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Turkish Journal of GERIATRICS

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FROM THE EDITOR IN CHIEF

The COVID-19 pandemic has been challenging the world and more specifically, our face-to-face course model. In accordance to these disrupting circumstances, the executive board of Turkish Geriatrics Society decided to turn the coming courses into fully virtual meetings. These E-Courses will take place on October and November of this year with the exciting scientific programmes, developed by the members of the Committee of Scientific Advisors of the Turkish Geriatrics Society.

The upcoming educational activities are:

12th BASIC GERIATRICS COURSE-APPROACH TO THE ADVANCED AGE GROUP DURING THE COVID-19 PANDEMIC

This course will be held in 1-3rd Oct, 2020. In daily clinical practice attempts to provide older persons wellbeing encounter many practical problems during this pandemic. Based on this issue, all the aspects of their requirements will be discussed during the 12th Basic Geriatrics Course.

SCIENTIFIC RESEARCHES IN GERIATRICS-5

This course will be held in 26-28th Nov, 2020 and will cover the problems of the researches on seniors in a multidisciplinary manner.

All the details of these courses are announced on the web site of Turkish Geriatrics Society and the members of the Board of Directors are honored to invite you to these scientific events.

Yeşim Gökçe Kutsal



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REVIEW

COVID-19 PANDEMIC AND THE MENTAL HEALTH OF ELDERLY

ABSTRACT

The new type of corona virus (SARS-Cov 2) pandemic, which broke out in Wuhan province of China in December 2019, has spread rapidly in a short time, affected and is still affecting millions of people all over the world. Numerous measures have been taken to prevent the spread of the outbreak, in particular "maintaining social distance". Elderly individuals are vulnerable to COVID-19 due to the aging of their immune systems and concomitant chronic diseases; morbidity and mortality are rather high in this age group, so prevention measures are even of greater importance in older individuals. However, both the pandemic and the infection control measures taken for the pandemic negatively affect the mental health of elderly individuals as well as their physical health. In this review study, it was aimed to examine briefly the effects of pandemics on mental health of the society, to review the studies investigating the effects of outbreaks on the mental health of the elderly, and to make inferences for the future.

Keywords: Coronavirus; Pandemics; Aged; Mental health

INTRODUCTION

Started in Wuhan province of China in December 2019, the new type of Coronavirus (SARS-Cov 2) outbreak has spread rapidly all over the world and affected thousands of people in almost every country. Many epidemics caused by viruses (like SARS and MERS) have been around since the beginning of the twenty-first century, but among them, COVID-19 seems to have spread at the highest speed and caused enormous number of deaths (1). The World Health Organization (WHO) declared the new type of Coronavirus outbreak as a pandemic on 11 March 2020. Measures have been taken by authorities in almost all countries of the world in order to prevent the spread of SARS-Cov-2 infection, which has a higher range of contagiousness compared to previous Coronavirus infections (2). In addition to the fundamental measures such as the use of face masks in public areas, following general basic hygiene rules, maintaining a distance of at least 2 meters from others called as "social distancing", other measures such as stopping production in non-essential business sectors, quarantine and curfews have also been implemented in some countries.

Although the SARS-Cov-2 virus affects individuals of all ages, older individuals have been found to be more vulnerable and at higher risk of infection due to their declining immune systems and concomitant chronic diseases. In older adults, the illness follows a more severe and prolonged course; secondary bacterial infection and respiratory failure is reported to develop more frequently and intensive care treatment is needed with additional pharmacological treatments (3). The elderly people, often fragile and with a number of concomitant chronic diseases, should be closely monitored during and after the treatment, and additional measures should be implemented for rehabilitation. However, in addition to many physical problems, those elderly adults are also deprived of the help and social support of their caregivers due to the social distancing measures both at home and in the

hospital, and become socially isolated (4).

The high mortality and morbidity associated with the disease makes the protection measures more crucial in the elderly population. Though the epidemic broke out a couple of months ago, health authorities such as the World Health Organization have developed a guideline for the elderly and the staff in nursing homes, but they have not developed any guidelines for older people in the community, which comprises the majority of the elderly population (5). With the circular of the Ministry of Internal Affairs issued in our country on 21 March 2020, a curfew for the people aged 65 and over and those having additional chronic diseases were implemented. In other countries, such a restrictive curfew decision was not taken for the elderly, but older people were recommended not to enter the crowds as much as possible to maintain social distance. Although such control measures have a positive effect on disease prevention, they also make it difficult for older individuals to implement their essential daily activities such as shopping, bank transactions, and health care services, leading them to stay away from social relations, which is very important especially in the old age, and cause them to experience some kind of social isolation. Curfews have been progressively relaxed and eventually lifted in some areas for the general public; however, as the risk of transmission of the virus continues, the older adults are recommended to continue their protection and isolation measures. Therefore, the elderly will likely continue their lives with restrictions for a longer period of time. As a result, both the disease process and prevention measures appear to cause elderly individuals to experience additional psychological difficulties.

Natural disasters, epidemics and preventive measures like keeping social distance have critical effects on the mental health of individuals both in the short and long term. From the beginning of the twenty-first century, numerous outbreaks caused by different viruses have been thought to affect the psychology of the whole society and also the groups



affected by the epidemic at differing levels (6); and numerous studies have been carried out on the psychological effects of epidemics both during and after the outbreak. The data obtained from previous epidemic experiences are quite valuable for the road mapping of the current and future outbreaks. In this review, it was aimed to investigate briefly the effects of outbreaks on the mental health of society as a whole, and to review the studies examining the effects of epidemics on elderly individuals' mental health and to make inferences for the future.

Effects of epidemics on mental health

The research focusing on the effects of epidemic diseases on mental health has generally been carried out on those who are primarily affected by the disease, healthcare professionals or on the individuals who survive the disease. Post-traumatic stress symptoms, anxiety and depression symptoms, anger and stigmatization were investigated in those groups after the SARS outbreak at the beginning of the twenty-first century. In a study with SARS survivors, 25% of individuals were found to have symptoms of post-traumatic stress and 15% had depressive disorders approximately 3 years after the outbreak (7). Being in long-term quarantine and being a healthcare worker have been found to be associated with post-traumatic stress symptoms and feeling more psychological stress (8). Twenty per cent of those who contracted SARS were healthcare professionals, that was the highest rate of SARS infection than in any other group. In a study with healthcare workers 3 years after the outbreak, being younger, working in high-risk areas, being quarantined during an epidemic, and having family members-friends who contracted SARS were found to be associated with higher symptoms of post-traumatic stress, as well as the persistence of such symptoms in the long term (9). On the other hand, many other studies have revealed that altruistic attitudes in healthcare workers reduced negative psychological responses and depression symptoms. Having a higher level of education, being an experienced healthcare worker, and being

adequately trained and supported for outbreaks have also been found to reduce the incidence of psychiatric illness in healthcare workers (10).

The effect of outbreaks on populations not directly affected by the disease, has rarely been a research topic investigated. In a population-based study conducted in Taiwan right after the SARS epidemic, 9% of the participants were found to be more pessimistic after the epidemic, and 11% of them had psychiatric diseases such as sleep disorder, anxiety and depression. In this group, being over 50 years old, being highly educated and having concerns that SARS will recur were shown to be factors predicting symptomatic cases (11). In another study conducted with people who applied to community health centers, it was detected that 23% of 415 people had psychiatric problems related to SARS, especially symptoms of anxiety and depression, and 26% of them had post-traumatic stress symptoms. These rates were close to, or even higher than the rates found in previous studies with healthcare professionals or people surviving the disease (12) and it has been suggested that this situation may be related to the sense of uncertainty, lack of information and loss of control in the society. After the Middle East Respiratory Syndrome (MERS) epidemic in 2015 in Korea, in a study conducted with people who had contact with MERS patients and isolated due to the risk of infection, anxiety symptoms were detected in 7.6% and the feelings of anger in 16.6%. The presence of anxiety and anger feelings after isolation was found to be associated with inadequate supply of daily necessities like food, water and self-care products, social activity limitation, history of psychiatric illness and financial loss (13).

Although COVID-19 is a new disease with yet unknown effects, studies have already started aiming to investigate its effects on mental health. In a study carried out in the Southwestern region of China in the early period of the COVID-19 epidemic, the prevalence of anxiety and depression were found higher in the group affected by quarantine (12.9%

and 22.4%, respectively) than the group unaffected (6.7% and 11.9%, respectively). In the same study, it was also found that lower household income, lower education level, perception of one's general health as poor, lack of psychological support, and high level of economic loss due to pandemic were associated with anxiety and depression scores (14).

It is common for the society to experience fear in the first encounter with diseases of unknown origin and with probable fatal consequences. The individuals who were isolated during the MERS epidemic were afraid of being stigmatized and excluded by their neighbors alongside other psychological problems they experienced (13). Fear and lack of information or being misinformed often bring about stigmatizing and discrimination. During the SARS epidemic in United States, fear, stigmatization and discrimination reactions emerged against Asian people (15). When infection control techniques such as quarantine and isolation are implemented on affected groups, fear seems to rise up even more, and discriminatory behavior also increases considerably.

Effects of epidemics on mental health of the elderly

Studies investigating the effects of epidemics on elderly individuals have been carried out mainly on medical issues such as symptomatology, clinical course and treatment of the infection. The scarcity of studies examining how diseases and preventive measures affect the mental health of older adults is surprising. Elderly individuals are bound to be a heterogeneous group from different perspectives: they may be classified by age periods (younger aged (65-74 years), elderly (75-84 years), and older aged ones (85 and over), both physically and cognitively tend to be distinctive from each other), and by living conditions such as those living alone or in an extended family, retired or actively working, appearing to be unemployed but actively taking on responsibilities such as housework and caring for grandchildren, living independently or dependent on all daily activities, those with a permanent

caregiver at home or in nursing homes. Thus the elderly are composed of many groups that differ from each other in terms of their financial and social opportunities. All these individuals with differing characteristics are anticipated to be affected by the epidemic differently on physical, economic and psychological grounds. Prior to the effects caused by the disease, prevention measures have important impacts on the mental health of older individuals.

SARS Cov-2 infection is known to be transmitted through droplets, for this reason increasing the social distance is the primary one among the measures taken for protection. In addition to the suggestions for the community-dwelling elderly to stay at home, not to enter the crowds or even reduce contact with family members, it is widely recommended to take measures to reduce the contact between caregivers, visitors and residents in hospitals and nursing homes, however all these measures also play a role in increasing social isolation.

Social isolation is known to increase the risk of cerebrovascular disease and cognitive impairment in the elderly and acts as an important risk factor on mortality (16). Numerous studies have reported that elderly individuals are significantly affected by loneliness and social isolation in their daily lives, and such isolation and lack of social support are associated with depression and suicide in elderly individuals (17). Social isolation has also been revealed to reduce the anti-viral immune response in older individuals (18). In addition to physical factors such as reduced immune response due to old age and accompanying chronic diseases, loneliness and isolation may increase the susceptibility of elderly individuals to various infectious diseases and COVID-19 through effects mentioned above.

The effect of outbreaks on mental health of the elderly is not limited to social isolation. Anxiety about getting sick and being a burden on the family, lack of support, limited access to healthcare system may also affect older individuals mentally. As a matter of fact, in a study conducted after the end of the SARS epidemic that caused the death



of 299 people in Hong Kong between 1 November 2002 and 7 August 2003, suicide rates during the outbreak were found to be increased by 31% among the elderly individuals in Hong Kong compared to the same period of 2002 (19). The main increase in suicide rates was in elderly women, enhanced hopelessness associated with inability to access previous social support networks and healthcare services was considered to lead to the increase in suicidal behavior. In a retrospective analysis, suicide rates among elderly individuals in Hong Kong were found to be still high in 2004 (20). Examining the forensic records such as notes and suicide letters left by the individuals, some cases were revealed to be associated with the fear of getting sick, fear and anxiety associated with social isolation, and the fear of becoming a burden to the family (21). Elderly people with mental illness or cognitive disorders such as dementia are expected to experience exacerbation of mental and behavioral problems due to both exposure to stress and a possible infection during the epidemic; in addition, the infected elderly present frequently with delirium rather than the classical symptoms.

Case fatality rate for individuals over 60 years of age for SARS has been reported as 43.3%. During the SARS epidemic, finding out that 70% of elderly people living in nursing homes in Hong Kong contracted the disease from the hospital, the visits to the hospitals were restricted during the epidemic period as a measure to prevent new infections. Elderly people with chronic illness and psychiatric disorders were adversely affected by this regulation, being unable to attend to regular follow-ups and having difficulty in accessing treatment and their medications (22). The COVID-19 outbreak is likewise expected to increase inequality in access to healthcare in low-income countries and further marginalize elderly people who already have limited access to healthcare (23).

During SARS epidemic, outreach healthcare services offered to the residential homes and domiciliary home visits to the elderly patients

were suspended due to the shortage of healthcare professionals (22). Dementia patients staying in long-term institutions and patients in geropsychiatric services have problems in following the infection control measures due to their cognitive problems; this fact increases the infection risk of healthcare personnel and other staff who are responsible for care, and the healthcare staff may be reluctant to take responsibility for the care and treatment of such patients, or take strict measures and reduce contact with the patients (22). Quarantine of nursing home staff who gets infected or who has contact with infected patients results in a shortage of care personnel in nursing homes, and overloading of the remaining staff leads to flaws in the care process. The nursing home residents may feel abandoned or lonely; depression, weight loss and behavioral problems may emerge in patients with dementia when further negative factors are added such as reduced human contact and warmth, living spaces arranged like a home resembling a hospital due to protective equipment, visitors banned, residents not allowed to gather in common areas and perform group activities, and being isolated in their rooms (24). The banning of the family visits may prevent the supervision of the service quality, especially in nursing homes operated by the private sector, and may create extra risk for such residents.

Another situation that negatively affects older individuals is the negative opinion that the elderly will pose an extra risk to healthcare professionals as "invisible SARS patients" due to the atypical clinical appearance of the disease in the elderly. Furthermore, there is a high risk of labelling the older people as "hopeless cases", "useless, unproductive" people, and regarding them as a burden on the system (22). As a matter of fact, both negative and stigmatizing posts about elderly people, negative stereotypes about age and "ageism" became more uttered on social media in both SARS epidemic and COVID-19 pandemic (25).

Shortage in staff and resources that may be encountered in the healthcare system during the

epidemic will also bring about ethical problems: during the COVID-19 outbreak, setting an age limit for the admission to intensive care, limiting the admission of the elderly with lesser years of survival or with a diagnosis of dementia to the hospital, instead saving the scarce sources for younger and healthy people have been frequently debated (26). In addition to being aware of the possibility of such a discrimination, fear of getting sick and dying would also trigger symptoms of anxiety and depression in elderly, yet increase the possibility of domestic violence and neglect.

It has been several months since the outbreak of the COVID-19 pandemic, and despite the now well-known fact that the viral outbreaks affect the mental health of older people from previous experiences, the scarcity of studies examining the mental health of elderly individuals is rather striking. In a survey conducted among elderly people in China, 37% of the people over the age of 60 were found to experience depression or anxiety, and women were found to be more affected than men (27). On the other hand, in some studies older people were found to experience lower anxiety and depression symptoms compared to younger ones (14). This finding is explained as those who live into the eighth or ninth decade of their lives in the present time have already survived many difficult periods such as the Second World War and economic crises, and gained resistance to stress. However more studies are needed to reach a definite conclusion.

Conclusions and recommendations

It seems that epidemics or pandemics associated with viruses will likely continue to pose a threat to humanity for a long time, with the contribution of globalization increasing the contraction risk (28). Governments, health authorities, public institutions and individuals need to be prepared for viral outbreaks in the future. Pre-drawn road maps will play a significant role in reducing contraction, mortality and morbidity in similar outbreaks in the future. Outbreaks affect the mental health as well as the physical health. Outbreaks and also

the infection control measures affect the mental health of elderly people who has a high risk of morbidity and mortality, and similar groups such as the healthcare workers, infected people and their close contacts and the poor with a limited access to healthcare services. Some short- and long-term measures could be implemented to protect the mental health of older people in present and future epidemics.

Initially all healthcare professionals, such as family physicians, nurses, physiotherapists, and especially mental health professionals working with elderly individuals should all be informed about the psychological reactions that may be seen in the elderly during the epidemics; they should evaluate the suicidal thoughts, anxiety and depression symptoms in all elderly patients they encounter. Large-scale studies examining the effects of outbreaks on the mental health of older individuals should be planned and conducted respectively. In addition to the research examining the factors predisposing to stress and negative psychological responses, widespread studies should be encouraged to investigate the factors predicting resilience in different groups. While planning protection measures for elderly people, collaboration of local and general administrations, health authorities, professional organizations and the participation of relevant non-governmental organizations and community representatives in decision-making mechanisms would provide more effective results. Maintaining social distance should be the most important and primary method in elderly individuals as in all vulnerable groups, but all measures to be taken for assuring the distance should be arranged so as not to increase the sense of loneliness and isolation. In today's world, social media and the internet are highly used modalities for the public information; but considering the limited use of the internet and social media by elderly, they should be informed through traditional media like television and newspapers. Local announcements through local authorities such



as municipalities and mukhtars in our country, and even announcements by religious services could also be used in appropriate situations. The suspension of routine healthcare services during epidemics may cause the elderly to feel helpless and abandoned; for this reason, "clean" healthcare services apart from pandemic hospitals should be created for the elderly to continue their routine healthcare and follow-up of the chronic conditions. Online counseling and online mental health services have become widespread in the 21st century and have also been widely used during epidemics. Considering the majority of elderly individuals not being familiar with internet services, more traditional methods such as telephone counseling/hotlines should be provided for this group. Mental health support lines providing services only for the elderly could be established, and voluntary mental health workers could reach elderly individuals who live alone through the support lines.

Through non-governmental organizations, volunteers could reach out for help to the elderly

in various ways; these services may include regular contact with elderly people over the phone and helping for the daily needs of those living alone. The establishment of coordination systems for the execution and control of such activities could be planned. Measures should be taken to protect older individuals residing in elderly care centers and nursing homes, but also arrangements should be made to gather them with their relatives in a controlled manner in order to reduce the feelings of loneliness, abandonment, and avoid the lack of stimulus and related behavioral problems. For taking early measures to prevent negative psychological consequences in the current and future outbreaks, relevant studies should be carried out about the psychosocial problems and mental health needs of the elderly.

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RESEARCH

COMPARISON OF HIGH FLOW NASAL OXYGEN AND MASK OXYGEN IN THE WEANING PROCESS OF GERIATRIC INTENSIVE CARE PATIENTS

ABSTRACT

Introduction: Geriatric patients under mechanical ventilation in the intensive care setting can have a prolonged weaning process and face respiratory failure requiring reintubation. High flow nasal oxygen therapy can be used to improve oxygenation after extubation. In this study, we aimed to compare high flow nasal oxygen therapy with simple oxygen face mask treatment in the weaning process of geriatric intensive care unit patients.

Materials and Method: Fifty-three patients above the age of 65 were retrospectively included in the study. High flow nasal oxygen therapy was initiated to patients with partial pressure of oxygen/fraction of inhaled oxygen < 150 within 48 hours of extubation. Patients with partial pressure of oxygen/fraction of inhaled oxygen ≥ 150 were treated with oxygen masks with 10-15L/min flow. The two groups were compared for reintubation and mortality. A cut-off partial pressure of oxygen/fraction of inspired oxygen value for reintubation requirement was calculated.

Results: Reintubation rates were 51.6% in Group-HFNOT and 54.5% in Group-Mask. Mortality rates of reintubated patients; Group-HFNOT 38.7%, Group-Mask 40.9%. There was no significant difference between the groups. The mean baseline partial pressure of oxygen/fraction of inspired oxygen value was 119.7 ± 18.4 for Group-HFNOT, and a cut-off value of 107 for predicting reintubation was calculated.

Conclusion: High flow nasal oxygen treatment can be preferred for geriatric patients with respiratory failure during the weaning process with appropriate patient selection.

Keywords: Geriatrics; Oxygen inhalation therapy; Ventilator weaning; Respiratory insufficiency; Critical care

INTRODUCTION

An increasing number of geriatric patients in intensive care units (ICUs) is expected with the expanding geriatric population worldwide (1). Mechanical ventilation (MV) is necessary for 38-51% of geriatric ICU patients and weaning from MV is a challenge in this patient population (2). Respiratory failure requiring reintubation is associated with increased ICU length of stay and higher mortality for all age groups (3,4). Acute respiratory failure can arise after weaning from MV due to dysfunction of the medullary respiratory centre or respiratory muscles, impaired lung mechanics, or impaired gas exchange (4). The rate of acute respiratory failure, which necessitates reinitiating MV within 48 hours, following successful, planned extubations is 10-15% among all ICU patients and can surpass 20% in high risk populations such as geriatric patients (3,5,6).

High flow nasal oxygen treatment (HFNOT) has emerged as an alternative to traditional oxygen support. These devices supply heated, humidified oxygen at flows as high as 60 L/min through nasal cannulae (7,8). HFNOT is beneficial in protecting mucociliary functions, preventing lung collapse, providing a constant inspiratory oxygen fraction (FiO₂), and clearing carbondioxide in dead spaces (9). With better gas exchange and oxygenation, HFNOT reduces the work of breathing. HFNOT may be preferred over traditional oxygen treatments following planned extubations (10,11). Improvement of dyspnoea and oxygenation parameters, better tolerance, and increased survival have been reported with the use of HFNOT to prevent respiratory failure after extubation (12,13).

In our retrospective study, we aimed to compare HFNOT with oxygen mask treatment in the weaning process of geriatric ICU patients.

Table 1. Comparison of demographic variables between the HFNOT and Mask groups

	HFNOT (n=31)	Mask (n=22)	p
Age	79±7.8	82.2±8.3	0.157 a
Sex (Male/Female); n (%)	19 (61.3%)/12 (38.7%)	10 (45.5%)/12 (54.5%)	0.254 b
GCS	14 (10-15)	12.5 (10-15)	0.216 c
Apache II	19.5±6.9	19.5±8.1	0.999 a
SAPS II	44.8±14	45±16.3	0.589 a
Cause of MV; n (%) Primary respiratory / Secondary	25 (80.6%)/6 (19.4%)	16 (72.7%)/6 (27.3%)	0.524 d
Basal PaO ₂ /FiO ₂ ratio*	119.74 ±18.43	211±77.36	<0,001a
MV duration before extubation (days)	5 (1-15)	3.5 (1-24)	0.339 c
NIMV support; Yes/No, n (%)	5 (16.1%)/26 (83.9%)	8 (36.4%)/14 (63.6%)	0.092 b
Reintubation; Yes/No, n (%)	16 (51.6%)/15 (48.4%)	12 (54.5%)/10 (45.5%)	0.833 b
Discharge from the ICU; n (%) Discharged alive Mortality	19 (61.3%) 12 (38.7%)	13 (59.1%) 9 (40.9%)	0.872 b

Descriptive statistics are expressed as the mean±standard deviation, median (min-max) or frequency and percentages. a Independent samples t-test b Pearson chi-square test c Mann-Whitney U test d Fisher's exact test * Average PaO₂ / FiO₂ ratio from blood gas results before HFNOT in Group-HFNOT and after extubation in Group-Mask. GCS: Glasgow Coma Score, Apache II: Acute Physiologic Assessment and Chronic Health Evaluation II scoring system, SAPS II: the Simplified Acute Physiology Score II, MV: mechanical ventilation, NIMV: noninvasive mechanical ventilation, ICU: intensive care unit



Table 2. Distribution of diagnoses underlying the need for mechanical ventilation

Diagnosis	HFNOT (n: 31)	Mask (n: 22)
Primary Respiratory Causes: n (%)	25 (80.6%)	16 (72.7%)
Pneumonia	21 (67.7%)	14 (63.6%)
Pulmonary oedema	2 (6.5%)	2 (9.1%)
Pulmonary embolism	1 (3.2%)	-
Lung cancer	1 (3.2%)	-
Secondary Causes: n (%)	6 (19.4%)	6 (27.3%)
Postoperative	2 (6.5%)	3 (13.6%)
Intracranial haemorrhage / CVD	2 (6.5%)	2 (9.1%)
Encephalitis	1 (3.2%)	-
Multi-trauma	1 (3.2%)	-
Urosepsis	-	1 (4.5%)

Descriptive statistics are expressed as frequencies and percentages. CVD: cerebrovascular diseases

METHODS

The study was conducted retrospectively on patients aged ≥ 65 who received HFNOT or oxygen support through face masks after planned extubation following more than 24 hours of MV in the ICU at the University of Health Sciences Fatih Sultan Mehmet Health Research and Application Center between January 2016 and January 2019. Patients with MV under 24 hours, an unplanned extubation, Glasgow Coma Scale (GCS) score ≤ 8 , or a tracheotomy were excluded. Approval for this study was obtained from the University of Health Sciences Fatih Sultan Mehmet Health Research and Application Center Scientific Studies Board (27/02/2019, 17073117-050.06-E.41).

