group living alone and the group not living alone, between the group receiving care and the group not receiving care, and between those cared for by their children and those cared for by other relatives or neighbors.

Conclusion: Frailty has been determined to be common enough to be considered a public health problem in Turkey. It has been concluded that almost all elderly people want to stay with their families and that state-sponsored arrangements are urgently needed in terms of caring for elderly people. The fastest and easiest way to educate caregivers and the elderly is possible with the family medicine system. We believe that the coordinated work of family doctors and caregivers will increase the success of home care.

Keywords: Frailty; Caregivers; Aged; Family.

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INTRODUCTION

One of the most common and important aging-related syndromes that plays a major role in older people's quality of life and health status is frailty (1). Various factors can lead to frailty. While most definitions focus on physical problems, Gobbens et al. defined vulnerability as a dynamic situation that affects a person with a loss in one or more areas of human life (physical, psychological, and/or social), which increases the risk of negative consequences due to the effects of some variables. Thus, they explained it as a multifactorial condition that includes sociodemographic factors, socioeconomic factors, lifestyle, life events, environment, and genetic factors (2). Frailty can have serious outcomes for society, such as frequent falls, fractures, dependency, hospitalization, and ultimately death. The syndrome is associated with decreased quality of life, disability, and a growing need for healthcare (4–6).

Various frailty screening instruments have been designed around the world, such as the Edmonton Frailty Scale, Prisma 7, Groningen Frailty Indicator, Sherbrooke Postal Questionnaire, Gérontopôle Frailty Screening Tool, Kihon Checklist, and Frailty Trait Score. The Tilburg Frailty Indicator (TFI) is one of the most widely used instruments used in frailty screening and has no known limitations in comparison with other frailty screening instruments. The TFI is the best multidimensional tool for measuring frailty, but it cannot yet be considered the gold standard (6,7). According to Sutton et al., the TFI has the strongest evidence of reliability and validity among 38 vulnerability assessment tools (7,8). While variations in definitions of vulnerability have resulted in a large number of scan tools, researchers have agreed that higher levels of vulnerability result in a higher risk of adverse outcomes, regardless of the tool used (8, 9).

A growing number of studies have indicated frailty as a major health condition for older adults (9–11). Older adults are at a higher risk of frailty (11). Due to the increasing geriatric population and their risk of frailty, it is imperative to address the shortcomings of both the diagnosis and treatment of frailty for older adults (12).

According to population projections, it is predicted that the elderly population in Turkey will increase by 201% between 2008 and 2040. According to the United Nations' definition, if the proportion of the elderly population in a country is between 8.0% and 10.0% of the total population, this means the population of that country is 'old,' and over 10% means that it is 'very old' (12,13).

While the population over the age of 65 in Turkey was 8.0% in 2014, it is estimated to be 9.5% according to the 2020 data of the Turkish Statistical Institute, and it will increase to 27.7% in 2075 (14,15). While the total population growth rate in Turkey was 13.4% in 2015, the increase rate of the elderly population was approximately three times (36.2%) this rate (15). Addiction rates have also increased. While this rate was 6.5% in 1940, it was determined to be 14.1% in 2020 (TUIK 2020). It is predicted that the elderly dependency ratio will be 43.0% in 2080 (16,17).

It is known that the elderly feel better when their practical needs are met via family relationships and when their emotional needs are met via friendships. The elderly want to live in their own homes for as long as possible and receive reliable care from a family caregiver. However, demographic changes, a decrease in the number of children, and the fact that children are not close to elderly parents have created new problems in elderly care (18).

However, the decision of family members or relatives to care for a dependent person and, thus, fulfill the wishes of aging in the home environment is influenced by several factors. The degree of family relationships has a significant impact on the willingness of family members to provide services and care. The factors that affect a decision whether to care for a relative include the quality of a relationship, gender, mental, or physical illness of a person in need of care, a caregiver's health status, financial factors, perceptions, and attitudes toward



nursing homes (19). It has been reported that daughters and daughters-in-law are primarily held responsible for elderly individuals' care (20).

Considering Turkey's growing elderly population and the fact that frailty is one of the most common disorders in this population, frailty prevention can play a major role in improving the health statuses of older people and their families. In Turkey, elderly care is mostly taken care of by elderly people's children or their daughters-in-law. Since there is no study in Turkey examining the relationship between the TFI and the degree of closeness of caregivers, this current study investigated the relationship between frailty and caregivers' closeness to elderly patients in Turkey.

MATERIALS AND METHOD

Study Design and Participants

In this descriptive, cross-sectional study examined the TFI and sociodemographic data survey of 400 individuals (aged over 65 years) from the Çumra region of Konya, Turkey. Approval for data collection was obtained from the Karatay University Faculty of Medicine Ethics Committee. All of the participants provided written informed consent. The agesof the participants ranged from 65 to 92 years. Both sexes were equally represented: 223 females (55.7%) and 177 males (44.3%).

This study, conducted between February and August 2020 in Çumra, Konya, involved individuals aged 65 and over. Using simple random sampling, a sample size of 350 was determined with a 95% confidence level and a 5% margin of error (G Power 3.1.7). Due to participant willingness, the study included 400 individuals.

Inclusion Criteria:

- Aged 65 or older,
- Willing to participate,
- No language barriers or psychiatric issues preventing survey responses.

Exclusion Criteria:

- Under 65 years old,
- Language barriers or psychiatric issues preventing survey responses,
- Unwilling to participate.

Participants were first informed about the study. Those who agreed to participate provided informed consent in accordance with the Helsinki Declaration. Data were collected through face-to-face surveys with 400 randomly selected individuals in the Çumra district, including home visits for suitable participants.

Data Collection Tools

Sociodemographic Data Survey

We adapted a 50-question survey to assess participants' economic situations, family ties, living conditions, illnesses, and care statuses. The frailty index was compared with caregivers' degree of closeness, place of care, and care reception among participants aged 65 years and older.

Frailty Instrument (TFI)

The TFI consisted of 15 self-reported questions encompassing three domains: eight questions on the physical domain, four on the psychological domain, and three on the social domain. Scores ranged from 0–15, with higher scores indicating greater frailty. A cutoff score of≥5 was used to diagnose frailty. Detailed questions can be found in the original study (2).The final Turkish version was consistent with the original scale (3).

Statistical Analysis

Variable normality was assessed using histograms and the Kolmogorov–Smirnov test. Student's t-test was used to compare the means of two independent groups. Descriptive analysis included measures of central tendency and dispersion for continuous variables, and frequency distributions for categorical variables. TFI and sociodemographic

data were compared across age groups (65–74, 75–84, and 85+), with significance determined by the student's t-test ($p < 0.05$). Data were analyzed using SPSS v16.

Ethical Procedure

Approval was obtained from the Karatay University Faculty of Medicine Health Sciences Ethics Committee (28.01.2020/005). Each participant was informed and gave consent to participate.

RESULTS

Four hundred participants over 65 years of age were included. The mean age was 73.37±6.35 years, with a median age of 72. Of the participants, 55.7% (n=223) were women and 44.3% (n=177) were men. Participants were categorized into age groups: 62.7% (n=251) were aged 65–74 years, 30% (n=120) were aged 75–84 years, and 7.3% were aged 85 years and older. Table 1 shows the distribution of the participants' characteristics.

Two-hundred forty individuals were classified as frail (TFI ≥ 5). The overall frailty rate among the participants was 60%. The frailty rates were 68.1% for women and 49.7% for men. The frailty rates were 51.3%, 72.5%, and 82.7% for the 65–74, 75–84, and 85and over age groups, respectively. The mean TFI scores were 5.43±3.5, 7.33±3.6, and 8.51±3.1 for these age groups, indicating a significant increase in frailty with age ($p < 0.0001$).

The TFI of living alone and not living alone were calculated according to the participants' age groups.