All 53 included patients were started on 6-8 L/min of oxygen via standard face masks after their extubation. At the time of the study period, HFNOT was a new treatment modality in our clinic and the decision to switch to HFNOT was made by the patient's clinician. HFNOT was initiated if partial pressure of oxygen/fraction of inhaled oxygen ($\text{PaO}_2/\text{FiO}_2$) was < 150 within 48 hours of extubation. Patients with $\text{PaO}_2/\text{FiO}_2 \geq 150$ were treated with oxygen masks with flows increased

to 10-15L/min. The patients were thereby placed in different groups. Patients who were on HFNOT had continued their treatment for at least 24 hours and until supplemental oxygen was no longer necessary or reintubation was required. Patients who were continued on standard oxygen support via face masks made up the Mask group and patients who were started on HFNOT within 48 hours of extubation made up the HFNOT group. HFNOT was delivered with the AIRVO 2 OptiFLOW™ (Fisher & Paykel, New Zealand) device.

Data on age, sex, diagnoses, GCS score at the time of extubation, Acute Physiologic Assessment and Chronic Health Evaluation II scoring system (APACHE II) and the Simplified Acute Physiology Score II (SAPS II) scores, days on MV and, for reintubated patients, days free of MV were recorded.

Arterial blood gases immediately after extubation for the Mask group and before HFNOT for the HFNOT group were used for baseline measurements of partial pressure of oxygen / fraction of inspired oxygen ($\text{PaO}_2/\text{FiO}_2$), partial pressure of oxygen (PaO_2), partial pressure of carbon dioxide (PaCO_2), and oxygen saturation (SaO_2). Baseline heart rate (HR), mean arterial pressure (MAP), ini-

Table 3. Comparison of reintubated and non-reintubated patients in the HFNOT group

HFNOT Group	Non Reintubated n=15	Reintubated n=16	P
Age	77±7.3	80.8±8.1	0.681a
Sex (Male/Female); n (%)	10 (66.7%)/5 (33.3%)	9 (56.3%)/7 (43.8%)	0.552b
GCS	14 (10-15)	14 (10-15)	0.129c
APACHE II	19.4±7.7	19.6±6.2	0.528a
SAPS II	49±9.5	41.4±16.3	0.724a
Cause of MV; n (%) Primary respiratory / Secondary	9 (60%)/6 (40%)	16 (100%)/0 (0%)	0.007d
MV duration before extubation (days)	6 (1-12)	5 (1-15)	0.257c
Basal PaO ₂ /FiO ₂ ratio	127±19.9	112.8±14.3	<0.001a
Basal PaO ₂ (mmHg)	60.8±8.9	54.1±5.2	<0.001a
Basal PaCO ₂ (mmHg)	38.8±6.6	36.3±5.3	0.146a
PH	7.50±0.04	7.46±0.06	0.723 a
SaO ₂	90.6±6.3	88±3.2	<0.001a
HR (beats/min)	96.4±16.3	91.7±14	0.476a
MAP (mmHg)	92.9±12.1	87.7±14	0.981a
HFNO initial flow (lt/min)	40 (30-60)	37.5 (30-60)	0.830c
Initial FiO ₂ (%)	50 (40-60)	55 (40-80)	0.281c
NIMV support; n (%) Yes / No	4 (26.7%)/11 (73.3%)	1 (6.3%)/15 (93.8%)	0.172d
NIMV support; n (%) Yes / No	15 (100%) 0 (0%)	4 (25%) 12 (75%)	<0.001b

Descriptive statistics are expressed as the mean±standard deviation, median (min-max) or frequency and percentages. a Independent samples t-test. b Pearson chi-square test. c Mann-Whitney U test. d Fisher's exact test. GCS: Glasgow coma score, Apache II: Acute Physiologic Assessment and Chronic Health Evaluation II scoring system, SAPS II: the Simplified Acute Physiology Score II, MV: mechanical ventilation, ICU: intensive care unit, HR: heart rate, MAP: mean arterial pressure, HFNO: high flow nasal oxygen, NIMV: noninvasive mechanical ventilation

tial flow rates and oxygen concentrations for the HFNOT group, need for noninvasive mechanical ventilation (NIMV), need for reintubation within 10 days of extubation, successful discharge from the ICU, and mortality were also recorded.

Age, sex, APACHE II scores, SAPS II scores, mechanical ventilation time, need for reintubation, ICU discharge rate, and mortality were compared between the two groups. Within-group comparisons were carried out for reintubation requirements. Reintubated patients in both groups were

further analysed for age, sex, GCS, APACHE II, SAPS II scores, diagnoses, MV time, freedom from MV, ICU discharge rate, and mortality. PaO₂/FiO₂ measurements were analysed for their association with reintubation, and a cut-off PaO₂/FiO₂ value for reintubation was calculated.

Statistical Method

The results are presented as the mean ± standard deviation or median (minimum-maximum) for continuous variables. Categorical variables are described as frequencies and percentages. The



Shapiro Wilk test was used to test normality. Continuous variables were compared using Student's t-test and the Mann-Whitney U test. Pearson's chi-squared test and Fisher's exact test were applied for categorical variables. The cut-off value for PaO₂/FiO₂ was determined with an ROC analysis according to reintubation for patients in the HFNOT group. A p-value <0.05 was considered significant. All statistical analyses were performed with IBM SPSS v.23.0 (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.).

2; there was no significant difference between the groups (p=0.524).

When reintubated and non-reintubated patients within the HFNOT group were compared, there were significant differences in the cause of MV, baseline PaO₂/FiO₂, PaO₂, SaO₂, and ICU discharge rates. The HFNOT group patients who required reintubation had lower baseline PaO₂/FiO₂, PaO₂, and SaO₂ values. Primary respiratory causes were more frequent in HFNOT patients requiring reintubation (p=0.007) (Table 3).

Table 4. Comparison of reintubated patients in the HFNOT and Mask groups

Reintubated Patients	HFNOT n=16	Mask n=12	P
Age	80.8±8.1	82.9±8.2	0.507 a
Sex (Male/Female); n(%)	9 (56.3%)/7 (43.8%)	4 (33.3%)/8 (66.7%)	0.229 b
GCS	14 (10-15)	12 (10-15)	0.110 c
Apache II	19.6±6.2	20.5±5.3	0.694 a
SAPS II	41.4±16.3	43.9±10.1	0.645 a
Cause of MV; n (%) Primary respiratory / Secondary	16 (100%)/0 (0%)	10 (83.3%)/2 (16.7%)	0.175 d
MV duration before extubation (days)	5 (1-15)	6.5 (2-24)	0.189 c
Day without mechanical ventilation	5 (1-10)	2.5 (1-10)	0.423 c
NIMV support; n(%) Yes/No	1 (6.3%)/15 (93.8%)	7 (58.3%)/5 (41.7%)	0.004 d
Discharge from the ICU; n(%) Discharged alive Mortality	4 (25%) 12 (75%)	3 (25%) 9 (75%)	1.000 d

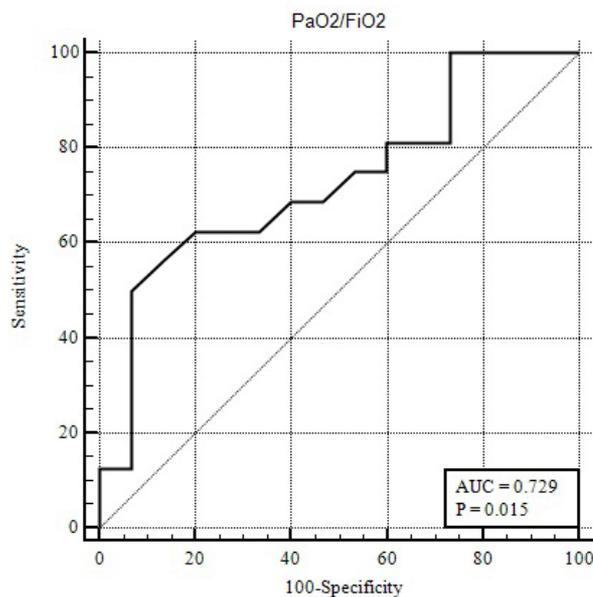
Descriptive statistics are expressed as the mean±standard deviation, median (min-max), or frequency and percentages. a Independent samples t-test. b Pearson chi-square test. c Mann-Whitney U test. d Fisher's exact test. GCS: Glasgow coma score, Apache II: Acute Physiologic Assessment and Chronic Health Evaluation II scoring system, SAPS II: the Simplified Acute Physiology Score II, MV: mechanical ventilation, NIMV: noninvasive mechanical ventilation, ICU: intensive care unit

RESULTS

A total of 53 patients who received MV in the ICU and underwent planned weaning were included in our study. Thirty-one patients were in the HFNOT group, and 22 patients were in the Mask group. Groups were not different in terms of demographic or ICU parameters (Table 1). Details on the causes of MV by study group are given in Table

Of the 22 patients in the Mask group, 12 (54.5%) required reintubation. Age, sex, GCS, APACHE II, SAPS II, MV time, and NIMV requirement were not different between the reintubated and non-reintubated patients. Ten (83.3%) reintubated patients and 6 (60.0%) non-reintubated patients in this group had primary respiratory causes for MV, and this difference was not significant (p=0.348). PaO₂

Figure 1. Figure 1: ROC curve for PaO₂/FiO₂ in predicting the reintubation of HFNOT patients



ROC analysis was used for diagnostic valuation.

and SaO₂ values measured under spontaneous respiration immediately after extubation were lower ($p < 0.001$) in patients who needed reintubation, while PH and PaCO₂ levels were within normal limits and with no significant difference ($p = 0.723$, $p = 0.080$). The mean PaO₂/FiO₂ was lower for reintubated patients (156.7 ± 33.1), than non-reintubated patients (278.1 ± 60.8) ($p < 0.001$). The mortality rate was higher, with 75% mortality in reintubated patients ($p < 0.001$). Of the reintubated patients, 2 were discharged without the need for a tracheotomy, while 1 patient was discharged with a tracheotomy.

Reintubated patients in the HFNOT and Mask groups were not different in terms of age, sex, GCS, APACHE II, SAPS II scores, cause of MV, MT time, or days free of MV. NIMV requirements were more frequent in the mask group. Mortality rates were not significantly different between two groups (Table 4).

A cut-off of PaO₂/FiO₂ ≤ 107 for reintubation

was significant in the HFNOT group with AUC = 0.729 and $p = 0.015$. For this cut-off, the sensitivity was 50%, and the specificity was 93.33% (Figure 1).

DISCUSSION

Since its introduction to our clinic, HFNOT has been increasingly used in to avoid reintubation of geriatric patients. Considering this growing interest in HFNOT in our clinic, we intended to guide our practice through our retrospective evaluation of patient data. We aimed to evaluate the effects of HFNOT on the weaning process and reintubation requirement of geriatric patients mechanically ventilated in our ICU. NIMV requirement was more frequent in the mask group than in the HFNOT group, which emphasizes HFNOT as a decent alternative to NIMV with its disadvantages (facial pressure, patient discomfort, hindrance to oral feeding). The reintubated patients in the HFNOT group had primary respiratory causes and lower PaO₂/FiO₂ ratios, which signify the need to better standardize the indications for HFNOT and



increase its appropriate use.

Lower reintubation rates in ICU patients who received HFNOT compared to standard oxygen support via face masks have been reported (7,14,15,16). Maggiore et al. showed that patients on HFNOT within the first 48 hours after extubation had lower rates of desaturation and reintubation (3.8%) in their study on ICU patients with PaO₂/FiO₂ of 200-300 (14). Hernández et al. studied patients under 65 years old with planned extubation and found a lower rate of reintubation (4.9%) among patients receiving HFNOT within 72 hours of extubation (15). In both studies, reintubation rates were lower than in our study. The two studies have accepted PaO₂/FiO₂ < 300 for HFNOT initiation, while in our study the accepted rate was <150 which explains our higher reintubation rate. Also, our patients were all in the geriatric age group and were high risk patients, which may have resulted in a higher rate of reintubation. Fernandez et al. reported better results with HFNOT than standard oxygen therapy in patients with high risk for post-extubation respiratory failure, with 11% of HFNOT patients requiring reintubation (16). In contrast to these studies, Futier et al. reported no benefit of prophylactic HFNOT over standard oxygen therapy for abdominal surgery patients with regard to long-term (>7 days) hypoxia or pulmonary complications in the postoperative period (17).

In both groups, some patients required intermittent NIMV to increase oxygenation. The NIMV requirement was not different between the groups. When only reintubated patients in the two groups were compared, we observed a higher rate of NIMV use in the Mask group. Hernández et al. reported similar rates of respiratory failure and reintubation when HFNOT alone was compared against intermittent NIMV in addition to oxygen support with a face mask (12).

HFNOT is beneficial in reducing intubation for acute respiratory failure or reintubation after extubation; however, it can cause a delay in the deci-

sion to intubate, thereby increasing mortality (18). In our study, nearly all our patients had primary respiratory causes for MV. In the HFNOT group, the last arterial blood gas results under spontaneous respiration yielded a base PaO₂/FiO₂ mean of 119.7±18.4.

In light of patients who do not require reintubation after HFNOT despite low PaO₂/FiO₂ values, we postulated that HFNOT is beneficial in preventing reintubation for patients with critical status. The PaO₂/FiO₂ cut-off we determined for reintubation in HFNOT patients was 107. Therefore, we believe that close monitoring of patients is crucial in not delaying the decision to intubate. We have taken the resulting PaO₂/FiO₂ cut-off of 107 into account when initiating HFNOT for geriatric patients in our clinic and accept a threshold up to 20% above this value when necessary, depending on the clinical findings associated with our patients.

Kang et al. found lower rates of successful weaning and extubation, more days on MV, and increased mortality (66.7%) in patients who were reintubated after longer than 48 hours of HFNOT (mean PaO₂/FiO₂=165.6) than in patients reintubated after shorter HFNOT durations (19). Ni et al observed fewer intubations with HFNOT compared to oxygen via face mask in patients with acute respiratory failure, with no difference in ICU length of stay or mortality (20). Brotfain et al. noted better oxygenation and fewer reintubations with HFNOT after extubation than with oxygen via face mask, without a difference in ICU length of stay or mortality (21). In our study, mortality was 38.7% in the HFNOT group and 40.9% in the Mask group, with no significant difference. Reintubation was associated with higher mortality in both groups.

Our study is retrospectively designed, however, we believe that HFNOT is significant in the intensive care setting, especially for geriatric patients. To reduce the rate of reintubation after weaning, HFNOT can be beneficial in clinical practice with close patient monitoring and selecting for patients

with appropriate PaO₂/FiO₂ ratios. Prospective studies that group patients according to their PaO₂/FiO₂ ratios can guide future practice. Our study has certain limitations. In addition to blood gas results, patients were evaluated for their respiratory patterns when assessing respiratory failure after extubation and making a decision regarding reintubation. However, this assessment was not recorded in a standard, numerical fashion and was not included in our statistical analysis. Future prospective studies on this topic can benefit from the standardized recording of respiratory parameters. Serial blood gas results are more important than a single result. We could not obtain serial results due to the retrospective nature of our study. An-

other limitation is the limited number of included patients. While a large number of patients received HFNOT in our ICU, only the specific group of geriatric patients was included in our study, limiting our patient size.

We conclude that, geriatric patients with post-extubation respiratory failure after the weaning process can benefit from HFNOT. In clinical practice, with appropriate patient selection, reintubation rates and noninvasive mechanical ventilation requirements can be reduced.

Conflict of Interest

The authors declare that there is no conflict of interest regarding this article.

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RESEARCH

THE OUTCOMES OF USING FIXED-DOSE NOMOGRAM-GUIDED UNFRACTIONATED HEPARIN THERAPY IN ELDERLY PATIENTS IN COMPARISON WITH YOUNGER PATIENTS

ABSTRACT

Introduction: In elderly patients, the dosing of unfractionated heparin is difficult because of changing metabolism, which affects the determination of a therapeutic level. The aim of this study was to evaluate the effects of unfractionated heparin therapy in an older population and to determine whether there was any difference from a younger population in terms of the activated partial thromboplastin time results and complication rates when using a standard nomogram.

Materials and Methods: A total of 120 patients aged <80 years (Group 1) and 120 patients aged ≥80 years (Group 2), all of whom had been given unfractionated heparin therapy for selected indications in the coronary care unit, were randomly selected and retrospectively enrolled in the study. Infusion time up to a maximum of 48 hours was included, and activated partial thromboplastin time results in that period were categorised as subtherapeutic, therapeutic, or supratherapeutic. The rates of the patients' subtherapeutic, therapeutic, and supratherapeutic results were compared between groups.

Results: The peak activated partial thromboplastin time level was higher in patients aged ≥80 years (58.85 [51.28] vs 76.50 [57.45], $p < 0.001$). The supratherapeutic activated partial thromboplastin time percentage (0 [0.25] vs 0.20 [0.43], $p < 0.001$) and numbers of first activated partial thromboplastin time in the supratherapeutic range (10% vs 24.2%, $p = 0.004$) were significantly higher in the older group.

Conclusion: Over-anticoagulation may be a problem in the elderly population when using standard nomograms. It was concluded that improvements should be made for a nomogram specific to an older population.

Keywords: Aged; Partial thromboplastin time; Heparin; Hemorrhage



INTRODUCTION

The decision to administer anticoagulation is difficult in the elderly population due to the higher risk of haemorrhage and susceptibility to thrombosis. However, there are no specific recommendations about the use of anticoagulant medications for patients of advanced age.

Unfractionated heparin (UFH) is a parenteral anticoagulant that has been used for many years for different indications. The pharmacokinetics of UFH can vary because of interactions with various plasma proteins (1). Therefore, closely monitoring UFH's effects to reach optimal anticoagulation is the mainstay of heparin therapy. For this monitoring, the activated partial thromboplastin time (aPTT), which targets reaching and maintaining a therapeutic range, is commonly used. However, the unpredictable pharmacokinetics of UFH also affect the time taken to achieve a therapeutic level.

The management of UFH administration is challenging, especially in the elderly. Age-related decreased renal function in elderly patients can result in prolonged half-life and increased blood levels of anticoagulants (2). Although the mechanism is not fully understood, older patients are more sensitive to anticoagulants because of pharmacodynamic changes (3). This may also be because of binding to plasma proteins other than antithrombin, which causes alterations in the blood level (4).

Based on the aforementioned data, it was hypothesised that routine treatment schemes and doses of heparin, which are in general use, may lead to over-anticoagulation in the elderly. World Health Organization has declared recently the elderly age group as 80 years and older. Also, there is no previous clinical study in the literature investigating the variable effect of UFH in the above mentioned oldest age group. Therefore, the aim of this study was to compare the results of using the same nomogram for patients aged <80 years and patients aged ≥ 80 years.

MATERIALS AND METHOD

A retrospective examination was made of the records of coronary care unit patients who had been treated with UFH according to the same nomogram between January 2012 and March 2020. Selected indications for anticoagulation included acute coronary syndromes, atrial fibrillation, mechanical heart valve, and intracardiac thrombus. Patients with pulmonary embolism or deep venous thrombosis were not enrolled in the study due to the use of a different nomogram. Patients with subcutaneous UFH administration, heparin infusion duration of less than 24 hours, or age of <18 years were excluded. A total of 120 patients aged ≥ 80 years (Group 2) were randomly selected, and 120 patients aged <80 years (Group 1) were also selected randomly for comparison.

All 240 patients had been given a bolus UFH dose of 5000 units intravenously followed by an intravenous infusion of 1000 units/h. The aPTT levels were measured every 6 or 12 hours, and the infusion dose was managed according to the nomogram in current use in the study hospital (Table 1). The therapeutic range was defined as aPTT within 50–70 seconds.

The aPTT measurements were performed with Dade Actin FS (Siemens Healthcare Diagnostics, Marburg, Germany), which can detect aPTT values between 22.1 and 180 seconds. The test results were classified as therapeutic (50–70 seconds), subtherapeutic (<50 seconds), or suprathereapeutic (>70 seconds). The proportions of therapeutic (the patient's therapeutic aPTT results / the patient's total number of aPTT measurements), subtherapeutic, and suprathereapeutic results were identified for each patient. Then, all the subtherapeutic aPTT ratios, calculated for each patient separately, were analysed to reach the mean and median values of subtherapeutic aPTT proportion distribution in 120 patients. The same calculations were also performed to display the distribution of

Table 1. Nomogram of intravenous unfractionated heparin that is used in our hospital.

aPTT(seconds)	Bolus, units	Discontinue infusion, minutes	Change rate of infusion (mL/hour)*	Time of next measurement, hours
<40	3000	0	+2	6
40-49	0	0	+1	6
50-70	0	0	0	next day
71-85	0	0	-1	next day
86-100	0	30	-2	6
101-150	0	60	-3	6
>150	0	60	-6	6

*1 ml fluid containig 50 IU heparin sodium aPTT: activated partial thromboplastin time.

therapeutic and suprathreshold aPTT ratios in each group. The first sample measurement and peak value of aPTT for each patient were evaluated. The time until the achievement of therapeutic value was recorded and was categorized as <12 hours, 12–24 hours, or >24 hours. The heparin infusion time and aPTT results were included up to the 48th hour. Unfractionated heparin infusion duration and aPTT measurements after 48 hours were excluded from the analysis.

Age, gender, comorbidities, and concomitant medications were evaluated. Data about new thrombosis and bleeding during UFH therapy was collected. Laboratory parameters on admission and during the haemorrhagic event were recorded. Approval for the study was granted by the Institutional Ethics Committee.

Statistical analysis

To determine the sample size required, the G-Power 3.1 program was used, and it was esti-

mated that 92 patients would be required in each group to provide 80% power with a 95% confidence interval.

Statistical analyses were performed using SPSS version 26 software (SPSS Inc, Chicago, IL, USA). Categorical variables were reported as number (n) and percentage (%). Continuous variables were presented as mean±standard deviation (SD) or median (interquartile range) values in the case of abnormal distribution. Comparisons of data between the two groups were made using Pearson chi-square or Fisher's exact test for categorical variables and with the paired t-test or Mann-Whitney U test for continuous variables.

A value of $p < 0.05$ was accepted as statistically significant for all analyses.

RESULTS

A total of 240 patients who had received UFH according to the same nomogram were evaluated. Group 1 consisted of 120 patients aged <80 years,



and Group 2 consisted of 120 patients aged ≥ 80 years. The age distribution of the study population is shown in Figure 1. The median age was 47 [15] years in Group 1 and 83 [5] years in Group 2. The baseline clinical characteristics of each group and laboratory parameters on admission are listed in Table 2.

The most common indications for UFH administration for Group 1 and Group 2 were acute coronary syndromes (67.5% vs 83.3%), followed by atrial fibrillation (16.7% vs 14.2%), mechanical heart valve (15% vs 1.7%), and intracardiac throm-

bus (0.8% vs 0.8%). Concomitant use of acetylsalicylic acid was more common in Group 2 (73.3% vs 95.8%, $p < 0.001$), and warfarin use was more prevalent in Group 1 (17.5 vs 0%, $p < 0.001$). The medications used at the same time as heparin and the comparison of the aPTT results between the two age groups are shown in Table 3. The peak aPTT level was higher in Group 2 (58.85 [51.28] vs 76.50 [57.45], $p < 0.001$). The supratherapeutic aPTT ratio (0 [0.25] vs 0.20 [0.43], $p < 0.001$) and numbers of first aPTT in the supratherapeutic range (10% vs 24.2%, $p = 0.004$) were significantly higher in Group

Table 2. Nomogram of intravenous unfractionated heparin that is used in our hospital.

	Group 1(n=120)	Group 2(n=120)	p value
Male	84(70)	46(38.3)	<0.001*
Hypertension	43(35.8)	79(65.8)	<0.001*
Diabetes mellitus	25(20.8)	41(34.2)	0,021*
Chronic renal disease	10(8.3)	39(32.5)	<0.001*
Haemodialysis	6(5)	2(1.7)	0,281
Heart failure	18(15)	41(34.2)	0,001*
Creatinine, mg/dL	0.84 [0.36]	1.12 [0.68]	<0.001*
Hematocrit,%	40.96 \pm 6.53	36.99 \pm 4.89	<0.001*
White blood cells, 10 ³ / μ l	11 [5.24]	8.85 [4.57]	<0.001
Platelets, 10 ³ / μ l	246.50 [124]	220.50 [114]	0,010*
C-reactive protein, mg/L	8.44 [22.03]	13.25 [37.20]	0,058

Categorical variables are presented as numbers and percentage n(%). Continuous variables are presented as mean \pm standart deviation or median [interquartile range]

* $p < 0.05$ accepted as statically significant

Table 3. Medications given concomitantly with unfractionated heparin and the distribution of aPTT test results.

	Group 1 (n=120)	Group 2 (n=120)	P value
Acetylsalicylic acid,n	88(73.3)	115(95.8)	<0.001*
Clopidogrel ,n	36(30)	26(21.7)	0,140
Prasugrel-tikagrelor, n	4(3.3)	0(0)	0,122
GP IIb-IIIa antagonists,n	15(12.5)	4(3.3)	0,009*
Warfarin, n	21(17.5)	0(0)	<0.001*
Heparin infusion duration,h	36.16±9.98	35.45±9.93	0,582
Subtherapeutic aPTT proportion	0.67 [0.60]	0.46 [0.47]	<0.001*
Therapeutic aPTT proportion	0.15 [0.33]	0.33 [0.36]	<0.001*
Supratherapeutic aPTT proportion	0 [0.25]	0.20 [0.43]	<0.001*
First time aPTT, s	37.20 [18.10]	48.25 [31.40]	<0.001*
First aPTT in subtherapeutic range,n	91(75.8)	63(52.5)	<0.001*
First aPTT in therapeutic range,n	17(14.2)	28(23.3)	0,069
First aPTT in supratherapeutic range,n	12(10)	29(24.2)	0,004*
Peak level of aPTT, s	58.85 [51.28]	76.50 [57.45]	<0.001*

Categorical variables are presented as numbers and percentage n(%). Continuous variables are presented as mean±standart deviation or median [interquartile range]. s:seconds h:hours

p<0.05 accepted as statically significant

2, suggesting that the older patients were more susceptible to the heparin effects.

When patients who could not reach the therapeutic range during UFH infusion were excluded, the time taken to achieve a therapeutic aPTT was

not statistically different for the remaining patients in both groups (p=0.561). In Group 1, 49.1% of the patients, and in Group 2, 24.2% of the patients, did not reach the therapeutic range during UFH therapy. Time durations to achieve therapeutic



aPTT are compared in Table 4.

Heparin-induced thrombocytopenia was not observed in any patient. Bleeding during UFH administration was detected in 8 (6.7%) patients in Group 1, only one of which was a major haemorrhage. Bleeding occurred in 3 (2.5%) patients in Group 2, one of which was major. The two age groups were not significantly different in terms of bleeding incidence ($p=0.123$). The aPTT values at the time of bleeding were subtherapeutic in 5 (45.4%) patients, therapeutic in 2 (18.2%) patients, and suprathera-peutic in 4 (36.4%) patients. None of the patients experienced a thrombotic event during UFH administration.

DISCUSSION

In this study, the aPTT results under UFH therapy were compared between two different age groups, and the results showed that dosing according to the same heparin nomogram resulted in higher peak values and a higher proportion of suprathera-peutic aPTT, even in the first sample, in the older age group.

Due to changes in metabolism, elderly patients are susceptible to drug complications. In addition to pharmacokinetic changes, the pharmacody-namics of UFH also alter with age as a result of changing body weight and composition. More-

over, UFH binds to numerous plasma proteins other than antithrombin, which causes variations in distribution volume and, consequently, changing plasma levels (4). It has been previously reported that therapeutic aPTT levels can be achieved with lower doses of UFH in older patients (5). In the current study, all age groups were given the same doses of heparin according to a standard nomogram, and the older patients had higher aPTT values as expected.

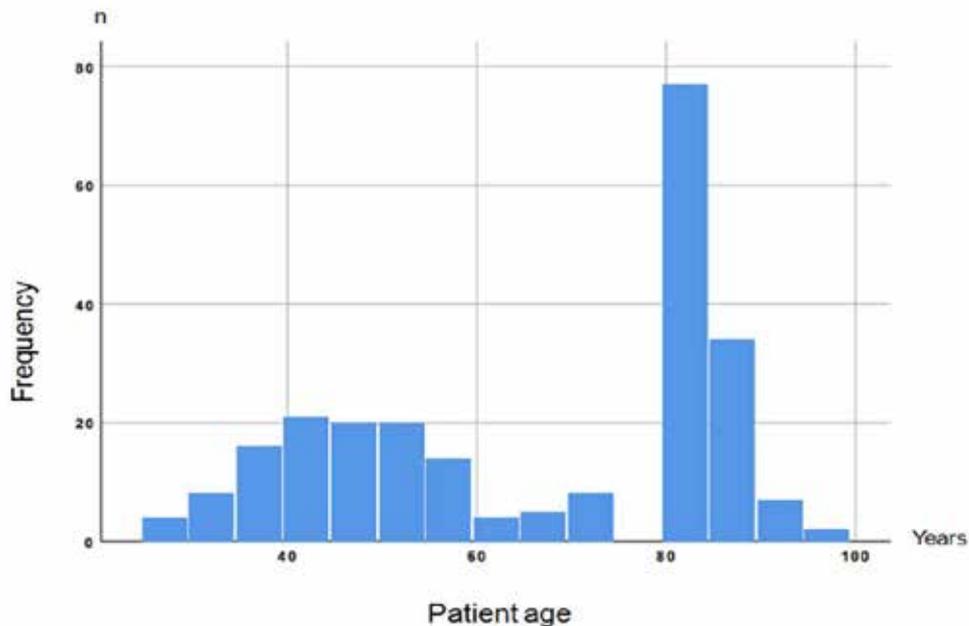
The elderly are at high risk of bleeding and thrombosis. Evaluating the risk/benefit ratio of anticoagulation in this population is still challenging because patients with a higher risk of haemorrhage will benefit more from anticoagulation based on current risk scores. However, anticoagulant levels that are too low or too high bring about the threat of new thrombotic events and bleeding. Moreover, the age of the patient has been reported to be a major risk factor for haemorrhagic complications, even in therapeutic aPTT values (6). Campbell et al. (5) reported that the incidence of bleeding and major bleeding in patients aged ≥ 72 years was higher compared with those aged < 72 years (14.1% vs 7.1% for bleeding and 11.1% vs 3.1% for major bleeding). In contrast with those findings, bleeding was encountered more in the younger age group in the current study, although not at a

Table 4. Time duration to achieve therapeutic aPTT

	Group 1 (n=120)	Group 2 (n=120)
Never	59(49.1)	29(24.2)
<12 hours	28(23.3)	46(38.3)
12-24 hours	21(17.5)	24(20)
<24 hours	12(10)	21(17.5)

The data are presented as numbers and percentages.

Figure 1. Age distribution of the study population.



statistically significant level. This result may have been due to the significantly higher prevalence of concomitant treatment with clopidogrel, warfarin, or GP IIb-IIIa antagonists in Group 1.

Whereas some researchers have reported that the prevalence of haemorrhage was associated with aPTT results, others could not reveal this association (7–10). The current study's findings also support this conflict because most of the bleeding occurred at therapeutic or subtherapeutic levels. Haemorrhagic complications occurred in only 4 (36.4%) of the bleeding events when aPTT was supratherapeutic.

Although thrombotic events were expected because of the high proportion of subtherapeutic aPTT values (0.67 [0.60] in Group 1 vs 0.46 [0.47] in Group 2, $p < 0.001$), no new thromboembolic events occurred in either age group. This result may be attributable to the relatively short observation time in the hospital. There was no screening

for any post-discharge embolic event that might have occurred as a result of thrombus formed previously during the subtherapeutic range. However, the high amount of subtherapeutic percentages may also have been due to the temporary interruption of anticoagulation before coronary angiography. As this was a retrospective study, it was not possible to be sure whether an aPTT measurement was performed at the time of terminating the heparin infusion.

The American College of Chest Physicians (ACCP) has recommended using a fixed-dose, as was used in this study, or a weight-based nomogram for UFH treatment, but there is no clarity as to which is superior (11). The use of a weight-adjusted heparin nomogram to reduce the risk of over-anticoagulation may be preferable, but in this case, the physicians must spare enough time for dose calculation to avoid medication errors.

The total dose and administration rate of UFH



were not recorded in this study because the aim was to evaluate the percentage of aPTT results in subtherapeutic, therapeutic, and suprathereapeutic ranges according to a standard nomogram.

Limitations

There are several limitations of the current study. First, because of the retrospective design, it was not certain whether each aPTT measurement was performed at the exact time. Second, the results are based on only the first 48 hours of the anticoagulation, and therefore, any delayed event of haemorrhage or thromboembolism may have been overlooked, as patients were not followed up after discharge. Finally, although the number

of patients was sufficient to reach statistical significance, further studies with larger populations are needed to prove the existence of an association between patient age and aPTT results.

CONCLUSION

Using a standard heparin nomogram for all age groups can result in a high percentage of suprathereapeutic aPTT results in the elderly. This finding supports the need for adopting a specific UFH nomogram for older patients. To find the optimal dosing scheme and frequency of aPTT measurements, further trials should be conducted in the older age group.

Conflict of interest: none declared.

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RESEARCH

RELIABILITY OF BRONCHOSCOPIC PROCEDURES IN VERY ELDERLY PATIENTS AND THE ROLE OF CHARLSON COMORBIDITY SEVERITY INDEX ON PREDICTING BRONCHOSCOPIC COMPLICATIONS

ABSTRACT

Introduction: In this study, we aimed to evaluate the complications of bronchoscopy in patients aged 75 years and above and to investigate the role of comorbidities on the complications.

Materials and Method: All bronchoscopic procedures performed between September 2017 and September 2019 in our bronchology unit on patients aged over 75 years were evaluated retrospectively. Characteristics of patients and bronchoscopic procedures were recorded. Charlson Comorbidity Severity Index was calculated for each patient.

Results: Bronchoscopic procedures were performed on 272 patients. The average age was 78.6±3.8 years (min:75-max:92). 194 (71.3%) flexible fiberoptic bronchoscopy procedures, 68 (25%) endobronchial ultrasonographic procedures, and 10 (3.7%) rigid bronchoscopy procedures were performed. One or more comorbidities were present in 238 (87.5%) patients. The most common comorbidity was cardiovascular disease. There were 236 (86.7%) patients using one or more medications. One or more complications rates were %5,8 (16/272). The complication rates were 5.7% in the low (≤6) comorbidity severity index group versus 6.4% in the high (>6) comorbidity severity index group, and there was no statistical significance between the two groups (p=0.829). There is no mortality. Only one patient developed hypoxia and respiratory acidosis required noninvasive mechanic ventilation.

Conclusion: In summary, bronchoscopic procedures are very safe in patients with advanced age who had ≥1 comorbidities and high CCSI. Although CCSI helps in predicting complications and mortality in many diseases, it was not seen to contribute to predicting bronchoscopic complications. Although bronchoscopy rarely causes complications in the elderly, more prospective cohort studies on more detailed and specific indices are needed to predict these complications.

Keywords: Bronchoscopy; Comorbidity; Aged; Polypharmacy

INTRODUCTION

In the last century, life expectancy has increased significantly, especially in developed countries, thanks to socioeconomic progress, improved control of fatal infectious diseases (e.g., using vaccines and antibiotics), and environmental health initiatives (e.g., sanitation and water potability) (1,2). Increasing aging population in developing countries has an important effect on the epidemiology of lung cancer (3). Both the increase in the elderly population and the increased incidence of pulmonary diseases in this age group also increase the need for bronchoscopic approaches (2,4,5). Although the efficacy and safety of bronchoscopy in the general population are well defined, different results have been reported in studies involving the elderly population with higher comorbidities (4,6-9). Several selected studies have reported on comorbidities in elderly patients undergoing bronchoscopy. However, no study has specifically evaluated the role of comorbidities in bronchoscopic results (10). One of the important aspects in planning the examination and treatment of any disease is the evaluation of comorbidities and their severity. There are various indexes for evaluating comorbidities. Recently, the age-combined Charlson Comorbidity Severity Index (CCSI) prescribed by Charlson et al. in 1987 in order to predict perioperative complications and mortality possibilities is used (11). The aim of this study is to evaluate the complications of bronchoscopy in patients aged 75 years and above and to investigate the role of comorbidities in complications in our bronchology unit.

MATERIALS AND METHODS

All bronchoscopic procedures performed on patients aged 75 years and above in the bronchology unit were evaluated retrospectively between September 2017 and September 2019. The age, gender, comorbidities, used medicines, bronchoscopy indications, bronchoscopic procedures, sedation type and agent applied,

material taken during the procedure, procedure duration, cytopathology and culture results, and complications of the procedure were recorded. CCSI was calculated for each patient according to the original publication by Charlson et al (12). Since all of our patients were above 75 years of age (which means three points for each patient), CCSI cut-off value was determined with 75% percentile value. It was divided into two groups: high (>6) CCSI and low (\leq 6) CCSI. Conventional bronchoscopic procedures were performed with flexible fiberoptic bronchoscopy (FOB) (BF-1TQ180 Olympus, Tokyo, Japan), and endobronchial ultrasonographic (EBUS) procedures were done with fiberoptic ultrasound bronchoscope (Convex Probe EBUS; EB-530 US; Fujifilm Medical Devices, Japan). Both procedures were performed under conscious sedation with midazolam. Topical airway anesthesia was administered using 1.0% or 2.0% lidocaine instilled through the bronchoscope. Rigid bronchoscopic procedures (Karl Storz, Germany) were performed under general anesthesia. General anesthesia induction was achieved with midazolam 0.05-0.1 mg/kg, propofol (maximum dose 1000 mg), remifentanyl (maximum dose 2 mg), or rocuronium (maximum dose 50 mg), according to the patient's condition.

Approval for the research was obtained from the ethics committee of Istanbul Training and Research Hospital.

Statistical Analysis

Data were analyzed with the Statistical Package for Social Sciences (SPSS) version 22.0 for Windows software (IBM SPSS Statistics Data Editor). Descriptive data were given as number of participants and frequency. Categorical variables were expressed as the number of patients and CCSI value. Chi-square test was used to compare categorical variables. Continuous variables were documented as mean and standard deviation, and the Shapiro-Wilk test was used to determine whether these variables were normally distributed. The Student's t-test and Mann-Whitney U test were



used for continuous variables depending on the normality of their distribution. A p-value of <0.05 was considered statistically significant.

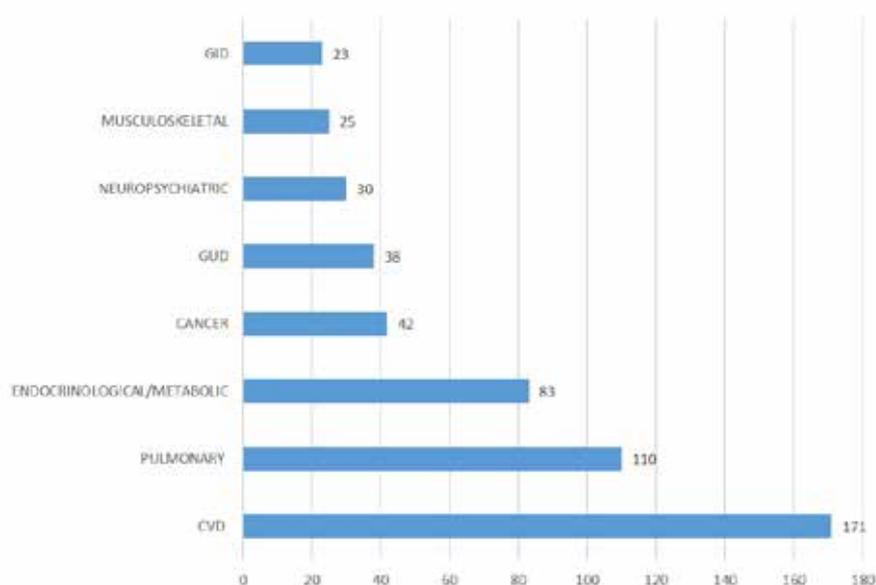
RESULTS

Bronchoscopic procedures were performed on 272 patients. The average age was 78.6 ± 3.8 years (min: 75-max: 92). 98 (36%) patients were females and 174 (64%) were males. The average ages of men and women were similar (78.2 ± 3.5 and 79.1 ± 4.2 , respectively; $p=0.076$). 194 (71.3%) FOB, 68 (25%) EBUS, and 10 (3.7%) rigid bronchoscopy procedures were performed. Only 10 (3.7%) rigid bronchoscopy procedures were performed under general anesthesia, while the other procedures, 262 (96.3%), were performed with conscious sedation. Nodule and/or mass detected by radiologic imaging ($n=80$, 29.4%) was the most common indication for bronchoscopy. In 256 (94.1%) patients, procedures were performed without complications. The rate of complications

was 5,8% (16/272). The most common complication was hemorrhage ($n=8$, 2.9%). Hypoxia ($n=6$, 2.2%), bradycardia ($n=2$, 0.7%), tachycardia ($n=1$, 0.4%), and respiratory acidosis ($n=1$, 0.4%) followed, respectively. The characteristics of patients and bronchoscopic procedures are summarized (Table 1). No patients required hospitalization due to hemorrhage. All instances of hemorrhage were minor or moderate and could be controlled by cold lavage and/or diluted adrenaline administration during the procedure. Also, there was no hypoxia requiring hospitalization. In only one patient, hypoxia and respiratory acidosis developed but did not require intubation and required 48 hours of hospitalization and noninvasive mechanic ventilation.

One or more comorbidities were present in 238 (87.5%) patients. The most common comorbidity was in CVD (Figure 1). The frequency of cancer was 15.44%, with lung cancer being the most common (Table 2).

Figure 1. Distribution of comorbidities



* Each patient had one or more comorbidities
 CVD: Cardiovascular diseases, GUD: Genitourinary diseases, GID: Gastrointestinal diseases

Table 1. Characteristics of patients and bronchoscopic procedures.

Age, mean ± SD	78.6 ± 3.8
Gender, n(%)	
Male	174 (%64)
Female	98 (%36)
CCSI, median	5 (0-13)
≤5 (n,%)	171 (63)
6	54 (20)
7	18 (6,6)
>7	33 (12)
Indications, n(%)	
Nodule and / or Mass	80 (29,4)
Mediastina LAM	57 (21)
Infiltration and / or consolidation	26 (9,6)
Diffuse parenchymal lung disease	19 (7)
BLVR	18 (6,6)
Stent control (stenotic / Y stent)	16(5,9)
Hemoptysis	10 (3,7)
Tracheobronchomalacia	10 (3,7)
Other	36 (13,2)
Bronchoscopic Procedures (n, %)	
Flexible Bronchoscopy (FOB)	194 (71.3)
Endobronchial Ultrasonography (EBUS)	68 (25)
Rigid Bronchoscopy	10 (3,7)
Materials, n (%)	
Bronchial lavage	122 (39,7)
Bronchial biopsy	45 (14,6)
EBUS-TBNA	58 (18,9)
Wang- TBNA	11 (3,6)
Bronchoalveolar Lavage (BAL)	18 (5,9)
Cryo-TBLB	2 (0,7)
No material	51 (16,6)
Total	307 (100)
Complications (n, %)	
Hemorrhage	8 (2,9)
Hypertensive attack	4 (1,5)
Hypoxia	6 (2,2)
Bradycardia	2 (0,7)
Tachycardia	1 (0,4)
Respiratory Acidosis	1 (0,4)
≥ 1 complication	16 (5,8)
Comorbidities	
≥ 1 comorbidity	238 (87,5)
No comorbidity	20 (7,35)
Comorbidity unknown	14 (5,15)

TBNA: Transbronchial Needle Aspiration; TBLB: Transbronchial Lung Biopsy; BLVR: Bronchoscopic Lung Volume Reduction



There were 236 (86.7%) patients using one or more medications. Moreover, 109 (40%) patients were using five or more medications. The most commonly used medications in polypharmacy were cardiovascular medicines (n=166, 61%), statins (n=110, 40%), bronchodilators (105, 38.5%), antiagregans/anticoagulans (n=75, 27.5%), oral antidiabetics/insulin (n=54, 20%), antacids (n=38, 14%) and neurological / psychiatric medicines

patients with one or more comorbidities was 5.9%, whereas it was 10% in patients without comorbidity (p=0.463). Processing time and sedation dose were not statistically significant different between those with and without complications (34.2±15.39; 31.6±13.5; p=0.67 and 2.15±0.68; 2.13±1.02; p=0.94, respectively)

When 16 patients having complications were evaluated, considering the characteristics of

Table 2. Malignancy Types of Cancer Patients

Malignancy types	N
Lung Cancer	15
Prostate Cancer*	6
Colon Cancer	5
Larynx Cancer	3
Malignant Melanoma	2
Breast Cancer	1
Bladder Tumors*	3
Lymphoma	2
Renal Cell Cancer	2
Tonsil Cancer*	1
Whartin Tumour	1
Sarcoma	1
Gallbladder Cancer	1
Endometrium Cancer	1

*One patient had three cancer type (Tonsil, Bladder and Prostate)

(n=27, 9.9%), respectively.

When the cut-off value was 6 according to CCSI, the respective complication rates were 5.7% versus 6.4% in the low and high groups, and there was no statistical significance between the two groups (p=0.829). Complication rates were 6.8% versus 3.8% in patients under 80 years and above 80 years, respectively, and there was no statistically significant difference between the two groups (p=0.335). The rate of complications in

the individual bronchoscopic procedure, the procedure performed and the material specimen obtained, the characteristics of the comorbidities, the age, and CCSI, there was a heterogeneous distribution (Table 3).

DISCUSSION

The increasing prevalence of respiratory disorders and increasing life expectancy in elderly patients

indicate that the performance and safety profile of bronchoscopic procedures should be better characterized for this age group (10). There are a selected number of studies evaluating reliability in the elderly population where bronchoscopic procedures are performed, and the results are contradictory. Also, the presence of comorbidities has been reported in very few studies. In our study, it was observed that bronchoscopy can be performed safely on patients over 75 years of age, with rare side effects and without mortality, and on elderly patients with comorbidities and high comorbidity severity index.

In the retrospective study of Haga et al., there was no difference in the rate of complications (12%) between the elderly and young population (4). In another prospective multicenter study of Haga et al., with 66 patients >80 years of age, it was stated that the complication rates (27.3%) were higher in the elderly population. They suggested that bronchoscopic processes of this age group should be examined in more detail, although fatal and major complications were not observed (7). In our study, the complication rate was 5.8% and it was less than both studies.