Table 1. Distribution of patient characteristics

Variables		n	%
Sex	Female	223	55.7
	Male	177	44.3
Age Group	65-74 years	251	62.7
	75-84 years	120	30.0
	85 years and above	29	7.3
Education	Illiterate	121	30.2
	Be literate	56	14.0
	Primary school	192	48.0
	Middle school/High school	28	7.0
	University	3	0.8
Marital status	Married	312	78
	Single/Divorced-widowed	88	22
Monthly income	600 TL and below	141	35.2
	601-1300 TL	42	10.5
	1301-1500 TL	59	14.8
	1501-2500 TL	122	30.5
	2501-3500 TL	30	7.5
	3501 TL and above	6	1.5
Total		**400**	**100**

Table 2. Fragile participant rates by sex and age

Variables		TFI ≥ 5 (n)	%
Sex	Female	152	68.1
	Male	88	49.7
Age Group	65-74 years	129	51.3
	75-84 years	87	72.5
	85 years and above	24	82.7
Total		**400**	**100**
Tilburg Frailty Indexes by Age Groups			
Age Group	**TFI Mean+sd**	**TFI Median**	**Participants n**
65-74 years	5.43±3.5	5	251
75-84 years	7.33±3.6	8	120
85 years and above	8.51±3.1	10	29
Total			**400**

Table 3. Tilburg fragility Indexes of Who Live Alone and Who Do Not Live Alone

Age Group	TFI Live Alone Mean+sd(n)	TFI Do Not Live Alone Mean+sd(n)	Participants n
65-74 years	7.23±3.94 (27)	5.29±3.46 (224)	251
75-84 years	8.52±3.61 (26)	6.63±3.61 (94)	120
85 years and above	8.75±3.15 (9)	8.21±3.27 (20)	29
Total			**400**

The TFI was 7.23±3.94 in the 65–74 age group, 8.52 ± 3.61 in the 75–84 age group, and 8.75±3.15 in the 85 and over age group who lived alone. The TFI was 5.29 ± 3.46 in the 65–74 age group, 6.63±3.61 in the 75–84 age group, and 8.21±3.27 in the 85 and over age group who did not live alone (Table 3). A statistically significant difference was found in the TFI between the 65–74 (p=0.01) and 75–84 (p=0.02) age groups between living alone and not living alone. There was no statistically significant difference between the 85-year-old and older groups (p=0.069).

According to the participants' age groups, the TFI of the group cared for by someone at home and the group that did not receive any care were calculated. The TFI was 7.19±3.69 in the 65–74 age group,7.84±3.80 in the 75-84 age group, and 8.74 ± 3.18 in the 85 and over age group who received care. However, the TFI was 4.83±3.2 in the 65–74 age group, 6.93±3.38 in the 75–84 age group, and 9.00±3.74 in the 85 and over age group who did not receive care (Table 4). A statistically significant difference was found in the TFI between those who received care and those who did not receive care in the 65–74 age group ($p < 0.0001$). In the 75–84 age group ($p = 0.17$) and the 85 and older group (p= 0.87), there was no statistically significant difference.

According to the participants' age groups, the TFI of the group cared for by their daughters/sons

Table 4. Tilburg fragility Indexes of who receive care and who do not receive care

Age Group	TFI Who receive Care Mean+sd(n)	TFI Who do not receive Care Mean+sd (n)	Participants n
65-74 years	7.19±3.69 (73)	4.83±3.26 (178)	251
75-84 years	7.84±3.80 (52)	6.93±3.38 (68)	120
85 years and above	8.74±3.18 (24)	9.00±3.74 (5)	29
Total			**400**

Table 5. Tilburg fragility indexes of the group cared by their daughter/son at home and the group cared by other relatives/neighbours

Age Group	TFI Who Cared by Son/Doughter Mean+sd (n)	TFI Who Cared by other relatives/neighbours Mean+sd(n)	Participants N
65-74 years	5.96±3.82 (53)	8.57±2.73 (26)	79
75-84 years	7.45±3.86 (35)	10.92±1.16 (12)	47
85 years and above	8.42±3.10 (26)	0	26
Total			**162**

at home and the group cared for by other relatives/neighbors were calculated. The TFI was 5.96 ± 3.82 in those aged 65–74, 7.45±3.86 in those aged 75–84, and 8.42±3.10 in those aged 85 and above. The TFI was 8.57±2.73 in those aged 65–74, 10.92±1.16 in those aged 75–84, and no participant over the age of 85 or above was cared for by other relatives/neighbors (Table 5). According to the participants' age groups, those cared for by their daughters/sons and cared for by other relatives/neighbors were compared in terms of the TFI. A statistically significant difference was found in the TFI between those cared for by their daughters/sons and those cared for by their relatives/neighbors in the 65–74 and 75–84 age groups ($p < 0.01$).

When we asked the participants, "Do you want to live in a nursing home?" only four people answered 'Yes.' The remaining 396 people said they wanted to be cared for by their wives/husbands or children.

The p-values for Tables 2, 3, 4, and 5 were calculated using Student's t-test.

DISCUSSION

In this study, we examined the impact of caregiving on frailty among individuals aged 65 and older in Turkey. We employed a sociodemographic survey alongside the TFI to explore the influence of sociodemographic and cultural factors on frailty. The TFI encompasses the physical, social, and psychological domains of frailty (2). Utilizing the Turkish version of the TFI, we conducted individual surveys, ensuring that participants' responses were independent of their partners' responses.

We investigated the associations between several factors and frailty. In crude analyses, many similarities have been observed in previous surveys worldwide(21). We found that the rate of frailty was



higher in women than in men. In other studies, females are commonly referred to as a risk factor for frailty (19, 21–23).

In our study, age was another factor that affected the fragility rate. We divided the participants into three groups: 65–74, 75–84, and 85 and over. As a result, we found that fragility increases as age groups get older. Other studies were like ours; age is an important factor associated with frailty (22, 23).This is because of an increase in diseases with age, a reduction in mobility, and social life. We eliminated the effects of age by matching the age groups among themselves. When we compared the TFIs of those living alone and those not living alone in their age groups, we found that those living alone had higher TFI scores.

There was a significant TFI difference between the 65–74 age group ($p = 0.01$) and the 75–84 age group ($p=0.02$).Although there are few publications on this subject, in a study conducted in Brazil, the researchers showed a significant difference between the group living alone and the group not living alone ($p<0.05$) (23).As in our study, the TFI was higher in living alone. Elderly people living alone find it difficult to access nutritious food, adequate housing, and healthcare (24). This plays an important role in increasing the fragility of living alone.

Another question we asked the participants was whether they received care assistance. There was a statistically significant difference only in the 65–74 age group ($p < 0.0001$). The TFI index of the elderly who received care was higher than that of those who did not receive care. This clearly showed that those with a high TFI index were in serious need of care. Receiving care can reduce the fragility of the elderly for years (25).

Receiving care is important for the survival of those in need of care. In our study, we showed that TFI increases in direct proportion to the need for care. However, the 75–84 age group was not significantly correlated with the other groups. Although the TFI of caregivers in this group was high (7.84±3.80 in receive care; 6.93±3.38 in do not receive care), it was not statistically significant ($p=0.17$).We wanted to reveal the fragility of the elderly who are cared for by their children in Turkish society by comparing the TFI indexes of those who are cared for by the son or daughter of people in need of care with those who are cared for by other people.162 of the participants, 162 were receiving care, 79 were in the 65–74 age group, 47 were in the 75–84 age group, and 26 were in the age group of 85 and above. A statistically significant difference was found in the TFI between those cared for by their daughter/sons and those cared for by their relatives/neighbors in the 65–74 and 75–84 age groups ($p<0.01$). No person in the 85+ age group received care from someone other than their children.

Our study showed that people of the same age who were cared for by their children had lower fragility. The importance of being a family member and being cared for by their children significantly reduced the fragility of the elderly individuals in our study group. For the elderly in Turkish society, living with their children is an important source of happiness in their lives. While the rate of those who wanted to receive care in a professional place was 1%, the rate of those who wanted to be cared for by their wives/husbands or children was 99%. Here, we can see how much the participants wanted to be taken care of by their families. Living with family plays an important role in the Turkish social structure.

CONCLUSION

This study utilized the TFI and sociodemographic surveys to assess frailty among elderly individuals in Turkey. The findings indicate that gender and age are significant factors that influence frailty. Independent of these factors, living alone was associated with increased frailty. Moreover, caregiving was found to correlate directly with frailty in the 65–74 age group in Turkey. The overwhelming preference for familial caregiving underscores its cultural significance and

potential benefits in reducing elderly frailty. To optimize care outcomes, training and support for familial caregivers should be prioritized within the family medicine framework.

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ORIGINAL ARTICLE

EVALUATION OF FALL PRESENTATIONS IN PATIENTS OVER 65 YEARS OF AGE ADMITTED TO THE EMERGENCY DEPARTMENT OF A HOSPITAL IN TURKIYE

Abstract

Introduction: Falls are a major cause of mobility and mortality among older adults. Regional monitoring and analysis of the risks and outcomes associated with falls are important for developing preventive approaches.

Materials and Method: This cross-sectional analysis retrospectively reviewed the electronic medical records of older adults (aged ≥65 years) who presented to the emergency department of a university hospital in Izmir, Turkey between January 2019 and January 2020. Information regarding pre-fall, fall-related, and post-fall treatments was analyzed.

Results: Over one year, 2,037 older patients (68.4% [n=1,349] women, with a mean age of 80.65+7.50 years) presented to the emergency department because of falls. Unfortunately, many important pieces of fall-related data were not routinely recorded at the institution. According to the available records, the majority of the patients were physically active (84.4%), lived independently (53.6%), and most frequently fell as a result of tripping or stumbling (88.1%). Of the patients, 74.9% were discharged; however, no information was available regarding whether they were informed about fall prevention before discharge. Head trauma was the most common cause of admission (n=415), and hip fractures were the leading surgical causes (n=175). The presence of chronic disease (p=0.910), age (p=0.274), and sex (p=0.304) did not affect the risk of fractures after falling.

Conclusion: Fall prevention is a more feasible and efficacious strategy than addressing the resultant complications. The current practice of analyzing the fall risks of individuals who present to emergency departmentwith falls and directing them to preventive programs is insufficient to address this issue.

Keywords: Geriatrics; Falls; Health Services Administration; Emergency Health Services.

INTRODUCTION

Fall-related injuries represent one of the most common problems related to older patients in hospital emergency departments (EDs) (1, 2). One-third of individuals aged >65 years fall at least once a year, and this proportion reaches 50% among 80-year-olds (3). Fall-related injuries in older adults often cause minor soft tissue injuries, likely because of the low energy of the exposed trauma. Serious injuries (e.g., hip fractures, subdural hematomas, serious soft tissue injuries, and head injuries) develop in 10% of older individuals who fall, which may require hospitalization (4). Approximately 36–44% of patients who present to EDs because of falls experience subsequent adverse events within the following year—including recurrent falls, additional ED visits, or death (5).

Studies have shown that declines in functional capacity in older adults after their first fall can lead to repeated cycles of falls and other self-inflicted injuries. The negative physical and psychological effects of reduced functional ability can make older individuals more dependent in terms of performing their activities of daily living, and lead to an increased risk of falls (6).

Identifying the environmental and personal factors that contribute to falls and implementing appropriate measures to address these are crucial to fall prevention. Multiple studies have highlighted that a prior history of falls represents the most significant consideration when assessing the risk of future falls among patients (7).

The majority of risk factors that result in falls are preventable, as they are associated with individual or environmental factors. Studies have indicated that, among the factors leading to falls in those aged >65 years, the incidence rate of balance disorders is 10–25%, whereas the incidence rate of accidents or environmental factors is 30–50% (8, 9). Identifying the risk factors and taking appropriate measures can reduce the occurrence of falls.

Emergency services should be considered an important step in fall prevention. The occurrence of a fall should not be ignored and should be considered a risk factor for future falls (10, 11).

Regularly collecting fall-related data, which tends to be overlooked by many healthcare systems, can reveal the true incidence of falls and fall-related injuries. This can lead to a better understanding of the root causes of rehospitalization related to falls (12, 13). These insights highlight the importance of adopting a proactive approach to preventing repeated hospitalizations among older individuals who fall.

The objective of this study was to analyze data related to the causes of falls and subsequent post-fall conditions experienced by older individuals who reported fall-related injuries to a hospital ED in Turkiye. This study aimed to provide evidence that can be used to recommend relevant precautions against this occurrence.

MATERIALS AND METHOD

This cross-sectional analysis retrospectively reviewed electronic medical record data from older individuals aged ≥65 years who sought treatment for fall-related injuries at the ED of Dokuz Eylul University Hospital (DEUH) in Izmir, Turkey, between January 2019 and January 2020.

Before data collection, ethics committee approval (decision dated 06.10.2021 and numbered 2021/27-05) was obtained from the university's Non-Interventional Clinical Research Ethics Committee.

Between January 1, 2019, and January 1, 2020, the ED records of DEUH were analyzed using Probel, a patient registration system. We examined the records of patients aged ≥65 years who reported incidents of falls—which were documented as Code 4 in the emergency records. Complaints of falls, traffic accidents, syncope, and forensic cases (e.g., brawls, assaults, and similar incidents) were excluded.

Table 1. The Data Collected

Place of residence
Home Alone
At home with first degree relatives
At home with a carer
Care Home
Physical condition before the fall
Physically active
Walking with supervision
Walking with assistive device
Immobile
Fall Mechanism
Stumbling / stumbling
Dizziness
Syncope
Acute stroke
Falling out of bed
Fall location
Room
Bathroom
Stairs
Out of home
Chronic diseases
Cardiovascular
Dementia/Alzheimer's
Musculoskeletal system
Eye
Metabolic
Neurological
Lung disease
Injury due to fall
No injuries
Minor head trauma
Major head trauma
Soft tissue injury
Hip / femur fracture
Fracture/dislocation of lower limb
Upper extremity fracture/dislocation
Thoracic trauma
Spinal fracture
Conclusion
Day of hospitalisation in the emergency department
Discharge to ward (number of hospitalisation days)
Discharged home
Exitus
Surgery
Yes
No

Data such as age, sex, place of residence, physical condition, presence of chronic diseases, mechanism of the fall, location of the fall, injuries sustained as a result of the fall, direction of emergency discharge, number of hospitalization days, surgeries, number of follow-up outpatient visits after the fall, and presence of recurrent falls were documented (Table 1).

Income level was determined according to the social insurance with which each patient was affiliated. Social security institution (SGK) was recorded as a labor-pensioner, insured self-employed (Bagkur) tradesman, or employer pension (ES) fund as a civil servant pensioner. The highest income level in ES was considered Bagkur, and the lowest was SGK.

Statistical Analysis

The data were analyzed using SPSS 21 software. The Shapiro-Wilks test was used to determine the normality of the distribution of quantitative data. Data distributions with skewness and kurtosis values between -2 and +2 were considered normal. Data are expressed as means, standard deviations, minimum and maximum values, and percentages. The Chi-squared test was used to analyze the association of fracture occurrence with age and the presence of chronic disease, after missing data were removed. Logistic regression was used to analyze the association with sex. Statistical significance was set at $p<0.05$.

RESULTS

In 2019, 2,037 individuals aged >65 years were admitted to DEUH with a complaint of falling. Their mean age was 80.65+7.50 years, and 68.4% (n=1,349) were female. A total of 34.8% were registered to the ES, 47.9% were registered to SGK, and 17.3% were registered to the Bağkur social insurance systems.

In the anamnesis records of 81.4% (n=1,658) of the patients, place of residence was not mentioned.

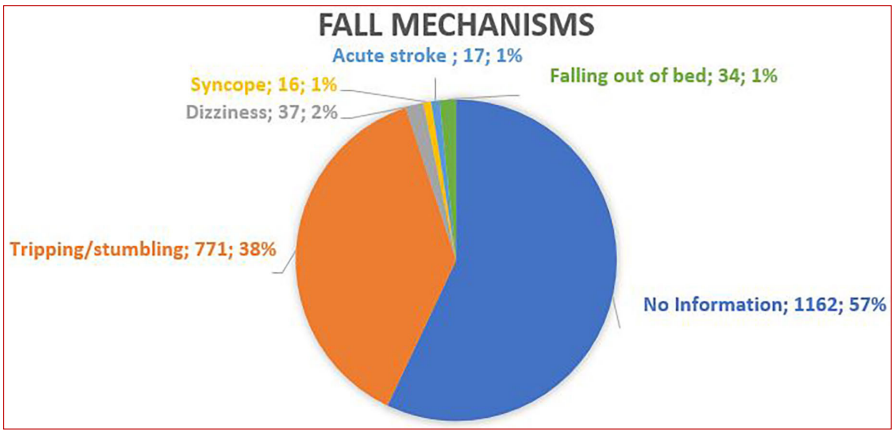


Figure 1. Fall Mechanisms of all patients

Of the 379 patients who provided this information, 53.6% lived independently at their homes, while 44.6% lived in care homes. The pre-fall physical levels of 73.6% of the patients were not assessed. Among the 537 patients who provided this information, 84.4% were physically active, 9.5% were supervised, and 6.1% used assistive devices.

When fall mechanisms were analyzed, 57% (n=1,162) of the patients did not provide any information regarding how the fall occurred (Figure 1). Of the 875 whose fall mechanisms were known, tripping or stumbling represented the most common cause of falls by a significant margin (Figure 2). In 580 (29%) of the 2,037 total cases, information was obtained regarding where the falls occurred. Of these, 38.4% fell in regular rooms, 12.9% fell in bathrooms, 22.2% fell while using stairs or steps, and 26.4% fell outdoors.