Hehn et al. evaluated the side effects according to age groups in patients over 18 years of age in their largest cohort study. Pulmonary side effects such as oxygen desaturation, bronchospasm, and laryngospasm were rare and their incidence was not related to age. Pneumothorax (3.4% versus 0.7%) and hemoptysis (3.8% versus 2.2%) were more frequent in the group of patients above 70 years old compared to the group under 40 years old. Transient hypotension was present in the group of patients above 70 years of age (1.9% vs. 0.5%), whereas the relationship between arrhythmia and age could not be shown. The frequency of all arrhythmias was 1%. In our study, the frequency of arrhythmia was similar with 1.1% in a similar age group population. In this study, there is an increase in the frequency of some comorbid diseases with age (COPD, CAD, and ILD), but their

role in bronchoscopy was not mentioned (13). The frequency of bronchoscopy-related complications was similar in the younger population and those who are above 75 years old in studies involving older patients who underwent bronchoscopy due to foreign body aspiration. Mortality and major complications were not reported in either group. Oxygen desaturation was the most frequent complication and its frequency was 25% in the group of patients above 75 years old, but all of them were treated effectively and easily. The frequency of hypoxia in our study was much lower than this. The reason for the development of hypoxia may be the prolonged procedure time required for foreign body removal, but comparison could not be made since there is no data on the study time. In this study, the presence of one or more of the comorbidities (CHF, COPD, and neurological) as a risk factor was addressed in 13 of the 20 patients evaluated who are above the age of 75 years, but the severity of these comorbidities and their effects in terms of bronchoscopic complications were not evaluated (14).

Davoudi et al. showed that therapeutic bronchoscopy can be successfully performed in patients above 80 years of age with airway obstruction and multiple comorbidities (especially hypertension, arrhythmia, and coronary artery disease). Mild and moderate adverse events were recorded during and after the procedure but there was no need for reintubation and mechanical ventilation. Only one patient had <80% oxygen desaturation lasting over one minute. The reasons for this situation in this patient were as follows: the anesthesiologist and bronchoscopist sharing the same airway, the extent of malignant obstruction in the airway, and the severity of the underlying comorbidities. However, there was no mention of the characteristics and severity index of the existing comorbidities (15). In another study, complication and mortality rates were found higher in patients above the age of 80 years compared to the control group who are below the age of 80



years (11.5% vs. 5.5%, respectively). There was no difference between groups in terms of prevalence of ischemic heart disease, diabetes mellitus, hypertension, malignancy, and chronic lung disease. Although there was no difference in terms of the presence of comorbidity, it was reported that the difference in comorbidity severities might have played a role, and it was difficult to relate

was performed on 88.8% of the elderly patients without complications, with the mortality being 0.3%. Patients' comorbidities were not mentioned in their studies (16). In our study, procedure-related mortality was not seen in patients with high comorbidity severity index.

The strength of our study compared to other studies was that the CCSI of each patient was

Table 3. Characteristics of patients who had complication

Complication	Age	CCSI	Comorbidities	Procedures
Bradycardia	75	7	RCC, CHF, CRF, CAD	EBUS-TBNA
HA+ Hemorrhage	77	4	CAD, HT	EBUS-TBNA
Hemorrhage	75	3	None	Wang NA
Tachycardia + Hypoxia	78	3	HT	Lavage&biopsy
Hypoxia	78	5	HT,COPD,BPH,demantia	Foreign Body
Hemorrhage	76	4	COPD	Wang NA
Hypoxia	75	6	CHF, COPD, HT, HL, DM	FOB, no material
Hypoxia	92	4	HT	Rijid, Criyo-TBLB
HA+ Hemorrhage	75	3	HT	Lavage
Hemorrhage	77	3	Asthma	Lavage
Hypoxia + Respiratory Acidosis	78	5	DM, HT, COPD	Rijid, stent control (PITS)
Hemorrhage	75	3	None	EBUS-TBNA
Hypoxia	74	6	COPD, DM, BPH, CAD	EBV removal
Bradycardia	81	11	Metastatic Prostat ca, CAD	EBUS-TBNA
HA+ Hemorrhage	75	5	HT, CAD, COPD	EBUS-TBNA
HA+ Hemorrhage	88	6	Osteoporosis, HT, CVD, PU	Wang iA

*One patient had three cancer type (Tonsil, Bladder and Prostate)

complications with comorbidities in the light of the available data. Mortality was rarely reported during the bronchoscopic procedure, but patients on mechanical ventilation were also included in this study. In terms of complications, no difference was observed in ventilated and nonventilated patients, but mortality was higher in the ventilated group (8). Ulaşlı et al. reported that the procedure

also calculated objectively in addition to the presence of comorbidities in all procedures. In studies investigating the safety of EBUS TBNA in the elderly population, CCSI was reported to be higher in elderly patients. However, there was no data regarding whether there is a difference in terms of complication rates in patients with and without high CCSI (17,18). CCSI has been studied

and evaluated as being useful in predicting postoperative complications of various invasive procedures (19,20). Park et al. recommend the routine use of CCSI to predict complications after laparoscopic distal gastrectomy in elderly patients with comorbidities (21). In another study, a positive correlation was noted between increased CCSI and prolonged postoperative complications in patients with colon and rectal cancer (22). However, neither age nor high CCSI was associated with complications in elderly patients.

When 16 patients with complications were evaluated, considering the characteristics of the individual bronchoscopic procedure, the performed procedure and the obtained material, the characteristics of the comorbidities, the age, and CCSI, there was a heterogeneous distribution.

If the number of patients in this study was higher, even if the ratio of patients with complications was the same, it could create a specific index that could predict complications with more patients with complications. A small number of patients was a limitation of our study on this issue.

An other limitation of our study was that it was retrospective. Except for the CCSI, many other specific parameters such as respiratory function test parameters, diffusion capacities, types of drugs used due to comorbidities, body

mass index, and nutritional status could not be evaluated. The possibility that these parameters could be responsible for complications could not be ignored. Randomized controlled studies including all parameters in this age group may provide a new scale for predicting possible complications. Using a specific method, including pulmonary functions, type of bronchoscopic procedure, characteristics, stage and distribution of lung lesions, may be helpful for predicting complications of bronchoscopy. We think that our study can help further research on this subject. In summary, bronchoscopic procedures are very safe in patients with advanced age who had ≥ 1 comorbidities and high CCSI. Although CCSI helps in predicting complications and mortality in many diseases, it was not seen to contribute to predicting bronchoscopic complications. Although bronchoscopy rarely causes complications in the elderly, more prospective cohort studies on more detailed and specific indices are needed to predict these complications.

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RESEARCH

COURSE OF ACUTE PANCREATITIS IN THE ELDERLY EVALUATED WITH COMPUTED TOMOGRAPHY SCAN

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ABSTRACT

Introduction: In our study, we aimed to evaluate how age affects the severity and course of acute pancreatitis according to the modified Balthazar scoring system.

Materials and methods: 354 patients diagnosed with acute-pancreatitis and followed-up in our hospital between July/2013-February/2019 were included our study. Demographic data, comorbid diseases and mortality rates of all patients were documented. Patients with aged 65 and over were assessed as geriatric population. All patients included in the study underwent contrast enhanced abdominal computed-tomography within the first 12 hours and on days 3 to 7. According to the modified Balthazar score, patients with mild, moderate and severe acute-pancreatitis respectively. The relationship between age and computed-tomography findings was analyzed.

Results: 206 (58.2%) of the patients included in the study were women. Mean age was 54.8±17.9 years (18-100 years). Geriatric population consisted of 129(36.5%) patients. There was no statistically significant difference between the two groups according to the modified Balthazar classification on the initial computed-tomographies on admission ($p>0.05$). However, on computed-tomography scans taken after the third day, severe acute-pancreatitis was detected significantly more frequently in the elderly ($p<0.05$). Additionally, in comparing the disease progression on computed-tomography scans, disease progression was significantly higher in the elderly group ($p<0.05$). In addition, comorbidity score and mortality rate were found to be significantly higher in the elderly group ($p<0.001$, $p:0042$, respectively).

Conclusion: In acute pancreatitis, age may have an effect on the severity of the disease. For this reason, multidisciplinary approach and close follow-up with monitoring is crucial in geriatric patients.

Keywords: Aged; Tomography, X-Ray computed; Pancreatitis



INTRODUCTION

Acute pancreatitis (AP) is an acute inflammatory disease of the pancreas and peripancreatic tissues (1). The incidence in western countries has increased steadily in recent year (2,3). AP is a potentially fatal disease with a general mortality rate between 2.1% and 7.8% which may increase up to 10% - 23% if pancreatic necrosis develops (2,3). Mortality associated with AP occurs most frequently for two reasons. While early mortality occurs due to severe and irreversible multiorgan dysfunction, late mortality results from pancreatitis induced sepsis followed by organ failure (4).

Due to the increasing life span, elderly patients constitute a large portion of the population. Large-scale cohort studies show that, the group with the highest rate of hospitalization due to AP is the elderly population (5). In cases of AP, it is of great importance to identify the disease and determine its severity in the early stages (6,7). In this context, besides many criteria in determining the severity of AP age is used as a factor. Age >55 is used as a criterion in both Glasgow scoring system and Ranson scoring system (8,9). Age is also included as a parameter in the Acute Physiology and Chronic Health Assessment (APACHE) score (10). All these scoring systems are used to differentiate mild acute pancreatitis from severe acute pancreatitis at an early stage (11).

Studies dealing with the relationship between age and prognosis show conflicting results and the relationship between AP severity and age is still controversial (12). In some studies, the mortality rate in elderly patients was similar to that in other age groups (13). In the study of Losurdo et al. evaluating patients over the age of 70 with acute biliary pancreatitis, despite high comorbidity rates in elderly group, mortality and disease severity were similar to those of younger patients (14). In contrast, in another study, which investigated the relationship between age, course of disease and mortality, it was shown that the disease was more severe in the elderly and the overall mortality rate

increased from 2% in those under 55 years to 11% in older patients (15).

The physiology and morphology of organs change with age, which is a natural process. Therefore, the response of metabolism to external factors and diseases also varies. In conjunction with the aging of our population, it is important to clarify the impact of AP in the elderly in order to identify and manage therapeutic strategies. In this study, we aimed to evaluate the severity and course of acute pancreatitis in elderly patients according to the modified Balthazar scoring system.

MATERIAL AND METHOD

Study design

354 patients with acute pancreatitis followed up in our hospital, gastroenterology service between July 2013 and February 2019 were included our study, The diagnosis of AP was based on the American College of Gastroenterology guidelines (16). Patients with chronic pancreatitis or with contrast agent allergies, pregnant women, and those who did not want to participate in the study were excluded from the study. Demographic data (age, gender) of all patients were documented. Two separate groups were formed according to the age of the patients. Those aged 65 and over were assessed as geriatric population. AP etiology was determined in all patients. Etiologies were classified as biliary, alcohol induced, drug/toxin induced, hyperlipidemia, post-endoscopic retrograde cholangiopancreatography (ERCP), infectious, malignancy related, hypercalcemia, genetic and structural anomalies. Those with no underlying pathology were evaluated as idiopathic AP. Comorbid diseases were documented in patients with AP. Charlson comorbidity index (CCI) was calculated according to the existing comorbidities (17). The two groups (non-elderly and elderly groups) were compared in terms of demographic features, presence of diabetes mellitus, CCI score and mortality.

Severity of acute pancreatitis

All patients included in the study underwent contrast abdominal computed tomography (CT) within the first 12 hours and on days 3 to 7. Besides pancreatic necrosis and peripancreatic collection; extrapancreatic findings like ascites, pleural effusion, extrapancreatic parenchymal abnormalities (subcapsular effusion, hemorrhage or infarction), gastrointestinal tract involvement (inflammation, intramural hematoma or perforation) and vascular complications (arterial hemorrhage, venous thrombosis or pseudo-aneurysm) were evaluated. AP was evaluated according to the modified Balthazar classification. According to this scoring, patients with scores of 0-2, 4-6 and 8-10 were evaluated as mild, moderate and severe AP, respectively (18).

Ethics statement

Ethics approval was obtained from the Ethics Committee of our hospital to carry out this study. All procedures were in accordance with the ethical standards of our institution's Human Experiment Committee and the Helsinki Declaration.

Statistical Analysis

The results were analyzed with "The Statistical Package for the Social Sciences 124.0 (SPSS Armonk, NY: IBM Corp.)". Continuous values were given as mean (\pm standard deviation) and categorical data as frequency and percentage (N,%). Distribution was tested with the Kolmogorov-Smirnov test, histogram, and \pm SD. Non parametric data of the groups were compared using Mann – Whitney U test and parametric data using Independent T test. Chi-square test was used to test categorical data. Cases with $p < 0.05$ were considered statistically significant.

RESULTS

Of 354 patients with AP, 206 (58.2%) were women. Mean age was 54.8 ± 17.9 years (age range: 18-100 years). The number of patients in the geriatric

population (≥ 65 years) was 129 (36.5%). There was no significant difference between the geriatric and non-geriatric groups in terms of gender ($p > 0.05$). The mean CCI was 1.67 ± 1.04 in all patients, 3.39 ± 2.1 in the elderly group, and 0.68 ± 1.11 in the non-elderly group. The presence of diabetes mellitus and mean CCI value were significantly higher in the elderly group ($p < 0.001$). Analysis of AP etiologies were as follows: While in 193 (54.5%) cases etiology was biliary, in 50 (14.1%) patients drug or toxic substance induced, in 28 (7.9%) patients secondary to ERCP, in 10 (2.8%) patients hyperlipidemia and in 8 (2.3%) patients alcohol induced AP were observed. In 32 cases other causes (structural pathologies such as annular pancreas and pancreatic divisum, malignancy, hypercalcemia, etc.) were detected. In 33 (9.3%) patients any cause could be detected (idiopathic AP). In terms of severity of AP according to modified Balthazar classification on initial tomographies in young and elderly group; there was no statistically significant difference between the groups ($p > 0.05$). However, on the follow up imaging taken after the third day, severe AP ratio was significantly higher in the elderly ($p < 0.05$). In analysing the disease progress on the follow up imaging compared to initial CT scan results are classified as regression, progression or no-change. Disease progression was significantly higher in the elderly group ($p < 0.05$). Also the mortality rate was significantly higher in the elderly group 4 (3.1%) and 1 (0.4%) respectively, $p:0.042$ (Table 1).

Progress of AP severity in both groups was analyzed in detail. In the geriatric group; of 12 patients in stage A initially, 8 (66.6%) patients remained as stage A, 2 (16.7%) patients progressed to stage B and 2 (16.7%) patients progressed to stage C on the follow up CT taken after 72 hours. Of 12 patients in stage B initially, 8 (66.7%) patients remained as stage B on control CT scan, 4 (33.3%) patients progressed to stage C. 72 patients were in stage C initially. 43 (59.7%) of these patients remained as stage C, 11 (15.3%)



Table 1. Demographic characters and CT scores in Patient with Acute Pancreatitis

	Elderly patients N:129 (36.5%)	Non-elderly patients N:225 (63.5%)	Total N:354	P value
Age (year)	73.8±7.6	43.8±11.9	54.8±17.9	<0.001**
(Mean, SD, Range)	(65-100)	(18-65)	(18-100)	
Swex				0.114
Male	61 (47.3%)	87 (38.7%)	148 (41.8%)	
Female	68 (52.7%)	138 (61.3%)	206 (58.2%)	
Diabetes Mellitus				<0.001*
Yes	38 (29.5%)	25 (11.1%)	63 (17.8%)	
None	91 (70.5%)	200 (88.9%)	291 (82.2%)	
Charlson comorbidity index score	3.39±2.1	0,68±1.11	1.67±1.04	<0.001*
Balthazar classification (On admission)				0.245
Mild	96 (%74.4)	152 (%68.9)	251 (%70.9)	
Moderate	31 (%24.0)	69 (%30.7)	100 (%28.2)	
Severe	2 (%1.6)	1 (%0.4)	3 (%0.9)	
Balthazar classification (After 72 hours)				0.048*
Mild	86 (%66.7)	170 (%75.6)	256 (%72.3)	0.072
Moderate	31 (%24.0)	47 (%20.9)	78 (%22.1)	0.492
Severe	12 (%9.3)	8 (%3.6)	20 (%5.6)	0.024*
CT changes				0.013*
Regression	21 (16,3%)	56 (24.9%)	77 (21.8%)	0.059
Progression	36 (27.9%)	36 (16.0%)	72 (20.3%)	0.007*
No change	72 (55.8%)	133 (59.1%)	205 (57.9%)	0.545
Mortality				.042*
Yes	4 (3.1%)	1 (0.4%)	5 (1.4%)	
None	125 (%96.9)	224 (99.6%)	349 (98.6%)	

*:p<0.05, **:p<0.001

patients regressed to stage A and B, and 18 (25.0%) patients progressed to stage D and E on control CT scans. Of 14 patients in stage D, 2 (14.3%) patients remained as stage D, 7 (50.0%) patients regressed to stage A, B, C, and 5 (35.7%) patients progressed to stage E. In stage E initially, there were 19 patients. 17 (89.4%) patients remained as stage E, and 2 (10.6%) patients regressed to stage

A to D on the control CT scan (Table 2).

In the non-geriatric group; there were 50 patients in stage A on initial imaging, of these 40 (80%) remained as stage A and 10 (20%) progressed to stage B, C and D on control tomographies taken after 3 days or later. Of 26 patients in stage B initially, 14 (53.8%) remained as stage B, 8 (30.8%) regressed to stage A and 4 (15.4%) patients

Table 2. Evaluation of the changes in CT scan performed on the 3th-7th day compared to the one performed within the first 12 hours in elderly patients

CT: After 72 hours	CT: On admission					
	Stage A	Stage B	Stage C	Stage D	Stage E	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Stage A	8 (66.6%)	0 (0%)	7 (9.7%)	3 (21.4%)	1 (5.3%)	19 (14.7%)
Stage B	2 (16.7%)	8 (66.7%)	4 (5.6%)	1 (7.2%)	0 (0%)	15 (11.6%)
Stage C	2 (16.7%)	4 (33.3%)	43 (59.7%)	3 (21.4%)	0 (0%)	52 (40.3%)
Stage D	0 (0%)	0 (0%)	10 (13.9%)	2 (14.3%)	1 (5.3%)	13 (10.1%)
Stage E	0 (0%)	0 (0%)	8 (11.1%)	5 (35.7%)	17 (89.4%)	30 (23.3%)
Total	12 (100%)	12 (100%)	72 (100%)	14 (100%)	19 (100%)	129 (100%)

progressed to stage C. In stage C, there were 79 patients initially, of these 50 (63.3%) remained as stage C, 23 (29.1%) regressed to stage A and B, and 6 (7.6%) patients progressed to stage D and E. Of 31 patients in stage D, 11 (35.5%) remained as stage D, 15 (48.4%) regressed to stage A, B, C, and 5 (16.1%) patients progressed to stage E. 39 patients were in stage E on initial exam. Of these, 29 (74.4%) remained as stage E, and 10 (26.4%) patients regressed to stage A to D (Table 3).

DISCUSSION

Although AP shows a mild clinical course in the majority of patients, it is a severe and life-threatening disease of elderly patients (15,16,19). In recent years, a marked increase in AP-related morbidity has been observed in elderly patients (20). According to a study published in 2017 by Robert et al., which summarizes the results of the European studies, it was observed that the disease progresses more aggressively and has a significant increase in morbidity in individuals over 65 years of age (20).

Various scoring systems are available to assess AP severity. While clinical and laboratory data are

used to assess Ranson, APACHE II, and Atlanta scores, Balthazar scoring is based on radiological findings (9,21). Although age is used as a criterion in many scoring systems, there are rare studies examining the relationship between age and Balthazar scoring system (22-25). Moreover, inconsistency between the results of the studies conducted draws attention. Study performed by Losurdo et al. evaluating patients over 70 years of age with acute biliary pancreatitis, showed, older patients despite their high comorbidities had similar clinical severity and mortality with younger patients (14). Vatansever and colleagues found no difference according to the Balthazar scoring and CT severity index in patients with acute biliary pancreatitis among groups aged under 65 and over (22). However, in contrast to this; in another study investigating the relationship between age and the course of the disease, it was reported that the disease showed significantly worse progression in patients over 70 years of age compared to patients under 60 years of age (19). Similarly, Koziel and colleagues reported that the course of the disease was more severe in patients with AP over the age of 80 compared to patients under 65 (23). In our study, comparing AP severity in geriatric and non-geriatric groups;



Table 3. Evaluation of the changes in CT scan performed on the 3th-7th day compared to the one performed within the first 12 hours in non-elderly patients

CT: After 72 hours	CT: On admission					
	Stage A	Stage B	Stage C	Stage D	Stage E	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Stage A	40 (80%)	8 (30.8%)	17 (21.5%)	8 (25.8%)	2 (5,1%)	75 (33.3%)
Stage B	2 (4%)	14 (53.8%)	6 (7.6%)	0 (0%)	1 (2.6%)	23(10.2%)
Stage C	6 (12%)	4 (15.4%)	50 (63.3%)	7 (22.6%)	5 (12.8%)	72 (32.0%)
Stage D	2 (4%)	0 (0%)	4 (5.1%)	11 (35.5%)	2 (5,1%)	19 (8.4%)
Stage E	0 (0%)	0 (0%)	2 (2.5%)	5 (16.1%)	29 (74.4%)	36 (16%)
Total	50 (100%)	26 (100%)	79 (100%)	31 (100%)	39 (100%)	225 (100%)

there was no statistically significant difference between the two groups on admission. Even if CT is considered the gold standard for the diagnosis of pancreatic necrosis, since not all pancreatic necrosis may develop within the first 48 hours, early screening is limited to predict severity (24). In this context, control CT scans were taken after the third day, which demonstrated that severe AP was significantly more common in the elderly group. In addition, comparing the course of the disease (regression, progression or no-change) on initial and control CT scans; geriatric group showed a significantly higher rate of disease progression.

Older patients are known to be more prone to infections in surgical procedures and are associated with a high inflammatory response. Old age is followed by an inflammatory process, which may worsen during certain conditions (sepsis, surgery, ischaemic/reperfusion injury) (25). This condition is associated with antigenic stress, which can lead to lifetime depletion of immunological cells, thus reducing the capacity of the immunological system to respond to antigens (23,25). The aged cells remain metabolically active and produce a number of tumor suppressors and proinflammatory substances. It is also known that

older patients are more susceptible to infections after surgical procedures, and this may be related to the patients' proinflammatory status. This increased susceptibility to infections contributes to increased postoperative morbidity and mortality in older patients (24,26). Older patients often seek late medical attention. They experience anxiety about becoming an independent person, about the possibility of inadequate care provided by relatives, or fear of a simple hospitalization or impending death (26). In addition, the presence of accompanying chronic diseases in these patients negatively affects the already decreased physiological functions of geriatric patients. This results in a severe reduction of physiological reserve to deal with an inflammatory condition, leading to a more serious AP clinical symptom (11). Some researchers have associated increased mortality in the elderly with higher mortality rates due to accompanying medical or surgical diseases, not complications directly from AP (25,26). The rates of mortality are high in severe AP due to multiorgan dysfunction and it is still about 20-25% (27,28). Despite age is generally accepted as a risk factor for multisystem organ failure, there are controversial data about increased mortality from AP in elderly patients (27,28). In a study by Uomo et

al., mortality was shown to be significantly higher among the patients aged over 70 years (25.8% vs 7.8%) (29). In another study with 884 patients, mortality was found to be significantly increased in elderly patients (7.4% vs 1.9%) (30). In the our study, we showed that mortality was significantly increased in the elderly population (3.1% vs 0.4%).

This study has some limitations. It is a single center retrospective study and other risk factors that play a role in disease progression are not discussed in detail. The strengths of our study are the high number of patients included and the fact that both tomographies (initial and control after 3rd day) have been evaluated by the same radiologist, permitting a reliable comparison of disease severity and its course.