Of the total cohort, 51.4% (n=1,046) of the patient records provided no information regarding chronic diseases during their medical anamnesis. Of the 991 with chronic diseases, 46.0% had one,

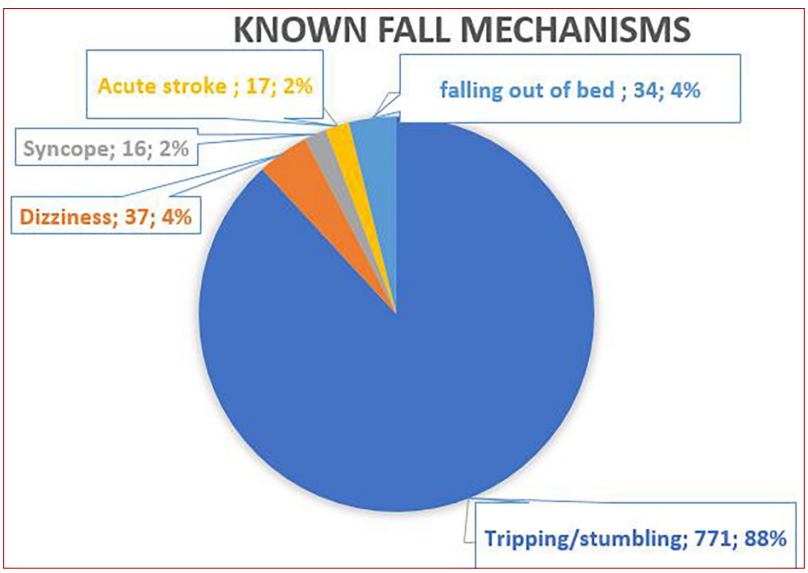


Figure 2. Known Fall Mechanisms

Table 2. Results of Falls

	Injury due to fall n (%)	Surgery due to injury n (%)
No Data	75 (3.7)	
No injury	198 (9,7)	
Minor Head Trauma	403 (19,8)	1 (0,3)
Major Head Trauma	12 (0,6)	
Soft Tissue Injury	215 (10,6)	
Hip/Femur Fracture	393 (19,3)	175 (46,9)
Lower extremity Fracture /subluxation	152 (7,5)	65 (17,4)
Upper extremity Fracture /subluxation	352 (17,3)	102 (27,3)
Thorax Fracture	189 (9,3)	
Vertebrae Fracture	48 (2,4)	30 (8,0)
Total	2037	

39.1% had two, 12.1% had three, 1.6% had ≥4, and 1.2% had no known diseases. The most common diseases were cardiovascular (41.7%) and metabolic (25%).

The distribution of injuries resulting from falls is shown in Table 2. Information regarding the injury was not recorded in the system in 75 (3.7%) of the cases. When mild and major injuries after falls were evaluated together, head trauma was observed to be the most common injury during AS admissions.

A total of 4.4% of the patients were discharged from the institution without receiving treatment. Of the remaining patients, 74.9% were discharged after the intervention, 1.7% were admitted to the ED, and 19.0% were admitted to other wards.

Of the total 2,037 patients, 18.3% (n=373) underwent surgeries. When the reasons for these surgeries were analyzed, 46.9% (n=175) had hip fractures, 27.3% (n=102) had upper-extremity fractures, 17.4% (n=65) had lower-extremity fractures and dislocations, 8.0% (n=30) had spinal fractures, and 0.3% (n=1) had minor head trauma.

Data regarding chronic diseases in the 48.8% of the patients who underwent surgeries were not recorded. According to the data obtained, 41.3% of the patients who underwent surgery had 1–2 chronic diseases, whereas 9.9% had ≥3.

After surgery, older individuals were hospitalized for an average of 5.32±2.87 days and had an average of 4.30±7.03 hospitalization days and 5.40±7.57 outpatient clinic visits within the first year postoperatively. In the nonsurgical cases, the mean number of hospitalization days was 0.79±1.33. The mean number of days of re-hospitalization within the first year after the fall was 3.26±6.35 days, and the mean number of outpatient visits was 5.31±7.33.

Because of a lack of sufficient data, analyses of the factors related to post-fall fractures could only be performed by age, sex, and presence of chronic diseases. When the relationship between the 991 cases with chronic disease data and fracture formation was analyzed, we observed that the presence of chronic disease did not affect the risk of fracture formation (p=0.910). Similarly,



no association was observed between fracture occurrence and age (p=0.274) or sex (p=0.304).

DISCUSSION

The demographic transition toward aging populations has highlighted the issue of falls among older adults, resulting in a significant public health concern (14). In this context, it is important to understand the demographic profiles and prior fall histories of patients who are injured by falls. Examining prior fall history is crucial for risk analysis; however, it is important to consider the characteristics of those who have fallen, to prevent similar future injuries.

This study aimed to analyze the risk factors and post-fall medical conditions of individuals >65 years of age who presented to the ED of a Turkish university hospital in 2019 because of falls. We accessed the necessary information from the patients' electronic medical records.

Over the year, 2,037 individuals >65 years of age presented to the ED for injuries related to falls.

Our study revealed an average age of 80.65 among the patients. Consistent with the relevant literature, the results of our study indicated a concentration of falls occurring within the age range of 75–85 years (15). Similarly, the results of our study are consistent with those in the literature, showing that women have an increased risk of falling (16). Studies on the occurrence of fractures following falls have indicated that lean mass is an important factor in the prevention of fractures. As lean mass decreases with age—particularly in women—this population becomes more prone to fracture formation (17). In contrast to the findings of previous studies, the results of our study indicated that age and sex were not significant factors related to the occurrence of fractures.

The presence and nature of chronic illnesses are associated with an increased risk of falling. Comorbidities affecting the cardiovascular system, cognitive functions, and pain increase the risk of falls (18). Our study revealed that comorbidity data were not consistently recorded for older patients who presented to the ED because of falls. Approximately half of the admitted patients had information on chronic diseases of which 98.8% had ≥1 chronic disease. The most prevalent chronic diseases are typically related to the cardiovascular system. The risk of falls increases with the number of chronic diseases a patient has (18). In this study, 46% of the participants had one chronic disease, 39% had two, and 12% had three. The available data were insufficient to determine the relationship between the number of chronic diseases a patient has and their risk of falls. Longitudinal studies are warranted to determine this risk; therefore, no conclusions can be drawn regarding this issue from the current data. The results of our study showed that, contrary to the literature (19), the presence of chronic diseases did not affect the risk of fractures after falls.

The risk of falling is affected by the places where individuals live. Single individuals face a higher risk of falling than those living with their families. Furthermore, staying in institutions long-term increases the risk of falling (20).

The results of our study indicate that a significant proportion of individuals who were admitted to the ED because of falls did not have their residential information recorded in the emergency service records. Upon examination of the records at a 20% rate, no significant difference was observed between those who were living independently at home and those who were residing in care facilities (21).

To develop effective prevention strategies, it is imperative to recognize the multifaceted nature of falls among older adults. Understanding the mechanisms underlying falls enables more expedient clinical assessments and analyses of the risks related to falls. The most common causes of falls are loss of balance and dizziness, while the second most common cause is falling from stairs or steps

(14). Our data indicate that the practice of recording the causes of falls is not common in Turkiye.In 57% of the cases in which our patients presented to the ED with a complaint of falling, the cause of the fall was not determined. The most common causes of falls were tripping and stumbling, with a significant difference in prevalence. When individuals who present with falls are registered in hospital systems, falls attributed to neurological and cardiopulmonary issues are categorized differently. In our study, the data associated with these codes were not analyzed. This may explain the high incidence of data about tripping and stumbling.

Head trauma was the most common injury seen among our patient cohort, although only one of these cases required surgical intervention. The most common injuries that required surgical treatment were hip and lower-limb fractures. Given that such injuries typically occur after high-severity and risky falls, individuals need to seek immediate medical attention in the event of a fall. Moreover, it may be more common for individuals to present to the ED after high-severity falls. Studies have indicated that the incidence of intracranial hemorrhage after falls is increasing. Although data on this subject are insufficient, it has been concluded that intracranial hemorrhage is seen in 1 of every 20 older individuals admitted to the ED after falls (22).

While 75% of our patients were discharged following an emergency service intervention, 18.3% underwent surgeries. The most common indication for surgery was hip fracture. Hip surgery was performed in 8.6% of the patients who presented with complaints of falling. Erkal et al. reported that nearly half of the older individuals who underwent surgery exhibited cognitive impairments (23). While falls themselves can have negative effects, surgeries to treat fall-related injuries can have profound impacts on quality of life and functionality.