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RESEARCH

OUTCOMES OF ELDERLY PATIENTS UNDERGOING CARDIOPULMONARY RESUSCITATION IN THE EMERGENCY DEPARTMENT: A 7-YEAR ANALYSIS

ABSTRACT

ABSTRACT

Introduction: We aimed to analyze demographic and clinical characteristics, and outcomes of patients aged 65 years and older who underwent cardiopulmonary resuscitation.

Materials and Method: Data of elderly patients who underwent cardiopulmonary resuscitation in the emergency department between January 2013 and December 2019 were scanned retrospectively. Patients characteristics, cardiac arrest location, and outcomes were recorded and analyzed.

Results: In total, 224 patients with mean age of 76.51 ± 8.23 years. A return of spontaneous circulation rate was 46.4%, and the 30-day survival rate was 7.6%. A return of spontaneous circulation rate was decreased with age. Some 86.7% of the patients had at least one comorbidity and cancer was the most common. The mean duration of cardiopulmonary resuscitation was 33.28 ± 22.16 minutes. The mean cardiopulmonary resuscitation duration in the patients who had an return of spontaneous circulation and survived was significantly lower. The pH and lactate values of the patients were found to be statistically different in patients who had a return of spontaneous circulation. The most common cardiac arrest cause was infectious diseases in 72 (32.1%) patients and the most common diagnosis in living patients was cardiac causes.

Conclusion: As the number of elderly individuals increases, and the number of comorbidities increase, the number of emergency department admissions as well as the incidence of in-hospital and out-of-hospital cardiac arrest will also increase in parallel with the increase in life expectancy.

Keywords: Heart arrest; Cardiopulmonary resuscitation; Emergency service, Hospital; Aged



INTRODUCTION

The population of elderly has been increasing globally in recent years. According to data, the elderly population aged 65 years and older constitutes 20% of the population in the USA (1). Although Turkey is composed of a comparatively young population, the increase in life expectancy worldwide is also occurring in our country. According to data from the Turkish Statistical Institute, the elderly population aged 65 years and over increased from 8.8% of the population in 2017 to 9.1% in 2019. They predict that this percentage will reach 10.2% in 2023, 20.8% in 2050, and 27.7% in 2075 (2). Consistent with this increase, the rate of admission of elderly patients to hospitals, particularly to emergency departments (EDs) and intensive care units, is also gradually increasing (3–4).

Cardiac arrest (CA) is a leading cause of death worldwide. There are approximately 375,000–700,000 CA cases in Europe annually; in the USA, there are approximately 383,000 cases over a similar period. Internationally, the survival rate for CA is low, at <14% (5–6). Since the introduction of external cardiac massage in 1960, cardiopulmonary resuscitation (CPR) has become the standard treatment for patients with a CA (7). The incidence of sudden CA increases markedly with age, from 100 per 100,000 in 50-year-old patients to 800 per 100,000 in 75-year-old patients (8). With the increase in the age of hospitalized patients, physicians are frequently confronted with the dilemma regarding whether resuscitation is a medically appropriate and ethically acceptable treatment for older patients (9).

We aimed to analyze demographic and clinical characteristics, and outcomes of patients aged 65 years and older undergoing CPR in the ED.

MATERIALS AND METHODS

This retrospective study was performed between January 1, 2013 and December 1, 2019 in the Department of Emergency Medicine

of Cerrahpasa Faculty of Medicine, Istanbul University- Cerrahpasa. The study was approved by the Ethics Committee of Cerrahpasa Faculty of Medicine, Istanbul University- Cerrahpasa (83045809-604.01.02- Date: December 3, 2019). Informed consent was not obtained, given the retrospective nature of the study.

Patients aged younger than 65 years, patients with incomplete data, and patients aged 65 years and older who were intubated but did not receive CPR were excluded from the study.

All data were collected from the hospital database. Age, sex, comorbidities, and complaints (in-hospital CA cases) of the patients were recorded. The patients were divided into three age groups: young (65–74 years), middle aged (75–84 years), and advanced age (≥ 85 years). CA location was divided into in-hospital CA (IHCA) and out-of-hospital CA (OHCA). Places within the hospital, such as the emergency room, outpatient clinic, and laboratories were understood to comprise the interior of the hospital. The duration of CPR and the return of spontaneous circulation (ROSC) were recorded. The final diagnoses of the patients were recorded. The patients' lactate, pH, and partial carbon dioxide pressure values were recorded, as well as was the 30-day survival of those patients who had ROSC.

Data were analyzed using SPSS 22.0 for Windows. The Kolmogorov–Smirnov test was used for the data distribution. Descriptive statistics were applied, and the values for quantitative data were calculated as mean \pm standard deviation, whereas qualitative values were expressed as numbers and percentages. An independent sample t-test or the Mann–Whitney U-test was used to compare the means of two groups. The chi-squared test was used to compare quantitative data. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 433 patients underwent CPR between January 1, 2013 and December 1, 2019. Some

52.8% (229) of the patients were aged 65 and older. Data on 5 patients were not available; thus, a total of 224 patients were included in the study. Half of the patients were women. The mean age of the patients was 76.51 ± 8.23 years. In-hospital CA occurred in 187 (83.5%). The ROSC rate was 46.4% (104), and the 30-day survival rate was 7.6% (17). The ROSC rate in the IHCA group was 48.7%, while in OHCA group it was 35.1%. In addition, the ROCS rate in the younger group was significantly higher than in the middle and older aged groups. Some 38.5% (40) of the 104 patients who had

ROSC died within the first 24 hours, 29.8% (31) died in 2–7 days, and 5.4% (16) died in 8–30 days.

Some 86.7% (194) of the patients had at least one comorbidity. Cancer was the most common, at 34.8% (78), followed by hypertension at 33.5% (75), and diabetes at 27.7% of the patients (62). Demographic data on the patients are shown in Table 1.

The mean duration of CPR was 33.28 ± 22.16 minutes. The mean CPR duration in the patients who had an ROSC and survived was significantly

Table 1. Demographic data.

	ROSC +	ROSC -	p	Survived	Exitus	p
Age Group						
65–74	55	37	0.004*	11	81	0.120
75–84	33	54		4	83	
≥85	16	29		2	43	
Sex						
Men	49	63	0.421	6	106	0.313
Women	55	57		11	101	
Arrest Location						
IHCA	91	96	0.184	14	173	0.896
OHCA	13	24		3	34	
Comorbidities						
Present	94	100	0.177	15	179	0.838
Absent	10	20		2	28	
Cancer	35	43	0.783	3	75	0.200
HT	44	31	0.009	8	67	0.334
DM	33	29	0.207	6	56	0.573
CAD	23	20	0.302	7	36	0.025
HF	19	15	0.230	4	30	0.300
COPD	10	7	0.286	1	16	1
CVD	7	10	0.842	0	17	0.375
CRF	7	7	0.782	2	12	0.288
Alzheimer	8	5	0.260	1	12	1

*. Difference between 65–74 and 75–84, ≥85 age group

ROSC, return of spontaneous circulation; OHCA, Out-of-hospital cardiac arrest; IHCA, In- hospital cardiac arrest; HT, hypertension; DM, diabetes mellitus; CAD, coronary artery disease; HF, heart failure; COPD, chronic obstructive pulmonary disease; CVD, cerebrovascular disease; CRF, chronic renal failure.



lower. The mean age of the women was significantly higher, and the mean age of the patients who had an ROSC was significantly lower (Table 2).

When the complaints from the IHCA patients were analyzed, dyspnea was the most common, at 50.6% (91), followed by nausea/vomiting, abdominal pain, and syncope (Figure 1).

The pH and lactate values of the patients were found to be statistically different in patients with successful resuscitation. There was no difference in 30-day survival between blood parameters

common diagnosis in living patients was cardiac causes in 10 patients (Figure 3).

DISCUSSION

Improvements in living conditions and healthcare in developed countries have resulted in increased life expectancy and duration; therefore, the number of elderly individuals presenting at hospitals and emergency services is also increasing. The rates of admission to EDs according to the sex of elderly

Table 2. Comparison of mean age and CPR duration.

	Age in years		p	CPR duration in minutes		p
ROSC (n, %)	Yes	No	0.016	Yes	No	0.000
	75.10 ± 8.55 (104, 46.4%)	77.74 ± 7.77 (120, 53.6%)		15.95 ± 12.59	48.30 ± 17.52	
Sex (n, %)	Men	Women	0.000	Men	Women	0.184
	74.46 ± 7.40 (112, 50%)	78.56 ± 8.54 (112, 50%)		35.25 ± 21.51	31.31 ± 22.71	
30-day survival (n, %)	Survived	Exitus	0.113	Survived	Exitus	0.000
	73.47 ± 7.67 (17, 7.6%)	76.76 ± 8.24 (207, 92.4%)		14.53 ± 12.22	34.82 ± 22.10	
Arrest location (n, %)	IHCA	OHCA	0.761	IHCA	OHCA	0.086
	76.14 ± 8.25 (187, 83.5%)	76.59 ± 8.25 (37, 16.5%)		32.15 ± 21.93	39.00 ± 22.74	

ROSC, return of spontaneous circulation; OHCA, Out-of-hospital cardiac arrest; IHCA, In-hospital cardiac arrest.

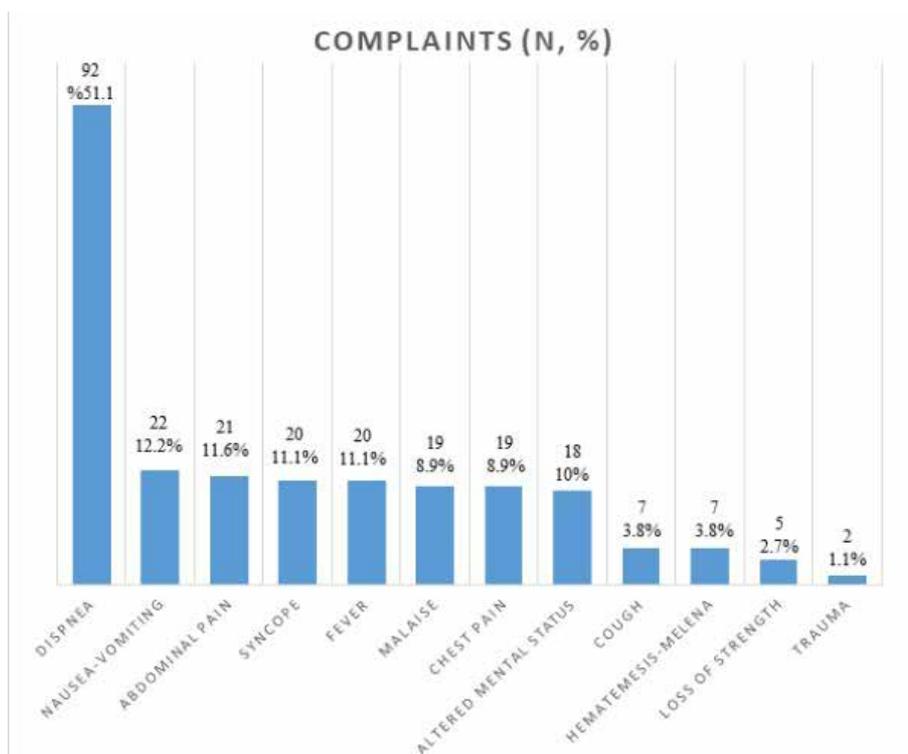
(Figure 2).

When the definitive diagnoses of patients with CA were examined according to cause, the most common causes were infectious diseases in 72 (32.1%) patients, cardiac causes in 66 (29.5%), and respiratory causes in 43 (19.2%). The most

patients generally differ by country (10–12). In our study, the proportions of men and women were equal.

The incidence of at least one comorbidity in elderly patients is 70%–83%, and hypertension, coronary artery disease, diabetes mellitus, chronic

Figure 1. Distribution of the complaints of patients with IHCA.



heart failure, and chronic obstructive pulmonary disease are among the most common comorbidities (13–15). In our study, the comorbidity rate was higher than that of the other studies. Cancer was found to be the most common comorbidity, probably because our hospital is a leading hospital to monitor and treat oncological cases, especially in our region. This situation reflects higher cancer rates in the elderly population along with other comorbidities due to increased life expectancy, and might be found in EDs in CAs that develop as a result of complications related to cancer.

Socioeconomic status and comorbidity did not directly affect the outcome after CA in patients younger than 65 years of age, whereas increasing age and number of comorbidities had negatively affected ROSC and hospital survival in elderly patients (16–18). Even if there was no significant

relationship between the presence of comorbidity, ROSC, and 30-day survival, except in terms of a history of hypertension in our study, higher comorbidity rates in elderly patients could be associated with a lower ROSC rate.

It is known that ROSC and survival rates are poorer in elderly patients in CA conditions in-hospital or out-of-hospital (12). The ROSC rate was between 7.7% and 48.2% in the lower age group, and was between 4.5% and 20% in the patients older than 85 years of age. However, the 30-day survival or hospital discharge rate of elderly patients decreased with age: it was between 5.2% and 20% in the younger age group and between 1.9% and 3.9% in the older age group. Despite low ROSC and survival rates in elderly patients, 12-month survival and favorable neurological outcome rates of the elderly patients who were



discharged from the hospital were 87%–92% (19–21). In our study, older individuals had lower ROSC and 30-day survival rates compared with their younger counterparts. Of the 17 survivors, 15 (88.2%) were still alive in the short-term follow up.

It has been reported that CPR duration was shorter in patients who had ROSC or survived. Also, the ROSC and survival rates were higher in patients with a shockable rhythm or an arrhythmia (12, 22–23), a finding consistent with the literature. We also believe that more than half of our surviving patients had CA due to cardiac causes, which might have included shockable rhythms and arrhythmias.

Dyspnea, abdominal pain, chest pain, fever, general malaise, and limb pain were the most common complaints of elderly patients at ED admission (9). In our study, dyspnea was the most common symptom in patients with CA. Myocardial infarction, arrhythmia, heart failure, and lung

edema were common causes of CA in elderly patients, followed by respiratory, metabolic, and neurological causes (11, 13, 21). Even if cardiac and respiratory causes were common in our study, infectious causes were the top cause of CA. This situation could be related to the spread of infectious diseases in the winter season and complication of cancer related therapy.

Low pH values and high lactate levels were found to be associated with mortality. In addition, the mortality rate was found to be as high as 100%, especially in patients with pH values under 7.1 (24–25). In our study, high lactate levels and low pH values were significantly associated with unsuccessful CPR, however they had no effect on survival.

This study has some limitations. First, we were not able to perform a rhythm analysis of all patients before or during CA because of OHCA cases. Second, we were not able to determine

Figure 2. Comparison of the blood gas parameters in ROSC and 30-day survival.

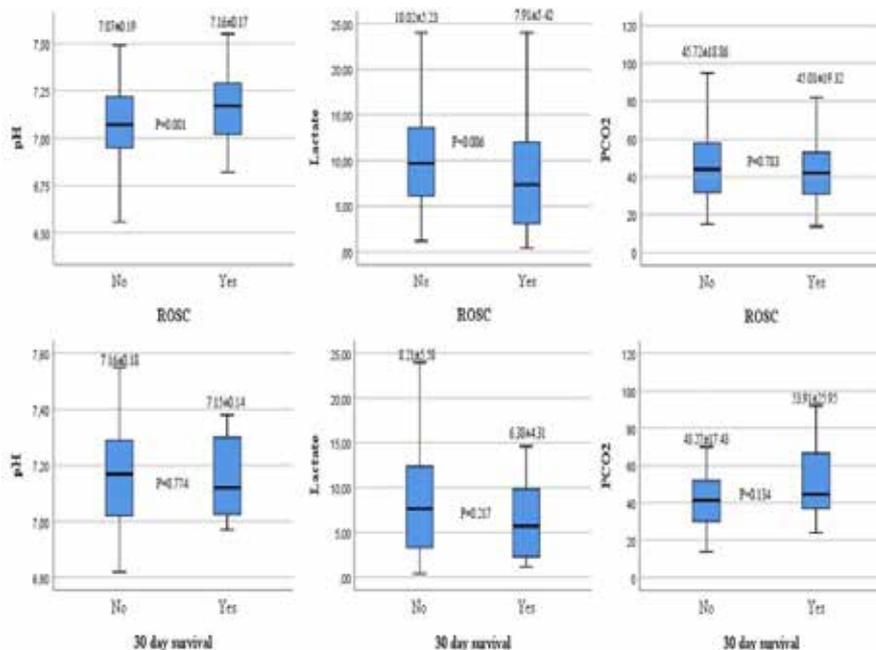
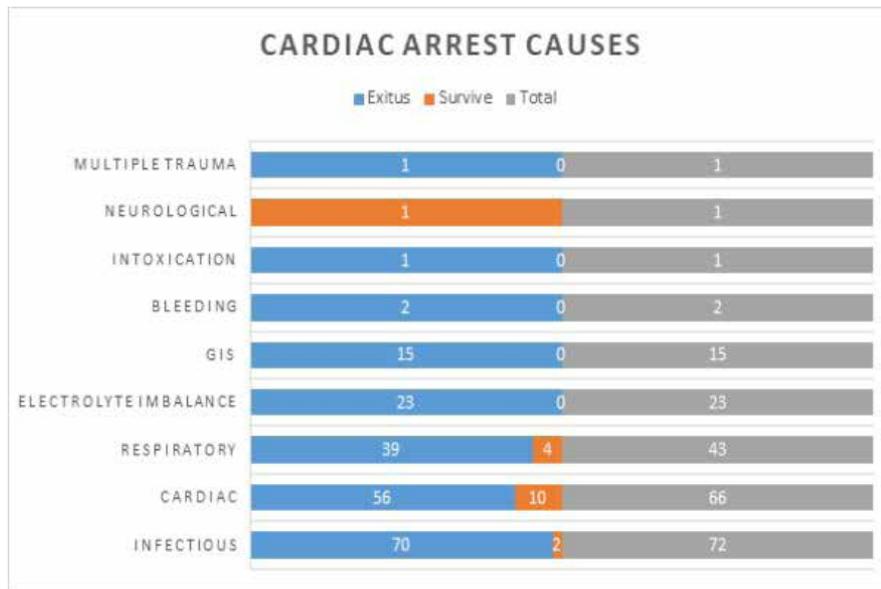


Figure 3. Distribution of the causes of cardiac arrest.



the CPR duration of the patients with OHCA. Third, long-term follow up and an assessment of detailed neurological outcomes, such as cerebral performance category scale, were not performed in our study.

In conclusion, in parallel with the increase in life expectancy, an increase in the number of elderly individuals is inevitable. As the number of elderly individuals increases, the number of ED admissions as well as the incidence of IHCA and

OHCA will also increase. As age and the number of comorbidities increase in elderly patients, ROSC rates decrease, as does the chance of survival in these patients. However, considering the high rate of favorable neurological outcomes in patients who are discharged from the hospital, further studies should be conducted to determine factors that might increase the survival rates of these patients after resuscitation.

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RESEARCH

INDEPENDENT PROGNOSTIC INDICATORS IN THE ELDERLY WITH PNEUMONIA: A SINGLE-CENTRE PROSPECTIVE OBSERVATIONAL STUDY

ABSTRACT

Background: The goal of this study was to identify and investigate the indicators of a poor prognosis in the elderly with pneumonia.

Material-Method: In this prospective observational study, the patients with pneumonia were stratified into younger (18 to 64 years) and older (more than 65 years) groups. The poor prognostic indicators were determined and compared.

Results: A total of 184 pneumonia episodes in 151 patients were recorded. The median age was 72 (18-104) of whom 127 (69%) were more than 65 years old and 110 (59.8%) were male. A multivariate regression analysis identified three variables that could be potential independent risk factors for a poor prognosis in the elderly: 1) dyspnea at the onset (OR:5.85, CI:5.18-6.52, p=0.01), 2) use of antibiotics within the last three months (OR:2.97, CI:2.51-3.43, p=0.02) and 3) acute renal failure (OR:2.51, CI:2.06-2.96, p=0.04). A receiver operating characteristic analysis showed that the areas under the curves of procalcitonin and C-reactive protein as indicators of a poor prognosis in the elderly were 0.846 (p<0.001) and 0.650 (p=0.008). In addition, changes in mental status (p<0.001), confusion, blood urea nitrogen, respiratory rate, blood pressure, and age ≥65 years score (p<0.001) and pneumonia severity index (p<0.001) were associated with a poor prognosis.

Conclusion: Dyspnea at the onset, use of antibiotics within the last three months, acute renal failure, serum C-reactive protein and procalcitonin levels should be carefully evaluated to determine the need for hospitalization, intensive care, and initial antimicrobial therapy.

Keywords: Aging; Pneumonia; Prognosis



BACKGROUND

Pneumonia is one of the most common acute infectious conditions causing fatality at any age. Treatment of pneumonia typically commences empirically based on clinical, radiological and non-specific laboratory findings (1).

Whether acquired in the community or the hospital, pneumonia leads to more severe outcomes in the elderly than the young. The results are a significant increase in health care costs due to prolonged hospitalization and the use of multiple antibiotics (2). As a result, we must develop new clinical strategies to reduce mortality and morbidity rates in the elderly.

The purpose of this prospective study was to identify and investigate the indicators of a poor prognosis in the elderly with pneumonia. We compared the risk factors, clinical and laboratory findings, severity of the course and the treatment responses in patients with pneumonia over and under-age 65.

METHODS

This prospective observational and single-centre study included patients aged 18 years or older who were diagnosed with pneumonia by the Department of Infectious Diseases and Clinical Microbiology between January and December of 2017.

Patients with community-acquired pneumonia (CAP) requiring hospitalization or hospital-acquired pneumonia (HAP) were included in the study. Outpatients, patients with neutropenia, and ventilatory-associated or postoperative pneumonia were excluded. The diagnosis of pneumonia was made on the basis of current guidelines (3-6). A total of 184 pneumonia episodes in 155 patients were recorded.

A "recurrent episode" was defined as an episode of recurrent pneumonia at least 30 days after the initial diagnosis of pneumonia during

the one-year follow-up period. Each episode of pneumonia was recorded separately.

The data on demographics, underlying diseases, immunosuppressive conditions, symptoms and findings of physical examinations, laboratory test results, radiological findings, and treatments and responses were recorded in a follow-up data sheet. The cases were divided into two groups according to their ages (over or under 65) with the comparative analyses applied.

Modified Charlson comorbidity scores were calculated for all the patients. The CURB-65 and (PSI) scores were calculated only for patients with community-acquired pneumonia.

Based on tympanic membrane measurement, fever was defined as the body temperature of 37.8 °C or greater for patients 65 or older and 38 °C or greater for patients under 65. Hypothermia was defined as a body temperature of less than 35.6 °C.

A "poor prognosis" was defined as the development of septic shock associated with infection and/or the need for intensive care and/or death within 30 days.

Dependent variables were compared with many independent variables such as demographic, clinical and laboratory parameters. The Friedman Variance Analysis was used to assess continuous and more than two dependent non-parametric groups. The Wilcoxon Signed Ranks Test was used for post-hoc analysis. Afterward, these dependent groups were reviewed one by one. Receiver operating characteristic (ROC) curves were drawn and Area Under the Curve (AUC), cut-off values and sensitivity and specificity of cut-off values were shown.

Non-parametric groups containing two continuous sets of data were compared, and the Mann Whitney U Test was used to determine the significant difference. The significance of the categories of dependent groups and categorical independent groups was determined using a Chi-

Table 1. The demographic characteristics of the cases in terms of age groups.

	In total		<65 years		≥65 years		p
	n	%	n	%	n	%	
Number of cases	184	100	57	44.9	127	55.1	<0,001
Mean age ±se	69.27 ±1.23		49.63 ±1.68		78.09 ±0.81		<0.001
Median age	72		53		76		
Male	110	59.8	28	49.1	82	64.6	0.048
Female	74	40.2	29	50.9	45	35.4	
CAP	145	78.8	51	89.5	94	74.3	0.561
HAP	39	21.2	6	10.5	33	26	0.019
Aspiration associated pneumonia	13	7.1	4	7	9	7.1	1.000
Underlying disease	174	94.6	50	87.7	124	97.6	0.011
COPD	58	31.5	8	14.0	50	39.4	0.001
Diabetes mellitus	61	33.2	12	21.1	49	38.6	0.020
Hypertension	99	53.8	19	33.3	80	63.0	0.000
Congestive heart failure	36	19.6	5	8.8	31	24.4	0.015
Cerebrovascular disease	16	8.7	2	3.5	14	11.0	0.155
Chronic renal failure	64	34.8	9	15.8	55	43.3	<0.001
Malignancy	51	27.7	20	35.1	31	34.4	0.135
Cystic fibrosis	1	0.5	1	1.8	0	0	-
Asthma	10	5.4	1	1.8	9	7.1	0.178
Bronchiectasis	4	2.2	4	7.0	0	0	-
Coronary artery disease	52	28.3	7	12.3	45	35.4	0.001
Dementia	22	12.0	0	0	22	17.3	<0.001
Immunosuppression	36	19.6	21	36.8	15	11.8	<0.001
Chemotherapy	16	8.7	8	14.0	8	6.3	0.096
Steroid	14	7.6	8	14.0	6	4.7	0.037
Immunosuppressive disease	9	4.9	4	7.0	5	3.9	0.462
Radiotherapy	8	4.3	3	5.3	5	3.9	0.705
History of previous tuberculosis	10	5.4	7	12.3	3	2.4	0.011
Smoking history	94	51.1	24	42.1	70	55.1	0.103
Previous antibiotic use within the last 3 months	101	54.9	30	52.6	71	55.9	0.412
Hospital stay within the last 1 year	95	51.6	32	56.1	63	49.6	0.638
ICU stay within the last 1 year	24	13.0	6	10.5	18	14.2	0.638
Cough	145	78.8	51	89.5	84	74.0	0.019
Sputum	121	65.8	42	73.7	79	62.2	0.135
Dyspnea	141	76.6	48	84.2	93	73.2	0.132
Mental disorder	25	13.6	3	5.3	22	17.3	0.035
Fever	83	45.1	29	50.9	54	42.5	0.292
Hypothermia	15	8.2	6	10.5	9	7.1	0.561
Hemoptysis	13	7.1	9	15.8	4	3.1	0.004
Acute renal failure	63	34.2	18	31.6	45	35.4	0.737
Mechanical ventilation	25	13.6	5	8.8	20	15.7	0.249
Dialysis	5	2.7	2	3.5	3	2.4	-
Intensive care need	29	15.8	7	12.3	22	17.3	0.512
Poor prognosis	55	29.9	17	29.8	38	29.9	1.000
Death	19	10.3	4	7	15	11.8	0.435

TBNA: Transbronchial Needle Aspiration; TBLB: Transbronchial Lung Biopsy; BLVR: Bronchoscopic Lung Volume Reduction



Square Test. A Fisher's Exact Test was used in cases where $n < 20$ or $20 < n < 40$ and at least one expected value was less than 5. Yates was chosen when $n > 40$ and the minimum expected value was less than 5. In all cases, except those using the Pearson Chi-Square Test, the results were accepted. A univariate and multivariate analysis was performed to define significant variables.

The results were evaluated at a 95% confidence interval with the statistical significance level defined as $p < 0.05$. The analyses were performed using the IBM SPSS - 21 (Statistical Package for Social Sciences, Chicago, IL, USA).

RESULTS

A total of 184 pneumonia episodes in 155 patients were recorded. Of these episodes, 145 (78.8%) were CAP and 39 (21.2%) were HAP. Twenty-nine recurrent episodes were recorded during the one-year follow-up. Thirteen (7.1%) episodes were directly attributable to in-hospital pulmonary aspiration.

The median age was 72 (range of 18 to 104) of whom 127 (69%) were over 65 years old and 110 (59.8%) were male. Of the 127 cases, 53 (41.7%) were in the 65-74 age group, 44 (34.6%) were in the 75-84 age group, and 30 (23.6%) were more than 85 years old. The demographic characteristics of the cases are shown in Table 1. Death (20,5% vs. 7,6%, $p=0,040$) and the need for intensive care (37,9% vs. 18,1%, $p=0,016$) were more frequent in patients with HAP compared to patients with CAP.

Microbiological evidence was obtained in 37 (20.1%) cases (26 in sputum culture, one in both blood and sputum culture, four in the respiratory system using a multiplex polymerase chain reaction, two in a bronchoalveolar lavage culture, two in an endotracheal aspirate and two in a transtracheal aspirate).

Blood culture was obtained in 114 (62%) cases, and sputum culture was evaluated in 76 (41.3%)

cases. Positive blood culture was observed in only one case. Of the sputum cultures, the causative microorganisms were isolated in 27 (35.5%) cases.

Pseudomonas spp. ($n=11$, 29.7%) was the most common agent, followed by *Streptococcus pneumoniae* ($n=6$, 16.2%). Although *Pseudomonas* spp. was more frequent in the elderly compared to the younger group ($n=8$ vs. $n=3$), there was no significant difference between the two groups ($p=0.54$). Other typical bacterial agents were *Haemophilus influenzae* ($n=5$, 13.5%), *Acinetobacter* spp. ($n=4$, 10.8%) and *Staphylococcus aureus* ($n=4$, 10.8%). Of the *Staphylococcus aureus* strains, 25% had methicillin resistance. The rate of carbapenem resistance was 45.4% in *Pseudomonas* spp. and 50% in *Acinetobacter* spp.

Among the atypical agents, *Mycoplasma pneumoniae* in one case, Influenzavirus in two cases, Metapneumovirus in one case, Human coronavirus 229E (coupled with *Streptococcus pneumoniae*) in one case were detected using multiplex PCR in the respiratory system.

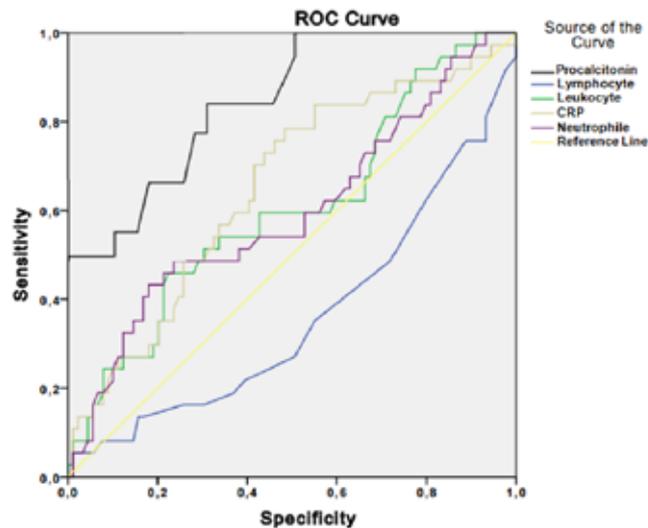
In terms of culture positivity, there was no significant difference between the elderly and the younger group. However, the availability of sputum samples was significantly lower in the elderly group ($p=0.04$).

Table 2 summarizes the statistical analysis of these dependent parameters with mean and median values by age group on days D0, D3 and D7.

A ROC analysis showed that AUC of procalcitonin and CRP as indicators of a poor prognosis in the elderly were 0.846 ($p < 0.001$) and 0.650 ($p=0.008$) (Figure 1). For a poor prognosis, the cut-off value of procalcitonin was 0.295 ng/mL in the elderly group with a sensitivity of 83% and a specificity of 69% ($p < 0.001$). The cut-off value of CRP was 79 mg/L with a sensitivity of 79% and a specificity of 52% ($p=0.008$).

In the Chi-square test, poor prognostic

Figure 1. Receiver operating characteristic curve of procalcitonin, CRP levels, leukocyte, neutrophile and lymphocyte counts for prediction of poor prognosis of elderly with pneumonia



indicators are shown in (Table 3). There was no statistically significant relationship between body temperature and a poor prognosis ($p=0.157$). In addition, a recurrent episode ($p=0.418$) and *Pseudomonas* spp. ($p=0.573$) were not associated with a poor prognosis.

Age-dependent and independent analyses, including univariate and multivariate regression, revealed that dyspnea, use of antibiotics within the last three months and acute renal failure were associated with a poor prognosis. Table 4 shows the odds ratios (OR), confidence intervals (CI) and p values for all ages and for those 65 years or older.

DISCUSSION

In this prospective observational study of pneumonia in the elderly, patients with pneumonia were divided into younger (18 to 64 years) and older (over 65 years) groups. The indicators of a poor prognosis were determined and compared in both age groups. We identified three variables that could be potential independent risk factors

for a poor prognosis in the elderly with pneumonia: 1) use of antibiotics within the last three months (OR:2.97, CI:2.51-3.43, $p=0.02$), 2) acute renal failure (OR:2.51, CI:2.06-2.96, $p=0.04$) and 3) dyspnea (OR:5.85, CI:5.18-6.52, $p=0.01$). Also, we found that serum procalcitonin ($p<0.001$) and CRP levels ($p=0.008$) were valuable indicators of a poor prognosis in the elderly. In addition, mental status changes, the CURB-65 score, and the pneumonia severity index (PSI) as well as the independent risk factors were associated with a poor prognosis for those 65 years and older.

Exposure to antibiotics is one of the primary reasons for increased pneumonia cases. With an increase in resistant microorganisms, that exposure leads to a lack of response to empirical antimicrobial therapies. Ruhe et al. (7) showed that previous use of antibiotics is a risk factor for infection with drug-resistant *Streptococcus pneumoniae*. In our study, the rate of previous antibiotic use within the last three months was high in the elderly ($n=71$, 55.9%) and in the younger group ($n=30$, 52.6%). Also, use of antibiotics within



Table 2. The analysis of five dependent laboratory parameters on D0, D3 and D7.

		D0		D3		D7	
Age		<65	≥65	<65	≥65	<65	≥65
WBC*	Mean ± se	12,761.40 ±845.07	11,971.65 ±527.41	9,575.80 ±617.70	10,215.49 ±506.77	10,209.80 ±660.69	10,297.98 ±634.44
	Median	11900	11900	9295	9200	10000	9050
	p	0.460		0.755		0.587	
Friedman p<0.001		The day which is made a significant difference was D0.					
CRP*	Mean ± se	181.68 ±15.86	118.11 ±8.34	79.47 ±11.13	79.24 ±6.85	35.51 ±6.42	47.68 ±5.40
	Median	179	92	51	56	19	31
	p	0.001		0.755		0.119	
Friedman p<0.001		All the days were made a significant difference.					
PRC*	Mean ± se	2.05 ±0.81	1.99 ±0.88	2.36 ±1.79	1.16 ±0.45	0.20 ±0.09	0.32 ±0.07
	Median	0.24	0.25	0.16	0.18	0.07	0.16
	p	0.758		0.703		0.002	
Friedman p<0.001		All the days were made a significant difference.					
NEU*	Mean ± se	11,017.54 ±896.59	9,399.68 ± 472.05	7,176.40 ±573.02	7,513.06 ±396.74	7,655.00 ±662.25	7,345.31 ±402.12
	Median	9,300	8,600	6,350	6,800	6,300	6,400
	p	0.173		0.702		0.792	
Friedman p<0.001		The day which is made a significant difference was D0.					
LYMP*	Mean ± se	1142,10± 88.04	1,560.48 ±226.04	1,498 ±133.11	1,641.65 ±332.71	1,757.31 ±161.53	1,943.77 ±465.30
	Median	1000	1,200	1,350	1,200	1,600	1,400
	p	0.072		0.354		0.235	
Friedman p<0.001		The day which is made a significant difference was D7.					

*WBC: Leukocyte CRP:C-reactive protein PRC: Procalcitonin NEU: Neutrophile LYMP: Lymphocyte

Table 3. Chi-square test for poor prognosis.

	Age-independent			≥65 years		
	n	%	p	n	%	p
Number of cases	184	100		127	55.1	
Cases with poor prognosis	55/184	29.9		38/127	29.9	
Gender			0.772			1.000
Male	32	58.2		25	65.8	
Female	23	41.8		13	34.2	
Dyspnea	52	94.5	<0.001	35	92.1	0.002
Mental status changes	18	32.7	<0.001	17	44.7	<0.001
Mechanical ventilation need	25	45.5	<0.001	20	52.6	<0.001
CURB-65 class			<0.001			<0.001
Class 1	8	21.1		1	4.0	
Class 2	10	26.3		7	28.0	
Class 3	20	52.6		17	68.0	
PSI class			<0.001			<0.001
Class 1	3	7.9		0	0	
Class 2	14	36.8		7	28.0	
Class 3	21	55.3		18	72.0	
Acute renal failure	28	50.9	0.002	20	52.6	0.014
Previous antibiotic use within the last 3 months	39	70.9	0.006	27	71.1	0.032
ICU stay within the last 1 year	12	21.8	0.03	9	23.7	0.055
Malignancy	22	40.0	0.015	12	31.6	0.261
Hospital-acquired pneumonia	17	30.9	0.048	13	34.2	0.189

the last three months was an independent risk factor for a poor prognosis in both age groups.

In our study, acute renal failure was an indicator of a poor prognosis in 52.6% of the elderly. Acute renal failure was also an independent risk factor for a poor prognosis. In a study by Murugan et al. (8), acute renal failure was associated increased mortality risk. Further, an increased severity of acute renal failure was correlated with the increased mortality rates.

In this study, dyspnea was found to be an independent risk factor for a poor prognosis. The diagnosis of pneumonia in the elderly is delayed because the signs and symptoms are infrequent (9). Although dyspnea was seen as less frequent in

the elderly, it is vital for the prognostic evaluation. However, due to weak compensating mechanisms, multiple organ failure and changes in mental status develop more easily in the elderly (1). In our study, mental status changes were found to be more frequent in the elderly ($p=0.035$). This finding was consistent with other studies (9-10). That is why changes in mental status should be considered one of the most important indicators in the early diagnosis of pneumonia in the elderly. Also, a change in mental status may be the first clue leading to the diagnosis of pneumonia in this group.

In our study, fever and hypothermia were less frequent in the elderly group than in the younger



group. We know that fever is less frequent in the elderly population because of reduced host immune response. In this reduced response, the decrease in the production of endogenous pyrogens such as interleukin-1, interleukin-6, the tumour necrosis factor and the reduced response to these pyrogens has been thought to play a role. In addition, hypothalamic changes occurring in the aging process and changes in thermogenic brown fat tissue may also play a role in a decreased fever response to infections observed in the elderly (11-13).

In our study, sputum culture positivity was 40.4% in the elderly group and 25.8% in the younger group. In a study by Saltoglu et al. (14), microbiological evidence was obtained in 44% of the cases. In Gutierrez's study (15), the rate was high (50.7%). In contrast, microbiological evidence was obtained in 20.1% of the cases in our study.

The rate at which the sputum sample was obtained in elderly patients was significantly lower than in the younger group ($p=0.037$). The reasons for the lower rates include use of antibiotics before inpatient treatment, and problems with sputum production and collection in the elderly.

In our study, *Pseudomonas* spp. that was isolated from clinical specimens were significantly higher compared to the other isolates. This may be because of previous antibiotic use and multiple comorbid diseases. Among cases with *Pseudomonas* spp., the rate of previous antibiotic use and multiple comorbid diseases (≥ 2 chronic comorbidities) were 81.8% and 63.6% respectively. von Baum et al. (16) reported that over age 65, congestive heart failure and cerebrovascular disease were indicators of Enterobacteriaceae. Also, chronic respiratory disease and enteral tube feeding were indicators of *Pseudomonas*

Table 4. Univariate and multivariate analysis for poor prognosis

	Age-independent univariate analysis			≥ 65 years univariate analysis			Age-independent multivariate analysis			≥ 65 years multivariate analysis		
	OR	CI	p	OR	CI	p	OR	CI	p	OR	CI	p
Dyspnea	7.80	7.18-8.42	<0.01	8.97	8.32-9.62	<0.01	6.24	5.60-6.88	<0.01	5.85	5.18-6.52	<0.01
Hypothermia	2.21	1.66-2.76	0.15	3.23	2.57-3.89	0.07	1.98	1.28-2.68	0.33	2.97	2.13-3.81	0.19
Previous antibiotic use within the last 3 months	2.63	2.28-2.98	<0.01	2.95	2.57-3.33	<0.01	2.51	2.09-2.93	0.03	2.97	2.51-3.43	0.02
Acute renal failure	2.79	2.45-3.13	<0.01	3.07	2.69-3.45	0.01	2.84	2.44-3.24	<0.01	2.51	2.06-2.96	0.04
Modified Charlson class 1	1.30	0.78-1.82	0.95	0.84	0.29-1.39	0.79	2.00	1.11-2.89	0.44	2.08	1.14-3.02	0.43
Modified Charlson class 2	1.29	0.81-1.77	0.59	1.45	0.93-1.97	0.48	1.69	0.84-2.54	0.54	2.45	1.55-3.35	0.53
Modified Charlson class 3	1.94	1.48-2.04	0.15	1.88	1.36-2.40	0.22	2.40	1.56-3.24	0.30	2.45	1.45-3.35	0.32

aeruginosa. In our study, there was no significant relationship between *Pseudomonas* spp. as a causative agent and a poor prognosis ($p=0.573$). The rates of carbapenem resistance were also quite high in *Pseudomonas* spp. (45.4%) and in *Acinetobacter* spp. (50%). And 25% of *Staphylococcus aureus* strains were resistant to methicillin.

In this study, we found that serum procalcitonin and CRP levels were valuable indicators of a poor prognosis in the elderly. There are various studies showing the contribution of a complete blood count, CRP and procalcitonin in the diagnosis and follow-up of pneumonia. However, there are fewer studies evaluating elderly patients with pneumonia in relation to these parameters (17, 18). In our study, the mean CRP value on D0 was 181.68 ± 15.86 mg/L in the younger group and 118.11 ± 8.34 mg/L in the elderly ($p=0.001$). The difference between the older and younger group showed that the initial CRP values on D0 may be lower in the elderly group than in the younger group. In order to evaluate the potential for a poor prognosis, the optimal cut-off value of CRP on D0 was set at 91.5 mg/L in the age-independent group, and at 79 mg/L in the elderly group. In a study by Zhang et al. (18), CRP predicted a poor prognosis at least as accurately as procalcitonin. They found that the cut-off values were 74.2 mg/L for CRP, 78% for sensitivity and 75% for specificity.

In our study, procalcitonin was found to be the best prognostic indicator in the ROC curve in both the age-independent and elderly groups. In a meta-analysis by Liu et al. (19), the prognostic cut-off value of procalcitonin was less than 0.5 ng/mL in only two studies. However, our study was consistent with the studies showing that procalcitonin is a reliable prognostic indicator (20, 21). On the other hand, in 667 cases evaluated by Akagi et al. (17) procalcitonin was not an independent predictor of mortality in either the elderly or the young group, but was associated with the severity of pneumonia. Yazici et al. (22)

showed that CRP and procalcitonin were not important for prediction of mortality in respiratory intensive care patients.

In the elderly, the immune response to infections is reduced due to immunosenescence, and a chronic, low-grade systemic inflammation occurs. Subclinical inflammation caused by exposure to various antigens in elderly patients manifests with relatively lower CRP and procalcitonin release. However, decreased procalcitonin levels in elderly patients can also be due to various etiologies of pneumonia with varying cytokine release patterns (17).

The modified Charlson comorbidity score was not correlated with poor prognosis in both age

groups. These findings suggest that the CURB-65 and the PSI are still superior to the modified Charlson comorbidity classification in accurately predicting the prognosis. Various studies have demonstrated that mortality rates are high in the elderly population (17,23). In our study, the 30-day mortality rates were found to be higher in the elderly group (11.8%) compared to the younger group (7%). However, they were not statistically significant ($p=0.435$). In a study by Saltoglu et al. (14), the mortality rate of 130 patients with CAP was 3% and the mean age was 40 ± 13.6 years. The high mortality rate in our study may stem from the high mean age of the patients (69.27 ± 1.23) and the inclusion of HAP with severe infection. The mean age of the younger group was also relatively high (49.63 ± 1.68).

Our study had several limitations. First, it was conducted in a single centre. Second, the rate of microbiologically confirmed cases was low and we did not consider the causative pathogens other than *Pseudomonas* spp. as a risk factor. Our study has also several strengths. First, it is a prospective study. Second, multiple comorbidities and different types of variables were included in the multivariate regression analysis.



CONCLUSION

CRP and procalcitonin should be included in the diagnostic and prognostic work-up of elderly patients because the classic symptoms and signs of pneumonia are less common in this group. Dyspnea and acute renal failure at the onset should be considered along with the PSI and the CURB-65 scores to evaluate the need for hospitalization and intensive care. In addition, the use of antibiotics within the last three months and current rates of resistance to common causative microorganisms should be evaluated to determine the most effective initial antimicrobial therapy.

Ethics approval and consent to participate

This study was conducted in compliance with relevant laws and guidelines and in accordance with the ethical standards of the Declaration of Helsinki. It was approved by the Clinical Research Ethics Committee of Istanbul University Cerrahpasa Medical Faculty (approval number: 83045809-604.01.02-52675). All patients (or their authorized legal representatives) gave written informed consent to be included in the study.

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RESEARCH

THE EFFECT OF BLOOD TRANSFUSION AND TRANEXAMIC ACID ON LENGTH OF HOSPITAL STAY AND MORTALITY AFTER HIP FRACTURE SURGERY IN ELDERLY PATIENTS

ABSTRACT

Introduction: The timely and appropriate administration of the transfusion of blood and/or blood components may considerably improve patient outcomes of geriatric hip fractures. However, the transfusion requirement is not free of complications. The purpose of this study was to evaluate the outcomes of geriatric hip fracture patients who required transfusion and antifibrinolytic treatment.

Material-Method: This study included geriatric patients with a hip fracture who were admitted to our institution between 2017 and 2018. Patient outcomes were evaluated in respect of mortality and length of hospital stay according to the need for blood transfusion.

Results: The data of 502 patients were analyzed. In-hospital mortality was recorded for 20 patients (4%). A median of 2 units of red blood cells were used in 218 patients (43.4%), median 2 units of platelet concentrates were used in 4 patients (0.8%), and a median of 2 units of fresh frozen plasma were used in 29 patients (5.8%). Length of hospital stay, and intensive care unit stay were significantly higher for patients who received blood products ($p<0.05$). The inpatient mortality rates were similar for patients who received and did not receive blood products ($p>0.05$) but were significantly low in patients who received tranexamic acid (1.2% vs. 5.3% respectively, $p<0.05$).

Conclusion: Blood transfusion in geriatric hip fractures is often associated with long-term hospital and intensive care stays and mortality. In addition, the results of this study revealed that inpatient mortality is significantly low in elderly patients with hip fractures who administered TXA perioperatively.

Keywords: Blood transfusion; Geriatrics; Hip fractures; Tranexamic acid; Mortality; Length of stay

INTRODUCTION

Trauma is a major contributor to mortality worldwide, reportedly the cause of 4.9 million deaths in 2016 (1). In extremely severe cases, mortality associated with trauma may be as high as 40%, and one-quarter of these deaths are associated with uncontrolled blood loss and coagulopathy (2). Thus, the acute management of orthopedic traumatic injury also includes interventions using transfusion algorithms to achieve rapid homeostasis to prevent morbidity and mortality (3).

Exsanguination due to traumatic injury is accompanied and aggravated by a significant deterioration in the endogenous control of homeostasis, hypoperfusion, and shock, which are collectively referred to as acute traumatic coagulopathy (4). The trauma-induced release of mediators acts as an activator for several humoral mechanisms including coagulation, complement, and fibrinolysis, which play important roles in altered homeostasis and the development of systemic inflammatory response and multiple organ failure (5).