Pierrie et al. reported that individuals who sustain hip fractures after falls typically have higher care and treatment requirements during the year preceding the fracture. However, a considerable proportion of these individuals do not receive guidance on fall prevention (24), and it is difficult to determine the relationship between the data obtained in our study and the risk factors of chronic disease requiring surgery, owing to the incomplete nature of the data (almost 50%). Data analysis revealed that all patients who underwent surgery had at least one chronic disease. Prospective studies must be designed to ensure the clarity of data to facilitate the interpretation of the relationship in question.

The follow-up of older people at high risk of falls by different health professionals significantly reduces the risk of falls. In their study, Goldberg et al. showed that the risk of falls decreased when the older who visited the ED for falls were referred to physiotherapists and pharmacists, and it was argued that this method feasibly prevented falls (2, 3). The identification of falls and fall prevention programs provided in emergency services are not sufficient to prevent falls. Falls should be analyzed as a multifactorial condition, for which interdisciplinary practices targeting patient-oriented approaches are recommended (25).

While falls significantly affect the quality of life and health-related expenditures in older adults, it is important to characterize this issue in studies conducted across multiple health systems. Older individuals who present to EDs as a result of falls should be evaluated and provided with targeted guidance (1, 25). From this perspective, the data collected from the ED in this study may not be sufficient for understanding and preventing falls.

Addressing falls among older patients admitted to the EDs of district hospitals requires a holistic and integrated approach that includes evidence-based interventions, patient participation, community participation, and interdisciplinary cooperation. To establish this approach, it is necessary to understand the current situation related to falls and determine the associated risk factors through cross-sectional

studies. The most important conclusion that can be drawn from our study is that the ED is an important step in developing preventive health strategies; however, the current medical practices in Turkiye did not allow for the collection of sufficient data to evaluate this approach.

A significant contribution of this study is the identification of critical gaps in data recording and management within the ED setting. Our study highlights the frequent lack of detailed information on fall mechanisms, chronic diseases, and post-discharge outcomes. This finding underscores the need for improved data collection practices in emergency healthcare settings, which can enhance the quality of future research and interventions. However, the study is limited by incomplete data, a retrospective and cross-sectional design. Despite these limitations, the identification of systemic issues in data recording highlights important areas for improvement in emergency care and fall prevention strategies. It is recommended that prospective studies be planned to investigate preventive measures, with the objective of establishing causal relationships and providing actionable recommendations.

The authors declare that they have no conflict of interest.

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ORIGINAL ARTICLE

EFFECTIVENESS OF SENNA IN TREATING CHRONIC CONSTIPATION IN GERIATRIC PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT: A RANDOMIZED, DOUBLE-BLIND, MULTICENTER STUDY

Abstract

Introduction: Chronic constipation is prevalent in the geriatric population. Undiagnosed and untreated constipation can lead to complications and decreased health-related quality of life. The aim of this study was to compare the therapeutic effectiveness of senna alone with a combination of bisacodyl and senna in patients diagnosed with chronic constipation.

Materials and Method: This prospective, multicenter, double-blind, randomized controlled trial included patients aged 65 years and older who presented to the emergency department with chronic constipation, diagnosed according to the Rome IV criteria, between July and October 2023. Patients were randomly assigned to either the senna group (20 mg sennoside B) or the senna + bisacodyl group (3 mg sennoside B + 5 mg bisacodyl). Participants took the drugs twice daily for 28 days. The Constipation Scoring System and Patient Assessment of Constipation Quality of Life scores were calculated before and after treatment for each patient.

Results: The study included 105 patients, with 54 in the senna group and 51 in the senna + bisacodyl group. There was a statistically higher need for dose reduction because of drug side effects in the senna + bisacodyl group compared with the senna group (p=0.026). Following treatment, the senna group had a higher score on the Constipation Scoring System and Patient Assessment of Constipation Quality of Life compared with the senna + bisacodyl group, and the difference was statistically significant (p<0.001, p=0.012).

Conclusion: In geriatric patients, short-term treatment of chronic constipation with senna is more effective than senna+bisacodyl regarding constipation severity and quality of life.

Keywords: Aged; Bisacodyl; Constipation; Quality of Life; Sennosides.

INTRODUCTION

Chronic constipation (CC) is the most common functional gastrointestinal disorder diagnosed in outpatient clinics, including emergency departments (EDs) (1). According to the Rome IV criteria, the community prevalence of CC is 10.3%, with higher rates observed in the elderly (~20%) compared with younger individuals (2,3). In elderly patients, CC significantly affects physical and mental health, as well as quality of life (QOL). In the frail geriatric population, underdiagnosed and undertreated constipation leads to complications and decreased health-related QOL. The inevitable consequences include increased ED visits and healthcare expenditures. Therefore, recognizing and appropriately managing CC in elderly patients is essential (4).

The initial treatment for CC includes patient education, dietary modifications, and lifestyle changes, such as increasing exercise, as well as fluid and fiber intake. However, these approaches often prove inadequate, and laxatives are needed for treatment (5). It has been reported that approximately 10% of community-dwelling older adults and 50% of residents in nursing homes use laxatives daily (5). In standard therapy for CC, laxatives are categorized into four types based on their mechanisms of action: bulking agents, osmotics, stimulants, and stool softeners (6). Additionally, stimulant laxatives can be grouped as diphenylmethane derivatives (e.g., bisacodyl and sodium picosulfate) and anthraquinones derived from plants (e.g., senna, aloe, and cascara).These laxatives exert their effects by stimulating the intestinal mucosa and increasing the secretion of water and electrolytes, thereby increasing water content in the intestinal lumen. They also enhance intestinal muscle contractions, promoting bowel movements (7).

It is crucial to achieving success in treating CC when it comes to improving patients' QOL and preventing potential complications. Stimulant laxatives, including both senna derivatives and bisacodyl, are widely used because of their low cost and over-the-counter availability (8). Numerous studies have investigated the therapeutic effects of stimulant laxatives in CC. However, although senna and bisacodyl are readily available without prescription and widely used across all clinics, including EDs, there is an apparent lack of comparative studies between the use of senna alone versus the combination of bisacodyl and senna. Therefore, in our study, we aim to evaluate and compare the therapeutic efficacy of these treatments in patients aged 65 years and older who present to the ED with a diagnosis of CC according to the Rome IV criteria.

MATERIALS AND METHOD

Study design

Our study is a multicenter, prospective, double-blind, randomized controlled trial. It was conducted between July and October 2023 at different tertiary academic medical centers' EDs and internal medicine outpatient clinics. Patients enrolled in the study initiated ED treatment and were subsequently scheduled for follow-up in the internal medicine outpatient clinic for treatment assessment. The study population consisted of 105 patients aged 65 years and older who presented to the ED and were diagnosed with CC according to the Rome IV criteria (9). Ethical approval for the study was obtained from the ethics committee (ethics committee number: 2023–06/02). Informed consent was obtained from all participants,and the study was conducted using the principles outlined in the Helsinki Declaration. Before beginning treatment, the patients were asked to document observations for the first seven days, including the frequency of bowel movements, the consistency of their stool, and any symptoms related to their abdomen.

Patients were randomized into two groups: the senna group (20 mg sennoside B, Sennalax®,



Tripharma İlaç Sanayi ve Ticaret A.Ş., Istanbul, Turkey, n = 54) and the senna plus bisacodyl group (3 mg sennoside B + 5 mg bisacodyl, Bekunis®, Abdi İbrahim İlaç Sanayi ve Ticaret A.Ş., Istanbul, Turkey, n = 51). An assignment list with consecutive numbers from 1 to 105, pre-generated by an independent party for purposes unrelated to our study, was used to allocate study medications. Randomization of participants was conducted using randomly permuted blocks. All study medications were encapsulated in two identically sized dark gray capsules; this ensured that the appearance of the capsules did not reveal the content of the medication. The study's primary investigator kept patient identification and the numbered medication list in a safe location.

Patients with CC received 20 mg sennoside B or 3 mg sennoside B + 5 mg bisacodyl daily for 28 consecutive days. Both groups received capsules twice daily, in the morning and evening. Participants were instructed to visit the internal medicine outpatient clinic for follow-up assessments during the first and fourth weeks of treatment. Patients who did not report experiencingserious adverse effects during the first-week visit continued their treatment as prescribed.

Inclusion and exclusion criteria

The inclusion criteria were as follows:

(i) Male and female patients aged 65 years and older;

(ii) Patients diagnosed with CC according to the Rome IV criteria;

(iii) Patients who did not use medication for constipation in the last week prior to the study start; and

(iv) Individuals who gave written informed consent to take part in the research.