Hip and femur fractures may deteriorate hemostatic mechanisms and cause significant mortality and morbidity in geriatric patients (6). Although minimally invasive techniques such as intramedullary nailing (IMN) are used to reduce bleeding, implantation of extra-medullary fixation devices, or Hemi/total arthroplasty, which are related to more bleeding, may need to be performed depending on the fracture type or patient characteristics (7). In the absence of prophylactic measures, the postoperative incidence of venous thromboembolism (VTE) following a hip fracture is generally very high (40%–60%) (8). Prophylactic agents may cause bleeding while protecting against VTE. In addition to surgical interventions, the management of hip fractures also includes timely and appropriate transfusion of red blood cells (RBC), fresh frozen plasma (FFP), and platelet concentrates (9). Transfusion

of blood components is associated with improved patient outcomes (10). However, transfusion is also related to infection and morbidity in orthopedic procedures (11).

A recently popularized approach for hemorrhagic control is the administration of the antifibrinolytic agent tranexamic acid (TXA), which inhibits the activation of plasminogen competitively (12,13). Evidence suggests that TXA is safe and effective to use for controlling blood loss without increasing the VTE in orthopedic procedures (14). Although there are studies in the literature on the use of transfusion and tranexamic acid in the management of blood loss in geriatric hip fractures, recent meta-analyses show that these studies do not reach a sufficient number to create conclusion (15,16). Based on the significant burden of hip and femur fractures in the geriatric population, appropriate management of orthopedic procedures and hemorrhagic control strategies in these patients are vital components of improved patient outcomes. In this study, we aimed to evaluate the outcomes of transfusion of blood components and administration of tranexamic acid (TXA) along with surgical interventions in geriatric patients with hip fractures regarding mortality and length of hospital stays with a high number of patients.

MATERIALS AND METHOD

This study was designed as a retrospective chart review. The target population of our study was the geriatric patients hospitalized in the orthopedic surgery department of our hospital between 2017 and 2018. The inclusion criteria of the study were patients age 65-110 years, patients treated for proximal femoral fracture (femoral neck, intertrochanteric, sub-trochanteric, and peri-prosthetic) and having complete hospital records. Patients were excluded from the study if they were scheduled for elective hip surgery, had a pathological fracture or any known hematological



Table 1. Demographic characteristics of the patients (n=502)

Characteristics	
Age (years), mean±SD	82.6±7.3
Sex, n (%)	
Male	184 (36.7)
Female	318 (63.3)
Diagnosis, n (%)	
Peritrochanteric fracture	305 (60.8)
Femoral neck fracture	179 (35.7)
Subtrochanteric fracture	14 (2.8)
Periprosthetic fracture	4 (0.8)
Comorbidities, n (%)	
Neurological diseases	10 (2)
Malignancies	4 (0.8)
Hypertension	305 (60.8)
Diabetes mellitus	67 (13.3)
Chronic obstructive pulmonary disease/asthma	222 (44.2)
Cardiovascular disease	41 (8.2)
Acute/chronic kidney failure	20 (4)

SD, Standard deviation

disorder. After exclusions, records of the remaining 502 patients were screened and included in the analyses.

The data collected for the study included the demographic and clinical characteristics of the patients in respect of the type of injury, surgical interventions, utilization of blood and blood components, and administration of antifibrinolytic agents (TXA). Analyses were performed to evaluate the effects of these characteristics on the length of hospital stay and in-hospital mortality.

Statistical Analysis

Data obtained in the study were analyzed statistically using SPSS ver. 21 software (IBM Inc., Armonk, NY, USA). Descriptive data were presented as mean and standard deviation for

numerical variables, and frequency and percentage for categorical variables. Comparisons of data between independent prognostic subgroups were performed using the Mann–Whitney U test and Chi-square test for numerical and categorical variables, respectively. Preoperative to postoperative changes in blood counts were compared using the Wilcoxon test. A type I error level of 5% was considered the threshold for statistical significance.

RESULTS

This study included 502 patients, comprising 318 (63.3%) females and 184 (36.7%) males with a mean age of 82.6±7.3 years. In total, 305 patients (60.8%) had per-trochanteric fracture,

Table 2. Treatment-related characteristics of patients

Treatment-related characteristics	
Surgery, n (%)	
Intramedullary nailing	277 (55.2)
Partial hip arthroplasty	181 (36.1)
Total hip arthroplasty	17 (3.4)
Plate fixation	4 (0.8)
Dynamic hip screwing	3 (0.6)
ASA class, n (%)	
1	1 (0.2)
2	63 (13.5)
3	382 (82.2)
4	19 (4.1)
The total length of hospital stay (days), mean±SD	6.9±6.8
Length of ICU stay (days), mean±SD	3.1±5
Survival, n (%)	
Alive	482 (96)
Dead	20 (4)
Preoperatively	8 (1.6)
Postoperatively after intramedullary nailing	8 (1.6)
Postoperatively after partial hip arthroplasty	4 (0.8)

ASA, American Society of Anesthesiologists; ICU, Intensive care unit; SD, Standard deviation

179 (35.7%) had femoral neck fracture, 14 (2.8%) had sub-trochanteric fracture, and 4 (0.8%) had peri-prosthetic fracture. The distribution of comorbidities in the patients was as follows: hypertension in 305 patients (60.8%), chronic obstructive pulmonary disease /asthma in 222 patients (44.2%), diabetes mellitus in 67 patients (13.3%), cardiovascular disease in 41 patients (8.2%), acute/chronic kidney failure in 20 patients (4%), neurological disorders in 10 patients (2%), and malignancies in 4 patients (0.8%) (Table 1).

Regarding treatment, 277 patients (55.2%) had undergone IMN, 181 (36.1%) had partial hip arthroplasty, 17 (3.4%) had total hip arthroplasty, 4

(0.8%) had plate fixation, and 3 (0.6%) had dynamic hip screw. Approximately 75.7% of the patients were classified as ASA 3 and the mean length of hospital stay was 6.9±6.8 days (1–65 days). For the duration of hospitalization, the mean length of intensive care unit (ICU) stay was 3.1±5.0 days (0–61 days) for all. In-hospital mortality was recorded for 20 patients (4%), of which 8 (1.6%) died preoperatively, 8 (1.6%) postoperatively after IMN, and 4 (0.8%) after partial hip replacement surgery (Table 2).

The mean values of pre- and postoperative hemoglobin and hematocrit values were 12±1.9 mg/dl and 37.5% (±25%), and 9.6±1.3 mg/dl and



Table 3. Blood counts and transfusion of blood and blood components

Hemoglobin (mg/dL), mean±SD	
Preoperative	12±1.9
Postoperative	9.6±1.3
P	<0.001
Hematocrit (%), mean±SD	
Preoperative	37.5±25
Postoperative	28.7±4
P	<0.001
Red blood cell transfusion, n (%)	218 (43.4)
Number of transfusions, median (min-max)	2 (1-8)
Platelet concentrate transfusion, n (%)	4 (0.8)
Number of transfusions, median (min-max)	2 (2-3)
Fresh frozen plasma transfusion, n (%)	29 (5.8)
Number of transfusions, median (min-max)	2 (1-7)

SD, Standard deviation

28.7% (±4%), respectively. Both the hemoglobin ($p<0.001$), and hematocrit ($p<0.001$) levels were decreased significantly in the postoperative period compared to the preoperative period. A median of 2 units of RBC (range: 1–8 units) were used in 218 patients (43.4%), median 2 units of platelet concentrate (range: 2–3 units) were used in 4 patients (0.8%), and median 2 units of FFP (range: 1–7 units) were used in 29 patients (5.8%) (Table 3).

When the patient outcomes were compared according to the received blood components, the length of hospital stay and ICU stay were significantly higher for patients who received RBCs ($p<0.001$ for both) and FFPs ($p=0.001$ for the hospital stay, $p=0.018$ for ICU stay). When the patient outcomes were evaluated in respect of survival, the inpatient mortality rates were similar for the patients who received and did not receive RBCs ($p=0.216$), platelet concentrates ($p=1.0$), and FFPs ($p=0.324$). When the outcomes were compared between patients with and without TXA

use, the total length of hospitalization ($p=0.721$) and length of ICU stay ($p=0.918$) were found to be similar, but inpatient mortality rates were significantly lower in patients who received TXA (1.2% vs. 5.3%, $p=0.026$) (Table 4).

When treatments were grouped according to the utilization of blood components and TXA, 170 patients (33.9%) received only blood components, 53 patients (10.6%) received both blood components and TXA, 112 patients (22.3%) received only TXA, and 167 patients (33.3%) did not receive any type of blood components or TXA. The comparisons of patient outcomes between treatment groups revealed that the total length of hospital stay was significantly longer for patients who received both treatments and shorter for patients who only received TXA ($p<0.001$). The length of ICU stay was significantly higher for patients who only received blood components ($p<0.001$). The lowest mortality rates were observed in patients who received both blood components and TXA (0%) and patients who

only received TXA (1.8%), and the highest rates were observed in patients who received neither treatment (7.2%) ($p=0.042$) (Table 5).

DISCUSSION

This study evaluated the outcomes of geriatric patients with hip fractures in respect of the need for blood and blood components to emphasize the related morbidity and mortality rates and the importance of administration of TXA to reduce transfusion requirement. Less than half of the patients needed RBC transfusion, and only 5.8%

whereas this increased to 21.2% in 2008–2010. During the past two decades, clinicians have used two major strategies for blood transfusion, namely restrictive and liberal strategies. These strategies (restrictive and liberal) have used hemoglobin threshold levels as ≤ 8 g/dL and ≤ 10 g/dL for transfusion, respectively (12). The liberal regimen suggests that utilizing an upper threshold for RBC transfusion provides an increased oxygen supply and circulatory stability, which eventually results in a shorter rehabilitation period (17). However, transfusion is not free of risk and has the potential to

Table 4. Patient outcomes (length of hospital stay and mortality) according to transfusion of blood and components

	RBC transfusion			Platelet concentrate transfusion			FFP transfusion			TXA		
	+	-	p	+	-	p	+	-	p	+	-	p
The total length of hospital stay, mean \pm SD	7.9 \pm 7.7	6.1 \pm 5.9	<0.001	7 \pm 0	6.9 \pm 6.8	0.165	11.1 \pm 9.6	6.6 \pm 6.5	0.001	6.9 \pm 5.6	6.9 \pm 7.3	0.721
Length of ICU stay, mean \pm SD	3.4 \pm 3.9	2.7 \pm 5.6	<0.001	3	3.1 \pm 5	0.332	3.7 \pm 2.9	3 \pm 5.1	0.018	2.8 \pm 2.8	3.1 \pm 5.7	0.918
Number of deaths, n (%)	6 (2.8)	14 (4.9)	0.216	-	20 (4)	1.0	2 (6.9)	18 (3.8)	0.324	2 (1.2)	18 (5.3)	0.026

RBC, Red blood cell; FFP, fresh frozen plasma; ICU, Intensive care unit; SD, Standard deviation

and 0.8% of patients needed transfusion of FFP and platelet concentrations, respectively. The length of hospital stay, and ICU stay were significantly longer for those received RBCs and FFPs. The statistical analyses revealed that the utilization of TXA had no significant effect on the length of hospitalizations, but the mortality rates were significantly low among these patients.

Over recent decades, there has been an increase in the proportion of patients receiving a blood transfusion during major orthopedic surgeries. A previous study by Browne et al. reported that 18.1% of patients received a blood transfusion during hip and knee surgeries in 2005,

increase postoperative unfavorable events such as infections and cardiovascular events (18). We have not evaluated the postoperative complications per se, but the total length of hospitalization and ICU stays were significantly higher among patients who received RBC or FFP. However, this could also be associated with the clinical severity of the patients because those who received transfusions would most likely be the patients with more complicated surgeries. In a study by Monsef et al, two-thirds of the patients were aged > 60 years, and it was reported that blood transfusion extended hospital stay after total hip arthroplasty (19). The current study findings supported the evidence in the literature that transfusion might be associated



with a prolonged hospital stay (12). On the other hand, the current study results also showed that the inpatient mortality rates were similar for the patients who received and did not receive blood components. This demonstrates that when transfusions are applied properly on time to those who need it, the mortality rates can be equalized. In the study of Smeets et al, patients who received erythrocyte transfusion had a significantly longer hospital stay and more postoperative cardiac complications (20). In the meta-analyses of studies investigating blood transfusion in major

et al also showed that TXA reduced hospital and ICU stays after total knee replacement surgery (22).

The mortality of elderly patients with a hip fracture is as high as 32.5% in males and 21.9% in females at one year after fracture (23). In the current study, the lowest inpatient mortality rates were observed in patients who received both blood components and TXA, and patients who only received TXA whereas the highest rates were observed in patients who received neither of the treatments. This reveals that patients receiving TXA appear to have low mortality rates regardless

Table 5. Patient outcomes (length of hospital stay and mortality) according to transfusion of blood and components

	Only blood components (n=170)	Blood components and TXA (n=53)	Only TXA (n=112)	None (n=167)	P
Total length of hospital stay, mean±SD	7.6±7.7	9.2±7.4	5.8±4.1	6.1±6.8	<0.001
Length of ICU stay, mean±SD	3.6±4.3	2.9±2.2	2.8±3.0	2.7±6.9	<0.001
Number of deaths, n (%)	6 (3.5)	-	2 (1.8)	12 (7.2)	0.042

ICU, Intensive care unit; SD, Standard deviation

orthopedic procedures, no significant differences have been detected between restrictive and liberal transfusion regimens (21).

In this study, the total length of hospital stay was significantly longer for patients who received both blood transfusion and TXA and shorter for patients who only received TXA, whereas the length of ICU stay was significantly longer for patients who only received blood components. This shows that for patients who need blood transfusions, the duration of hospital stay cannot be reduced, including those given TXA. However, the use of TXA may reduce the duration of ICU stay in patients who need blood transfusion., Leite

of the need for transfusion. Mortality was highest in patients who did not need a transfusion and did not receive TXA. These results demonstrated that patients who were not indicated for blood transfusion and who did not receive TXA were the ones with the highest in-hospital mortality rates. This can be explained by the hidden blood loss of the patients. Smith et al showed that hidden blood losses affect mortality in hip fractures (24) and TXA was reported to prevent hidden blood loss in geriatric patients with hip fractures (25). Optimal transfusion indications for the elderly trauma patients can be studied further because of this hidden blood loss and anemia of these

patients. Puckeridge et al remarked on the delayed treatment of anemia in elderly patients with hip fractures and as this study suggests, there seems to be a need for revision of the routine transfusion indications for elderly patients with hip fractures (26). Besides, although mortality can be related to the several comorbidities of elderly patients, TXA can be used for elderly patients with hip fractures to reduce in-hospital mortality.

There is currently no consensus on the practice guidelines for transfusion in orthopedic surgeries. This situation has therefore resulted in considerable variation in the rates of transfusions in different centers. A study by Cobain et al. (14) evaluated the epidemiology of transfusion in the United States, England, Australia, and Denmark, and reported that orthopedic surgeries used 6%–13.8% of all allogeneic and autologous packed RBCs, and the distribution of these transfusions was not even, as the utilization of blood components varied significantly between the centers. Boralessa et al (27) evaluated the use of blood in orthopedic surgeries in the United Kingdom in 2009 and reported that transfusion rates for total hip arthroplasty ranged from 0% to 100% among the evaluated hospitals, and only 47% of the hospitals had a transfusion protocol. Another study by Chen et al (28) evaluated the blood transfusion rates after primary total joint arthroplasties in the USA in 2013 and reported that the rates varied between 4.8% and 63.8% for total knee arthroplasties, and 4.3% and 86.8% for total hip arthroplasties. In the current study, 43.4% of patients received RBC

transfusion, which is a rational rate according to the literature data.

Besides the promising results observed about the survival benefit of TXA among geriatric patients who underwent surgical treatment due to hip fracture in this study, several limitations should also be considered when interpreting our results. First, the retrospective design of this study limited the assessments of these patients for both short- and long-term outcomes regarding extra complications other than the duration of hospitalization or mortality. Second, the effects of the history of baseline medications and other treatments on outcomes could not be assessed due to the unavailability of adequate data in patient records, which may alter the results about the TXA and transfusions. Nevertheless, the large sample size may be considered as a strength of the study, and promising results should worth evaluation in future researches.

CONCLUSION

Surgical treatment of the geriatric hip fracture is frequently related to significant blood loss, which may result in significant morbidity or mortality risk. Although blood transfusion is an essential component in the management of these patients, the results of this study revealed that it is related to longer hospital and intensive care unit stays. And although the mortality can be related with several comorbidities of these patients, in-hospital mortality is significantly low in elderly patients with hip fracture who administered TXA perioperatively.

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RESEARCH

CHARACTERISTICS AND OUTCOMES IN ELDERLY PATIENTS WITH DYSPNEA ARRIVING BY AMBULANCE AT THE EMERGENCY DEPARTMENT OF A TERTIARY HOSPITAL

ABSTRACT

Introduction: We investigated the characteristics and outcomes in elderly patients with non-traumatic dyspnea who arrived at the emergency department by ambulance.

Materials and Method: This retrospective descriptive study included patients aged ≥ 65 years, who arrived at the emergency department by ambulance with a chief complaint respiratory distress, between January 1 and December 31, 2018. We recorded age, sex, time and day of admission, season, length of stay in the emergency department, comorbidities, interventions, treatments, consultations, emergency department diagnoses, and patient outcomes.

Results: Of the 4089 elderly patients who arrived by ambulance, 16% (n=655) had respiratory distress. Mean patient ages was 78.23 ± 0.30 (65–98) years and 52.1% were female. Most admissions occurred in winter (30.7%). The most common comorbidities included hypertension (74.4%), chronic obstructive pulmonary disease (48.1%), heart failure (45.8%), and coronary artery disease (37.9%). The most common emergency department diagnoses included chronic obstructive pulmonary disease exacerbation (32.6%), pneumonia (31.1%), heart failure (26.1%), and hypertensive pulmonary edema (8%). The consultation rate was 65%. Notably, 47.3% of patients were discharged from the emergency department, 6.4% were admitted to wards, and 34.5% were admitted to the intensive care unit. The in-hospital mortality rate was 3.3%.

Conclusions: The prevalence of dyspnea in elderly patients arriving at the emergency department by ambulance was higher in our study than in previous studies. We observed a high hospitalization rate with most admissions to the intensive care unit. Most patients were diagnosed with chronic respiratory and cardiac diseases.

Keywords: Dyspnea; Emergency service; Hospital; Ambulances; Geriatrics



INTRODUCTION

An increasing life expectancy, better living conditions and availability of healthcare services have resulted in rapid growth in the elderly population worldwide, as well as in Turkey. The percentage share of elderly individuals >10% of the total population indicates an aging population. The percentage of the elderly population in Turkey is comparatively lower than that in many other countries; however, this figure is significantly high numerically. Reportedly, the elderly population (aged ≥ 65 years) represented 8% and 8.8% of Turkey's total population in 2014 and 2018, respectively, and this rate is estimated to increase to 10.2% by 2023 and 12.9% by 2030 (1).

Little is known about the etiology, epidemiology, and outcome of dyspneic patients presenting to the EDs worldwide. Dyspnea, which is associated with a large number of ward and intensive care unit (ICU) admission, is the one of the most common cause that necessitates emergency departments (EDs) visit among elderly patients; these patients usually arrive at EDs by ambulance (2, 3). Recent studies have reported that the rate of ED arrival by ambulance secondary to dyspnea was approximately 12% in the USA, 5% in the Asia-Pacific region, 6% in Switzerland, 8% in China, and 3.6% in Nepal (4,5). In Turkey, in a recent study conducted by Dundar et al., it has been reported that the most common presenting symptom of elderly patients admitting to the ED is dyspnea (6). To our knowledge, no Turkish study has described the prevalence, epidemiology, etiology, diagnosis, treatment modalities, length of stay (LOS) in the ED and outcomes in elderly patients who present to EDs with a chief complaint of dyspnea.

Understanding the characteristics of elderly patients with dyspnea who arrive at the ED by ambulance, the range of diagnoses and their outcome are important for understanding the challenges facing emergency clinicians and for planning training and services.

This study aimed to describe the epidemiology in elderly patients with dyspnea who arrived at

the ED by ambulance, to understand how it is investigated and treated and its outcome.

MATERIALS AND METHODS

This retrospective descriptive study was performed at the ED of the Bozyaka Training and Research Hospital of the University of Health Sciences, which is a tertiary ED with a 580-bed capacity and a resident training program. We recorded approximately 190,000 patient admissions between January 1 and December 31, 2018. Patients aged ≥ 65 years, who arrived by ambulance (112 emergency medical services) with the chief complaint shortness of breath were included in the study. For patients with repeated ED arrivals within the study period, we considered only the first arrival for this study. Patients with trauma-induced dyspnea and those aged <65 years were excluded from the study.

Data were obtained from the hospital information management system. We recorded the following information: age, sex, mode of arrival (via field or ambulance from other hospitals), time of arrival, day of arrival, season, length of stay (LOS) in the ED (defined as the interval [in hours] between arrival and ED discharge or hospital admission), comorbidities, investigations performed (laboratory tests, and imaging, among other testing), treatment in the ED, consultations, ED diagnosis (diagnosis after ED management), and ED outcomes in patients. The ED diagnoses were documented in all patients by the treating emergency physicians based on the International Statistical Classification of Diseases 10th Revision code.

Patients were classified into older and oldest-old group. With regard to geriatric age groups, the World Health Organization categorizes older individuals as those aged between 65 and 79 years and the oldest-old as those aged ≥ 80 years (7).

This study was approved by the Ethical Committee of the aforementioned hospital. Formal sample size calculation was not performed

Table 1. Distribution of characteristics of the study population according to sex

	Total	Females	Males
Age (years)			
Mean ± SD (min–max)	78.23±0.30 (65–98)	79.15±0.40 (65–98)	77.23±0.44 (65–96)
Older (<80) (n, %)	372 (56.8)	184 (49.5)	188 (50.5)
Oldest-old (≥80) (n, %)	283 (43.2)	157 (55.5)	126 (44.5)
Gender (n, %)	655 (100.0)	341 (52.1)	314 (47.9)
Season (n, %)			
Spring	152 (23.2)	72 (47.4)	80 (52.6)
Summer	130 (19.8)	79 (60.8)	51 (39.2)
Autumn	172 (26.3)	81 (47.1)	91 (52.9)
Winter	201 (30.7)	109 (54.2)	92 (45.8)
Type of admission (n, %)			
Ambulance (field)	629 (96.0)	328 (52.1)	301 (47.9)
Ambulance (hospital)	26 (4.0)	13 (50.0)	13 (50.0)
Time of admission(n, %)			
08.00–16.59 h	240 (36.6)	116 (48.3)	124 (36.6)
17.00–23.59 h	243 (37.1)	139 (57.2)	243 (37.1)
24.00–07.59 h	172 (26.3)	86 (50.0)	172 (26.3)
Day of admission(n,%)			
Weekdays	470 (71.8)	250 (53.2)	220 (46.89)
Weekends	185 (28.2)	91 (49.2)	94 (50.8)

considering the descriptive nature of this study. Statistical analysis was performed using the IBM SPSS Statistics software, version 20.0 (Armonk, NY, USA). We used descriptive statistics including frequencies, percentages, means±standart deviation (min–max), or median (interquartile range [IQR], 95% confidence interval [CI]). Data were compared based on age groups and sex group. The Mann-Whitney U and the chisquare tests were used to compare continuous and categorical variables, respectively. P<0.05 was considered statistically significant.

RESULTS

We observed that during the study period, 4089 elderly patients arrived at the ED by ambulance. Of these, 655 (16.01%) were elderly patients who presented with shortness of breath. Mean patient age was 78.23±0.30 (65–98) years, 341 (52.1%) were female, and 283 (43.20%) were categorized as oldest-old patients. The admission rate was higher in winter (30.7%) and less in summer (19.8%). Only 4% of the 655 patients included in this study were referred to our hospital from other hospitals for further evaluation and treatment. The minimum number of admissions was recorded on weekends



and between 24.00 and 07.59 hours. No statistically significant difference was identified between the age, season, admission (field/hospital), time of admission, and day of admission of the patients according to sex ($P>0.05$) (Table 1).