The exclusion criteria were as follows:

(i) Patients receiving treatment with different medications for constipation;

(ii) Patients diagnosed with irritable bowel syndrome;

(iii) Patients with renal dysfunction;

(iv) Patients with diabetes, hypercalcemia, hypokalemia, uremia, hypomagnesemia, or hypothyroidism;

(v) Patients with severe cerebrovascular disease, neurological diseases because of spinal cord lesions, multiple sclerosis, or Parkinson's disease;

(vi) Patients with heart disease;

(vii) Patients taking medications affecting the metabolism of senna and bisacodyl;

(viii) Patients using such medications as digoxin, opioids, anticholinergics, calcium channel blockers, antiemetics, antispasmodics, psychotropics, or histamine H1-H2 receptor antagonists;

(ix) Patients using medications that affect bowel movements (e.g., antibiotics, bowel control medications, antidiarrheals) or consuming specific foods and supplements (e.g., lactobacilli, oligosaccharides, bifidobacteria, dietary fiber).

Interventions and procedures

The criteria for discontinuation of medication in this study were defined as the following symptoms: diarrhea occurring ≥5 times per day, vomiting, weight loss, bradycardia, or lethargy. Patients were instructed to report these symptoms if they occurred and to consult with us. Depending on the discretion of the attending physician, the dose of the medication was planned to be reduced or discontinued in such cases. In addition, as a general guideline patients were asked to return to us if they experienced the absence of bowel movements for ≥3 days alongside abdominal symptoms. In this study, if diarrhea or abdominal symptoms were present, self-reduction of the study medication from two capsules to one capsule per day was permitted. While reduction criteria were established for this study, no rescue medication

was predetermined beforehand. Thestudy was conducted independently and did not receive any institutional financial support; therefore, all study medications were purchased by the researcher.

Measurements and questionnaires

In the study, patients were evaluated before and after treatment using the Constipation Scoring System (CSS) to assess the severity of constipation symptoms and the Patient Assessment of Constipation Quality of Life (PAC-QOL) to measure QOL (10, 11). The CSS was designed to assess symptom severity in patients with CC. It consists of eight items that define constipation symptoms, including frequency of bowel movements, duration of constipation, abdominal pain, painful evacuation, incomplete evacuation, time per attempt, need for assistance with evacuation, and unsuccessful attempts per 24 hours. The total CSS score ranges from 0 to 30, with higher scores indicating more severe constipation symptoms (10).

The PAC-QOL is a questionnaire used to measure the impact of CC on QOL and daily activities in patients with CC. It comprises 28 questions across the four following subscales: physical discomfort (4 items), psychosocial discomfort (8 items), concerns about bowel symptoms (11 items), and satisfaction (5 items). Each item on the scale is rated on a 5-point Likert scale from 0 to 4. The highest possible total score on the PAC-QOL is 140, and the lowest is 28; higher scores indicating poorer QOL as a result of constipation-related issues (11).

Elderly patients were categorized into the three following age groups for further analysis: 65–74 years (younger elderly), 75–84 years (middle elderly), and ≥85 years (older elderly). For participants with low literacy and auditory or visual impairments, the researcher read the questionnaire and scales aloud; the participants' responses were marked accordingly.

Outcome measures

The primary objective was to compare the effectiveness of two commonly used stimulant laxatives—namely, senna alone and senna plus bisacodyl combination therapy—in treating CC diagnosed in the geriatric population. The secondary objective was to compare the effects of 28 days of treatment with senna alone versus senna plus bisacodyl on the severity of constipation. In addition, the study aimed to investigate the impact of CC on QOL and daily activities.

Statistical analysis

Prior to the study, a G Power analysis was conducted, which determined a required sample size of at least 90 participants (at least 45 per group) based on an effect size of 0.6, power of 80%, confidence interval of 95%, and $\alpha = 0.05$. For the statistical analysis of the recorded data in our study, SPSS version 26 (IBM Corporation) was used. The data distribution was evaluated using the Kolmogorov–Smirnov and skewness–kurtosis tests. Categorical variables were presented as the number (n) and percentage (%) and compared using the Chi-square test. For the analysis of numerical variables between the two groups, an independent samples t-test was used if the data were normally distributed, and the Mann–Whitney U test was applied. A one-way analysis of variance (ANOVA) test was conducted if normal distribution assumptions were not met for analysis involving three groups with numerical variables. The significance level (p-value) was set at 0.05.

RESULTS

Participants, patients' demographic features, and general clinical characteristics

Our study included 105 patients, with 54 patients in the senna group and 51 in the senna plus bisacodyl group. The flowchart of patient enrollment is shown in Figure 1. The mean age of the senna group was 73.89 (6.10) years, and that of the senna plus

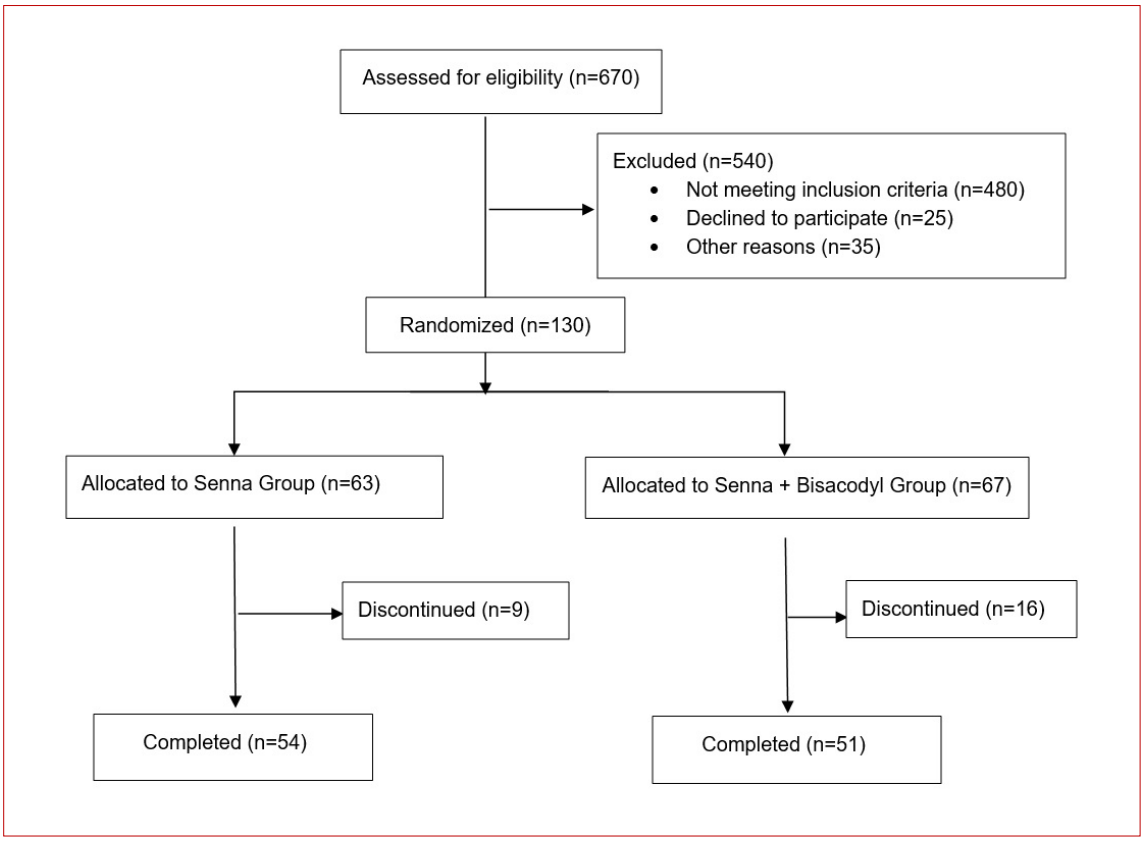


Figure 1. Flow chart of participants

bisacodyl group was 75.22 (6.60) years. There was no significant difference in age between the two groups (p= 0.287). In addition, the gender distribution did not show a statistically significant difference; 57.4% of patients in the senna group were male, and 62.7% in the senna plus bisacodyl group were male (p=0.577). Details of the patient's demographic and clinical data are presented in Table 1.

Side effects of interventions

No statistically significant difference was observed between the two groups regarding the frequency of developing medication side effects (p= 0.279). However, dizziness was statistically significantly more frequent in the senna plus bisacodyl group compared with the senna group (p= 0.011). In addition, there was a statistically higher necessity for dose reduction because of medication side effects in the senna plus bisacodyl group (p= 0.026). Detailed data on the side effects of the medication are presented in Table 2. The participants did not report the most typical side effect of senna, which is the occurrence of yellowish-brown urine.

Positive effects of interventions on constipation-related symptoms

In the senna group, greater reductions were observed compared with the senna plus bisacodyl group for the following symptoms: abdominal discomfort (p = 0.041), difficulty in defecation (p = 0.006), and incomplete evacuation (p = 0.025). The results, shown in Table 2, were statistically significant.

Table 1. Demographic and Clinical Characteristics by Drug Group

		All Patients (n=105)	Drug Group		p
			Senna Group (n=54)	Senna + Bisacodyl Group (n=51)	
Age (Year)		74.53(6.35)	73.89(6.10)	75.22(6.60)	0.287
Gender	Male, n (%)	63 (60)	31 (57.4)	32 (62.7)	0.577
	Female, n (%)	42 (40)	23 (42.6)	19 (37.3)	
Mobility Status	Independent, n (%)	46 (43.8)	27 (50)	19 (37.3)	0.264
	With help, n (%)	47 (44.8)	23 (42.6)	24 (47.1)	
	Bedridden, n (%)	12 (11.4)	4 (7.4)	8 (15.7)	
Exercise Frequency	None, n (%)	53 (50.5)	30 (55.6)	23 (45.1)	0.543
	Sometimes, n (%)	42 (40)	19 (35.2)	23 (45.1)	
	Often, n (%)	10 (9.5)	5 (9.3)	5 (9.8)	
Number of Meals	2, n (%)	42 (40)	20 (37)	22 (43.1)	0.799
	3, n (%)	57 (54.3)	31 (57.4)	26 (51)	
	>3, n (%)	6 (5.7)	3 (5.6)	3 (5.9)	
Fruit Consumption Frequency	1–2/wk, n (%)	38 (36.2)	18 (33.3)	20 (39.2)	0.772
	3–5/wk, n (%)	55 (52.4)	29 (53.7)	26 (51)	
	7/wk, n (%)	12 (11.4)	7 (13)	5 (9.8)	
Daily Water Consumption (Glasses)	1–3/day, n (%)	43 (41)	21 (38.9)	22 (43.1)	0.678
	4–10/day, n (%)	51 (48.6)	26 (48.1)	25 (49)	
	>10/day, n (%)	11 (10.5)	7 (13)	4 (7.8)	
BMI (kg/m2)		28.58(2.57)	28.78(2.60)	28.37(2.54)	0.423
Constipation Duration (Weeks)		24.91(4.68)	24.43(4.66)	25.43(4.69)	0.273
CSS (Before Treatment)		23 (14–29)	22 (14–29)	24 (14–29)	0.583
PAC-QOL (Before Treatment)		103.88(12.85)	105.09(15.16)	102.59(9.82)	0.315

BMI: Body mass index; CSS: Constipation Scoring System; PAC-QOL: Patient Assessment of Constipation Quality of Life

Changes in CSS and PAC-QOL after treatment

In the study, significant differences were observed between the senna group and the senna plus bisacodyl group in terms of changes inthe post-treatment CSS scores ($p<0.001$). Specifically, the senna group showed a statistically significantly greater reduction in CSS scores than the senna plus bisacodyl group, indicating that senna alone resulted in more improvement in constipation symptoms. Similarly, the post-treatment PAC-QOL scores showed a significant difference between the two groups, with the senna group demonstrating superior outcomes compared with the senna plus

Table 2. Distribution of Drug Side Effects and Positive Response to Treatment

	Drug Groups		p
	Senna Group	Senna + Bisacodyl Group	
Side Effects Seen, n (%)	25 (46.3)	29 (56.9)	0.279
Abdominal pain, n (%)	18 (33.3)	19 (37.3)	0.674
Diarrhea, n (%)	8 (14.8)	15 (29.4)	0.071
Nausea, n (%)	8 (14.8)	10 (19.6)	0.515
Weight loss, n (%)	7 (13)	5 (9.8)	0.611
Dizziness, n (%)	6 (11.1)	16 (31.4)	0.011
Dose Reduction Requirement, n (%)	8 (14.8)	17 (33.3)	0.026
Reduction in Swelling, n (%)	39 (72.2)	31 (60.8)	0.214
Reduction in Bloating, n (%)	39 (72.2)	27 (52.9)	0.041
Decreased Difficulty in Defecation, n (%)	44 (81.5)	29 (56.9)	0.006
Decrease in the Feeling of Incomplete Defecation, n (%)	39 (72.2)	26 (51)	0.025

Table 3. Comparison of Constipation Scale Difference and Constipation Score Difference by Drug Group

	Drug Group						p^{Δ}
	Senna Group			Senna + Bisacodyl Group			
	Before	After	Δ	Before	After	Δ	
CSS	22 (14–29)	19 (11–24)	3 (-8 - 11)	24 (14–29)	21 (11–27)	2 (-2 - 5)	<0.001
PAC-QOL	105.09(15.16)	81.28(15.18)	23.82(9.69)	102.59(9.82)	84.25(9.69)	18.33(11.97)	0.012

CSS: Constipation Scoring System; PAC-QOL: Patient Assessment of Constipation Quality of Life; Δ: Value change

bisacodyl group (p= 0.012; Table 3, Figure 2). This suggests that patients treated with senna alone reported greater QOL improvements related to constipation. In addition, within the senna group, variations in CSS scores were assessed for the older elderly (≥85 years), middle elderly (75–84 years), and youngest elderly groups (65–74 years). Levene's test indicated homogeneous variance across these groups. A one-way ANOVA analysis revealed a significant difference in constipation scale changes among these age groups ($F_{2\text{-}51}$ = 3.763, p= 0.03). Hochberg's GT2 multiple comparison test indicated that the difference stemmed from comparisons between the middle elderly and older elderly age groups. Specifically, it was concluded that the effectiveness of senna treatment alone was statistically significantly lower in the older elderly group than in the middle elderly group.

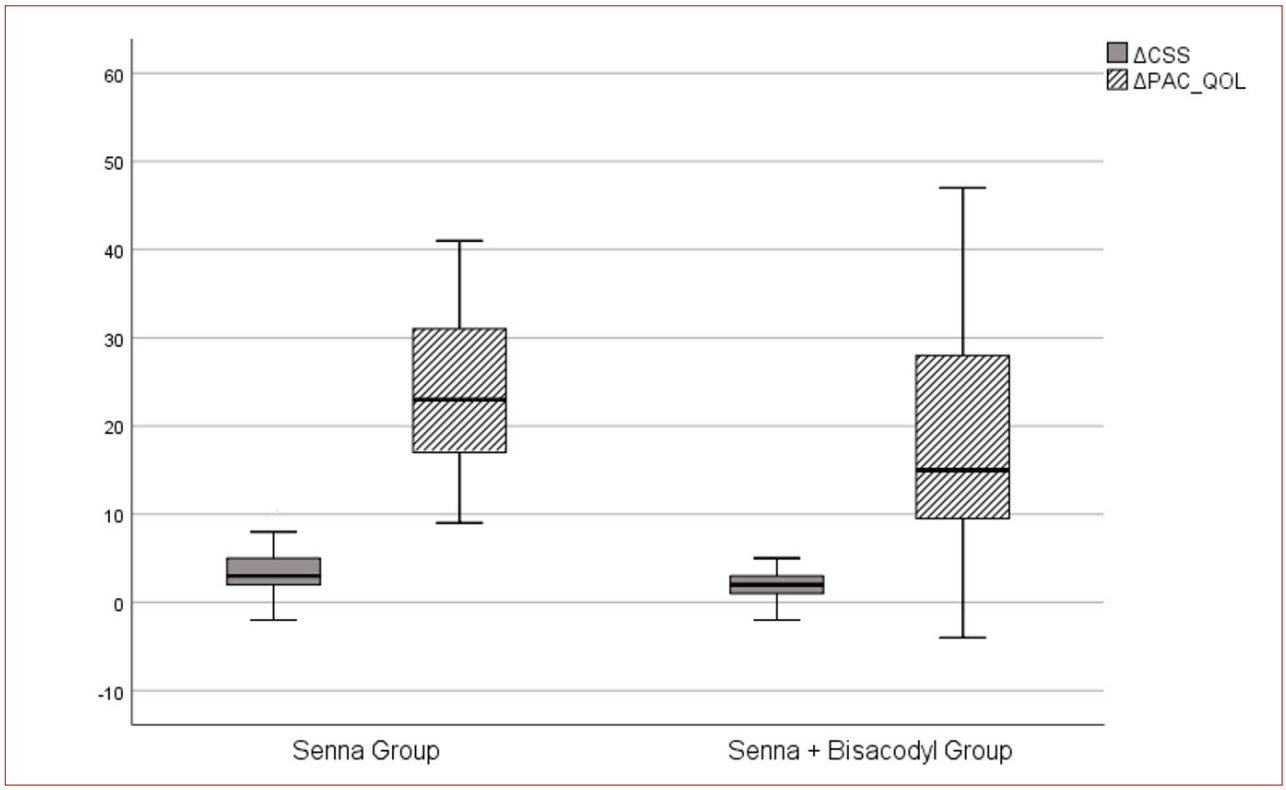


Figure 2. Post-treatment changes in CSS and PAC-QOL in by drug group

DISCUSSION

This study compared the efficacy of senna or senna + bisacodyl combination therapy, two commonly used stimulant laxatives, in elderly adults presenting with constipation in the ED. In addition, it examined the changes in CSS and PAC-QOL associated with these single and combined treatments. This is the first study to evaluate the combined use of senna and bisacodyl from the stimulant laxative class in patients aged 65 and older using CSS and PAC-QOL to assess their effects on constipation. Overall, the results of our study demonstrated that monotherapy with senna is more effective than its combined use with bisacodyl in the outpatient treatment of CC in elderly patients. Additionally, findings showed that senna monotherapy reduced the severity of constipation and positively affected the quality of life.

CC is a diagnosis associated with a significant burden on patients, healthcare resources, and costs; often, it leads to frequent ED visits. Studies have shown that there has been an increase in both outpatient and emergency room visits related to constipation in the United States since the early 2000s. Elderly patients constitute a substantial portion of emergency visits related to CC. Therefore, early and effective outpatient treatment for CC is crucial when it comes to preventing recurrent ED visits and complications, especially in the elderly (12). The increasing prevalence of CC in the elderly is primarily due to age-related physiological changes. Reduced physical activity and the use of multiple medications to treat comorbidities are major contributors to constipation in this population (13). In the absence of appropriate intervention for CC, elderly individuals are likely to become dependent



on care because of a decline in functional abilities and participation in daily activities (14). Current guidelines emphasize that standard treatment for CC in the elderly often includes pharmacological therapy when improvements in terms of diet and lifestyle changes are challenging. Laxatives form the cornerstone of pharmaceutical treatment for constipation, and they are widely used in treating and preventing constipation in elderly populations. Because of their physiological fragility, elderly individuals require careful assessment and personalized selection of laxatives based on their comorbidities, concomitant medications, and potential side effects (15).

Stimulant laxatives are widely reported to be used both by prescription and over the counter (16). As in all clinics, in the ED, stimulant laxatives are the most commonly prescribed medications in visits related to CC. Bisacodyl, a diphenylmethane derivative, and senna, an anthraquinone derivative, are considered rescue therapies for patients who do not respond to defecation. However, their long-term use is limited because of undesirable effects, such as abdominal pain, cramping, diarrhea, bloating, and electrolyte disturbances (17). A recent systematic review by Rao and Brenner indicated that over-the-counter medications such as senna and bisacodyl are effective in the treatment of CC, but they are also associated with common gastrointestinal side effects, such as abdominal pain and diarrhea. It was reported that a dose reduction of senna can improve tolerance (18).

The review by Rao and Brenner also noted that senna therapy was classified as recommendation grade A and evidence level I among over-the-counter laxatives. In contrast, bisacodyl therapy is classified as a class B recommendation and level I evidence (18). The most frequent adverse effects we saw in our study assessing these drugs' short-term use were nausea, diarrhea, abdominal pain, lightheadedness, and weight loss. Dizziness was significantly more frequent in combination therapy than it was in single therapy. Furthermore, the need for dose reduction was significant in 33.3% of the patients receiving combination therapy. Therefore, we think that it is essential to closely monitor elderly patients receiving combination therapy, which has a high potential for side effects. In addition, considering the high potential for adverse effects, we propose that this medication group should not be easily accessible to patients; it should require a prescription.

The efficacy or safety of the long-term use of stimulant laxatives still lacks sufficient research; hence, they are recommended primarily as short-term or rescue therapies. Bisacodyl and senna differ in their metabolites. Bisacodyl is metabolized in the intestines to an active metabolite called bis-(p-hydroxyphenyl)-pyridyl-2-methane, which is known to directly stimulate colonic peristalsis by acting on the colonic mucosa. It is understood that irritation occurring in the colon is attributable to this metabolite. When converted into active metabolites by intestinal bacteria, senna stimulates the production of prostaglandin E2 and the secretion of chloride ions, thereby promoting peristalsis in the large intestine and increasing moisture content in the bowel (19). A recent meta-analysis confirmed that bisacodyl significantly increases the number of spontaneous bowel movements per week when administered daily, with efficacy ranging from 78% to 99%. Furthermore, the study emphasized that bisacodyl is effective and safe for up to four weeks of treatment. Because of limited evidence about their long-term safety, however, stimulant laxatives are not recommended for use beyond one month (16).

In a recent guideline from the American Gastroenterological Association, bisacodyl was noted to be effective in treating constipation and improving QOL, despite its high potential for side effects. There is limited evidence from long-term studies of senna, but it has been reported that senna is effective for the short-term treatment

of constipation, even if dose reduction is often necessary. Thus, senna is highlighted among over-the-counter medications as preferred for the short-term management of CC (20). In a trial conducted by Morishita et al., senna dramatically enhanced QOL and increased the frequency of bowel movements compared with a placebo. In the senna group, there were significant alleviation in the following symptoms: abdominal bloating, straining when passing feces, and afeeling of incomplete evacuation. However, there was no improvements in abdominal pain. Senna's narcotic impact could be one explanation for this. As done in our study, Morishita et al. permitted patient-led dose reduction in the event of diarrhea or other stomach problems. The findings showed that the senna group experienced a much greater incidence of dose decrease than the placebo group did (21). Our study did not find a statistically significant difference in the frequency of drug side effects between the two groups. However, there was a statistically higher need for dose reduction because of drug side effects in the senna + bisacodyl group. Our findings also indicated that dizziness was more frequent in the senna + bisacodyl group compared with the senna group. This side effect poses challenges to the use of these medications in the geriatric population. Therefore, those selecting medications for geriatric patients should take into account dizziness as a significant side effect when selecting medications for geriatric patients.

Constipation can occur across all age groups, but elderly patients are particularly susceptible to this condition (22). Upon reviewing the literature, we did not come across studies specifically indicating an age range within the geriatric population in which stimulant laxatives are more effective. Our study population had an average age of 75 years, and the efficacy of senna alone was lower in the oldest age group. If stimulant laxatives are to be preferred in the oldest age group, based on our findings, we do not recommend senna alone. This situation could be attributed to advancing age, decreased physical activity, or diminished cognitive function.

Finally, in the literature, it has been observed that both senna and bisacodyl significantly improve PAC-QOL and CSS (21,23,24). Morishita and colleagues compared senna and magnesium oxide (MgO) treatment with a placebo in the short-term management of CC. They found that the senna and MgO group had significantly improved QOL compared with the placebo group (21). In another study, senna was compared with lubiprostone for the treatment of constipation in postoperative orthopedic patients treated with opioids. Both treatments showed beneficial effects on constipation symptoms and QOL (23). Another randomized controlled trial found that bisacodyl and sodium picosulfate significantly improved PAC-QOL scores in patients with CC (24). Our study showed that single therapy with senna was more effective on PAC-QOL and CSS in short-term treatment for constipation. Upon reviewing the literature, we did not find a study investigating the impact of senna + bisacodyl combination therapy on changes in PAC-QOL and CSS.

LIMITATIONS

This study had several limitations. First, the study population was small, which may limit the generalizability of the findings. In addition, while the senna group received 20 mg of sennoside B, the combination therapy group received only 3 mg of sennoside B, which could have affected the comparability of the treatments. Second, the study only evaluated patients admitted to the ED. Thus, the results may not apply to all elderly patients with constipation. Third, the study population consisted exclusively of geriatric patients, which could make treatment adherence and follow-up visits relatively challenging. Finally, the short duration of treatment was a significant limitation, highlighting the need for long-term prospective studies in this area.



CONCLUSION

In conclusion, CC is a common condition among elderly individuals that significantly affects QOL and healthcare resource utilization. Assessing the effectiveness of medications helps prevent potential complications. This study's findings showed that, for short-term treatment of constipation in the elderly population, senna demonstrates superior efficacy over senna combined with bisacodyl in alleviating the severity of constipation and improving QOL.

Statement of ethics: This study was approved by the Atatürk University Faculty of Medicine Training and Research Hospital, Erzurum, Turkey (approval no. 2023–06/02).

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