The median LOS in the ED was 7.66 hours (IQR: 7.50, 95% CI [8.99–10.18]) for all patients. The median LOS of the older and oldest-old patients was 7.41 hours (IQR: 8.80, 95% CI [8.81–10.53]) and 7.83 hours (IQR: 7.00, 95% CI [8.69–10.25]), respectively. The Mann-Whitney U test showed no significant difference between patient age groups and the LOS in the ED ($U=54.705$, $P=0.389$).

Table 2 shows the distribution of comorbidities, imaging studies performed, interventions, treatment, and consultations of the elderly patients according to age groups. The most frequent comorbidities included hypertension (74.4%), chronic obstructive pulmonary disease (COPD) (48.1%), heart failure (HF) (45.8%), and coronary artery diseases (37.9%). COPD and diabetes mellitus were more common in older patients. Only 5.2% ($n=34$) of the patients did not show comorbidities. No imaging was performed in 9.1% ($n=60$) of the patients. Chest radiography and thoracic computed tomography (CT) were the most common imaging modalities used in older patients, echocardiography and abdominal CT in oldest-old patients. Non-invasive ventilation was the most common interventions performed; however, no significant difference was observed between older and oldest-old group in interventions performed. Other interventions included pleurocan catheterization ($n=3$), tube thoracostomy ($n=6$), paracentesis ($n=1$), administration of blood products ($n=21$), hemodialysis ($n=2$), transcutaneous pacemaker ($n=1$), and tracheostomy tube inner cannula changes ($n=2$). Notably, 3.5% ($n=23$) of the patients did not receive any treatment. Diuretic treatment was commonly administered to older patients. In this study, 35.1% ($n=230$) patients did not undergo any consultations. The mean number of consultations per patient was 1.22 ± 1.19 (0–6).

Cardiology and Infectious Disease consultations were more common in the oldest-old group (Table 2).

The most common laboratory investigations performed included a complete blood count (99.5%), serum electrolyte panel (99.5%), and blood gas testing venous or arterial (98.9%). No statistically significant difference was observed between older and oldest-old group in laboratory values ($P>0.05$). The distribution of laboratory tests of the study population according to age groups is shown in Figure 1.

ED diagnoses and outcomes of patients according to age groups is shown in Table 3. The most common ED diagnoses were COPD exacerbation (32.6%), pneumonia (31.1%), HF (26.1%), and hypertensive pulmonary edema (8.0%). Mixed cardiac and respiratory causes were detected in 11.6%, whereas exacerbation of COPD with pneumonia was detected in 6.7% and pneumonia with acute renal failure in 3.8% of patients. Patients included in the "other group" presented with diverse conditions, such as malignancies ($n=6$), malignant pleural effusion ($n=3$), multi-organ failure ($n=3$), cerebrovascular accidents ($n=3$), allergic reactions ($n=2$), urosepsis ($n=3$), gastrointestinal bleeding ($n=3$), liver cirrhosis ($n=1$), hypertension ($n=9$), warfarin overdose ($n=5$), hyponatremia ($n=2$), complete heart block ($n=1$), pericarditis ($n=1$), and pericardial effusion ($n=1$). Of the patients included in this study, 47.3% were discharged from the ED, 40.9% were hospitalized (including inpatients and patients who were transferred to other hospitals after stabilization owing to insufficient bed capacity). 6.4% ($n=42$) were admitted to wards and 34.5% ($n=226$) were admitted to the ICU (Table 3). Among the in-hospital admissions, 26 patients were admitted to Internal Medicine, 5 to Thoracic Surgery, 1 to Neurology, and 1 to Urology.

Even though there was no statistical significance between the patient admission rates and the seasonal pattern of admissions, the number of admissions was highest (34.0%) in winter and

Table 2. Distribution of comorbid diseases, imaging, treatment, and consultations of the study population according to age groups

Variables	Total (n,%)	Older (n,%)	Oldest-old (n,%)	X2 (P)
Comorbid diseases				
Hypertension	487 (74.4)	266 (54.6)	221 (45.4)	NS*
COPD**	315 (48.1)	199 (63.2)	116 (36.8)	10.068 (0.002)
Heart failure	300 (45.89)	158 (52.7)	142 (47.3)	NS
Coronary artery disease	248 (37.9)	142 (57.3)	106 (42.7)	NS
Diabetes	228 (34.8)	149 (65.4)	79 (34.6)	10.436 (0.001)
Atrial fibrillation	143 (21.8)	71 (49.7)	72 (50.3)	NS
Cerebrovascular accident	91 (13.9)	57 (62.6)	34 (37.4)	NS
Malignancy	82 (12.5)	53 (64.6)	29 (33.4)	NS
Chronic renal disease	80 (12.2)	39 (48.8)	41 (51.2)	NS
Asthma	29 (4.4)	17 (58.6)	12 (41.4)	NS
Imaging				
Thorax CT	369 (56.3)	192 (52.0)	177 (48.0)	7.808 (0.005)
Chest x-ray	235 (35.9)	150 (63.8)	85 (36.2)	7.394 (0.007)
Abdominal CT	139 (21.2)	67 (48.2)	72 (51.8)	4.861 (0.02)
Echocardiography	111 (16.9)	49 (44.1)	62 (55.9)	8.715 (0.003)
CT pulmonary angiography	83 (12.7)	48 (57.8)	35 (42.2)	NS
Ultrasonography	62 (9.5)	31 (50.0)	31 (50.0)	NS
Venous doppler ultrasound	20 (3.1)	10 (50.0)	10 (50.0)	NS
Interventions				
Noninvasive ventilation	218 (33.3)	135 (61.9)	83 (38.1)	NS
Mechanical ventilation	93 (14.2)	49 (52.7)	44 (47.3)	NS
CPR [§]	32 (4.9)	14 (43.8)	18 (56.2)	NS
Treatment				
Oxygen (any delivery mode)	626 (95.5)	356 (56.9)	270 (43.1)	NS
Inhaled beta-agonists	513 (78.3)	302 (58.9)	211 (41.1)	NS
Antibiotics	307 (46.9)	181 (59.0)	126 (41.0)	NS
IV diuretics	288 (44.0)	151 (52.4)	137 (47.6)	3.988 (0.04)
IV nitrates	131 (20.0)	76 (58.0)	55 (42.0)	NS
Anticoagulants	82 (12.5)	42 (51.2)	49 (48.8)	NS
Inotropes/vasopressors	74 (11.3)	36 (48.6)	38 (51.4)	NS
Rate/rhythm control agents	42 (6.4)	24 (57.1)	18 (42.9)	NS
Consultations				
Pulmonary diseases	287 (43.8)	162 (56.4)	125 (43.6)	NS
Cardiology	207 (31.6)	101 (48.8)	106 (51.2)	7.890 (0.005)
Internal medicine	141 (21.5)	70 (49.6)	71 (50.4)	NS
Anesthesia	94 (14.4)	53 (56.4)	41 (43.1)	NS
Infectious diseases	57 (8.7)	24 (42.1)	33 (57.9)	5.489 (0.01)
Thoracic surgery	7 (1.1)	4 (57.1)	3 (42.9)	NS
General surgery	5 (0.8)	2 (40.0)	3 (60.0)	NS
Cardiovascular diseases	3 (0.5)	1 (33.3)	2 (66.7)	NS

*NS: Nonspecific; **COPD: Chronic obstructive pulmonary disease; &CPR: Cardiopulmonary resuscitation.



lowest (16.0%) in summer ($\chi^2=4.976$, $P = 0.174$). There was no statistically significant between the seasonal admission patterns and age groups of hospitalized patients ($\chi^2 = 1.949$, $P = 0.583$).

DISCUSSION

Depending on the methods used for statistical analysis and the patient population, the prevalence of dyspnea as the presenting symptom elderly patients arriving at the ED by ambulance ranges between 2.4% and 12% in the available literature (2, 8, 9). A recent 3-month retrospective study from Taiwan reported that 11.6% of elderly patients transported to the ED by ambulance presented with dyspnea (9). A study performed by Prekker et al. in the USA reported that 12% of patients transported to the ED by ambulance presented with dyspnea (2). A large-scale study performed by Kelly et al. in EDs across Asia, Australia, and New Zealand reported that 5.2% of patients (≥ 18 years) arrived at the ED (ambulatory and by ambulance) with complaints of dyspnea and that only 2.4% arrived exclusively by ambulance (8). Dundar et al. observed that elderly patients were most commonly admitted to the ED secondary to dyspnea (18.5%) (6). In the current study, we observed that the prevalence of elderly patients who were transferred to the ED by ambulance with a chief complaint of dyspnea was significantly high at 16%. When compared with other studies, the study which was having the similar findings was Taiwan study. Although our elderly population is less, the reason for the high number of dyspneic elderly patients presenting by ambulance may be due to the more frequent use of emergency services in our country, the higher incidence of chronic diseases in elderly dyspneic patients or the more frequent use of ambulance services by these patients.

Literature review did not reveal any data with regard to the time and day of admission of elderly patients with dyspnea who are transported to the ED by ambulance. Nearly two-thirds of the patients in the current study arrived at the ED

during weekdays and between 08.00 and 24.00 hours. Although this finding cannot be directly compared, Dundar et al. reported that 50% of the elderly patients investigated in their study arrived at the ED between 12.00 and 24.00 hours (6). In contrast, Crilly et al. observed that the highest number of admissions occurred during weekdays between 07.00 and 15.30 hours (10). Demircan et al. reported that the number of admissions was higher during weekdays (11).

Demircan et al. observed that the mean LOS in the ED among patients aged ≥ 85 years was 3.6 days (11). A study performed by Sir et al. reported that the mean LOS at the ED among patients aged ≥ 70 years was 216 min (12). A recent study performed by Street et al. in Australia reported that the median LOS of elderly patients at the ED was 4.7 hours (13). In the current study, the median LOS at the ED was 7.6 hours. In the study reported by Street et al., increasing age was associated with a longer LOS in the ED (13). The findings of our study were consistent with those reported by other studies in the literature. In our study, the LOS in the ED was higher in the oldest-old than in the older. Inadequate physiological reserves and multiple medicine uses of elderly patients may cause changes in the responses to stress. Therefore, symptoms and physical examination results of these patients may be unclear. For differential diagnosis, further testing and consultation are requested and performed. Excessive workload and lack of knowledge among ED staff may cause delays in accurate assessments of these patients. In conclusion several factors, such as characteristics of the study population, age, ED patient load, number of hospital beds, excessive workload, and experience of ED staff affect the LOS in the ED.

Most patients in the current study had comorbidities, including chronic cardiac and respiratory illnesses, such as hypertension, COPD, HF, and coronary artery disease, which concurs with the findings reported by previous studies (3, 4, 8, 14). Only 5.2% of the patients in this study

had no comorbidities. A study by Kelly et al., reported that 12% of the patients investigated had no apparent comorbidities (8). This difference between studies is attributable to the fact that the current study included patients aged ≥ 65 years, whereas 60% of the patients in the study reported by Kelly et al.

Non-invasive and mechanical ventilation were more common in our study than in other studies reported in the literature (8). In our view, this finding was attributable to the fact that the patients investigated in the current study were older, with a greater predisposition to life-threatening situations. Thoracic CT and chest radiography were more commonly performed in the older than in the oldest-old patients. These results were in agreement with the ED diagnoses of patients. Most older patients were diagnosed with COPD exacerbation and pneumonia. Additionally, a wide range of laboratory tests were performed in this study. This study highlights that preexisting chronic conditions and old age necessitate the extensive use of healthcare services.

Elderly patients admitted to EDs receive numerous consultations with various specialties owing to comorbidities and several complex issues observed in this patient population (12). In the present study, 65% of the patients underwent consultations with various medical specialties. Yenil et al. reported that 59.8% of elderly patients in the ED underwent consultations and that consultations were more common among patients arriving by ambulance (15). In a study conducted by Loğoglu et al. at a university hospital, the consultations most commonly requested for elderly patients were cardiology, internal medicine and pulmonary disease, respectively (16). Although not statistically significant, we observed that most consultations were with the pulmonary disease, cardiology, and internal medicine departments, respectively. These results were consistent with the ED diagnoses of patients in the current study. Sir et al. reported that the mean number of consultations for 2000 patients ≥ 70 years, who

arrived at the ED with various complaints in an ambulatory state or via ambulance, was 0.47 ± 0.74 (12). In the current study, the mean number of consultations per patient was 1.22 ± 1.19 . This observation is attributable to the fact that elderly patients who arrive by ambulance with complaints of dyspnea often present with severe clinical comorbidities, particularly respiratory and cardiac conditions.

Previous studies have reported that, dyspnea was most commonly associated with respiratory and cardiac diseases (2-4, 14, 17). Our study results are reported by the aforementioned studies. The most common disorders associated with dyspnea observed in the ED were COPD exacerbation, pneumonia, HF, and hypertensive pulmonary edema. Hypertensive pulmonary edema was commonly observed in patients included in our study in contrast to the findings of previous studies, which is, attributable to the fact that hypertension was the most common comorbidity in our study population. Dyspnea in elderly patients is often associated with multiple overlapping disorders, such as pneumonia or COPD exacerbation that may precipitate acute HF (18). A significant number of patients presented with such multifactorial etiology of dyspnea. Acute renal failure and anemia were also identified as prominent causes of dyspnea in addition to respiratory, cardiac, and infectious diseases. Patients categorized as the "other group" were diagnosed with a wide range of conditions, including metabolic disorders such as hyponatremia, neurological conditions such as cerebrovascular accidents, and oncologic complications such as malignant pleural effusion, in addition to gastrointestinal bleeding, warfarin overdose, urosepsis, and allergic reactions. The cause of dyspnea remained unclear in a small percentage of patients. All these data are consistent with those reported in the literature (2, 8).

A study performed by Kelly et al. reported a high admission rate (76.4%) but a lower rate of ICU admissions (5.6%) in patients with dyspnea

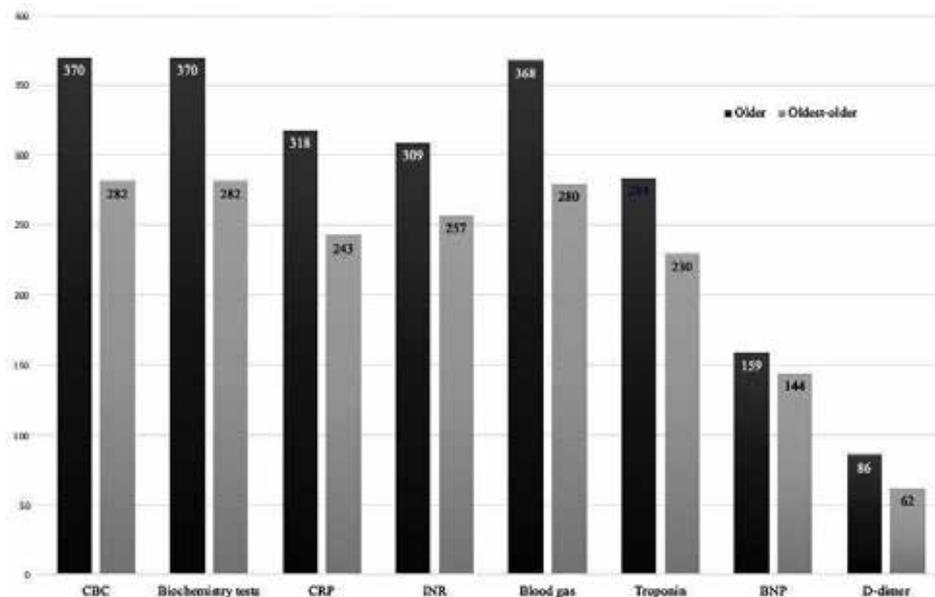


Table 3. Distribution of emergency diagnoses and outcomes of the study population according to age groups

Variables	Total (n,%)	Older (n,%)	Oldest-old (n,%)	X2(P)
Diagnosis				
COPD**	214 (32.6)	141 (65.9)	73 (34.1)	10.712 (0.001)
Pneumonia	204 (31.1)	122 (59.8)	82 (40.2)	NS*
Heart failure	171 (26.1)	88 (51.5)	83 (48.5)	NS
Hypertensive pulmonary edema	53 (8.0)	35 (66.0)	18 (34.0)	NS
COPD + heart failure	47 (7.2)	29 (61.7)	18 (38.3)	NS
Pneumonia + heart failure	46 (4.4)	23 (50.0)	23 (50.0)	NS
Pneumonia + COPD	44 (6.7)	37 (84.1)	7(15.9)	14.323 (0.0001)
Acute renal failure	35 (5.3)	11 (31.4)	24 (68.6)	9.695 (0.002)
Lower respiratory tract infection	30 (4.5)	14 (46.7)	16 (53.3)	NS
Pneumonia + acute renal failure	25 (3.8)	11 (44.0)	14 (56.0)	NS
Coronary artery disease	20 (3.0)	12 (60.0)	8 (40.0)	NS
Anemia	13 (1.9)	10 (76.9)	3 (23.1)	NS
Pneumonia+UTI ^β	12 (1.8)	4 (33.3)	8 (66.7)	NS
Pulmonary embolism	10 (1.5)	5 (50.0)	5 (50.0)	NS
Asthma	9 (1.3)	5 (55.6)	4 (44.4)	NS
Pneumothorax	5 (0.7)	4 (80.0)	1 (20.0)	NS
Other	44 (6.7)	16 (36.6)	28 (63.3)	NS
Unclear	41 (6.2)	20 (48.8)	21 (51.2)	NS
ED^α outcome				
Discharged	310 (47.3)	180 (58.1)	130 (41.9)	NS
Treatment refusal	55 (8.3)	33 (60.0)	22 (40.0)	NS
Exitus (ED and in-hospital)	22 (3.3)	11(50.0)	11(50.0)	NS
In-hospitalized				
Ward	33 (5.0)	20 (60.6)	13 (39.4)	NS
Intensive care unit	37 (5.6)	22 (59.5)	15 (40.5)	NS
Transported to other hospitals				
Ward	9 (1.3)	5 (55.6)	4 (44.4)	NS
Intensive care unit	189 (28.8)	101 (53.4)	88 (46.6)	NS

*NS: Nonspecific; **COPD: Chronic obstructive pulmonary disease; ^αED: Emergency department; ^β UTI: Urinary tract infection.

Figure 1. The distribution of laboratory tests of the study population according to age groups



who were transported to the ED by ambulance (4). Another study by the same author that included a larger and different patient population reported that the hospitalization rate was 64% (including ICU admissions and transfers for admission), and the ICU admission rate was 3.3% (8). Laribi et al. reported that nearly two-thirds of their study population was hospitalized, and the ward admission rate was higher (60.6% vs. 56.4%) and ICU admission rate was lower (3.4% vs. 8.4%) in the Asia-Pacific region than in Europe (3). The admission rates in our study were lower than those reported in the literature, which is attributable to the differences in the staff capabilities and working conditions between the study settings. Furthermore, the ICU and ward admission rates in the current study were different from those reported by previous studies, which can be explained by the fact that the current study included patients aged ≥ 65 years, whereas other studies included patients aged ≥ 18 years. Laribi et al. reported the ICU admission rate was higher in Europe (with a significantly high percentage of elderly patients) than in the Asia-Pacific region (3). The ICU admission rate was 2.5 to 4.6 fold higher

in elderly than in younger patients owing to the higher percentage of complex medical issues and comorbidities in the former (19).

Mortality rates reported by previous studies ranged between 5% and 9.4% (3, 4, 8). The in-hospital mortality rate in the current study was 3.3%. However, in our opinion, the actual mortality rate was significantly higher than this figure because more than 50% of patients who require hospitalization were transferred to other hospitals owing to insufficient bed capacity.

We did not observe any statistical significance between the seasonal admission patterns and age groups of hospitalized patients. Kelly et al. reported that ward admissions and ED visits were the highest in winter (8). We observed similar trend in our study with the highest and lowest hospitalization rates in winter and summer, respectively.

An accurate diagnosis of the cause of acute dyspnea in elderly patients with multiple comorbidities may be challenging for ED physicians, because dyspnea is associated with



multifactorial etiology, including cardiovascular, respiratory, metabolic, and neuromuscular disorders, malignancy, trauma, infection, or allergic reactions. Moreover, it is difficult to attribute dyspnea to a single condition, and acute dyspnea often presents in elderly patients as a combination of multiple diseases, such as pneumonia, which often triggers HF (3, 4, 18). In the literature, it is stated that the most common reason for dyspnea is respiratory and cardiac diseases. The differentiation of pulmonary and cardiac causes of dyspnea is a challenging task in emergency medicine. (2-4, 14, 17). Our study and previous studies also showed that most patients arrive at the ED following decompensation of chronic respiratory and cardiac disorders such as HF and COPD; therefore, close monitoring and a multidisciplinary approach are important during the acute phase in the ED, in addition to optimal patient management skills of ED physicians. In addition, appropriate management of this patient group at primary healthcare and outpatient settings may reduce frequent ED admissions and recurrent hospitalizations. Considering the wide range differential diagnoses in elderly patients with dyspnea, accurately diagnosing this condition may be challenging for emergency physicians. Therefore, emergency physicians should perform a wider range of diagnostic tests ve imaging modalities in this patient group.

There is no rapid and exact diagnosis test to describe the etiology of dyspnea. There are two meta-analysis studies recently carried out for use of BNP in patients presenting to the ED with acute dyspnea. These studies reported that the results recommended the use of BNP to rule out or diagnose HF are inconclusive. Moreover, there are often delays or lack of availability inherent with chest x-ray and BNP in patients with acute HF in the ED setting (20, 21). Standardization of patient care in chest pain units has improved the quality of patient care (22, 23). A similar approach can be performed for patients with a chief complaint of dyspnea in the ED.

The descriptive data regarding elderly patients with a chief complaint of dyspnea, who arrive at the ED by ambulance would benefit ED physicians and hospital administration departments and provide useful information for ED and hospital bed management planning. Our report offers useful insights for optimal planning to train ED personnel for improved management of elderly patients presenting with dyspnea.

Following are the limitations of this study: (a) The retrospective study design is a drawback because access to adequate and reliable data was limited to the capacity of the hospital information management system. (b) This was a single-center study; therefore, our results are not generalizable across all hospitals because working conditions, patient populations, and nature of the hospital vary. (c) This study was based on patient diagnosis; the diagnosis established by ED physicians might have differed from the final diagnosis confirmed in hospitalized patients following detailed assessments. (d) The study included mortality assessment. Owing to the retrospective design, it was not possible to contact patients who were hospitalized at other hospitals, and details regarding survival of these patients were unavailable. Therefore, mortality assessment was limited to evaluation of the survival of patients in the ED. (e) In addition, the lack of control group limits the interpretation of these results.

In conclusion, dyspneic patients present a heterogenous group with various clinical profiles and etiologies for dyspnea throughout the world. The prevalence of elderly patients who arrived at the ED by ambulance with a chief complaint of dyspnea was higher in this study than in other studies reported in the literature. The numerous tests, treatments, and consultations performed, as well as bed requirements tend to drain hospital resources. The results of this study may be leading for future planning of hospitals and healthcare systems. In additions, it may serve as a guide to improve the diagnostic and treatment approaches of ED clinicians.

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RESEARCH

THE RELATIONSHIP BETWEEN EMOTIONAL STATE AND QUALITY OF LIFE OF FAMILY CAREGIVERS OF STROKE PATIENTS AND PATIENT FACTORS

ABSTRACT

Introduction: We aimed to evaluate the emotional state and quality of life of family caregivers of stroke patients and to investigate the relationship between patient factors and these characteristics of caregivers.

Materials and Method: Ninety-seven patients with hemiplegia after a cerebrovascular event and their caregivers were included in this cross-sectional study. The emotional state of the caregivers was evaluated with the Hospital Anxiety and Depression Scale (HADS). Their quality of life was evaluated with Short Form-36. Functional Independence Measurement (FIM) and modified-Rankin Score (MRS) were used for functional status of the patients, HADS was used for their emotional state and Stroke-Specific Quality of Life Scale (SS-QOL) was used for their quality of life.

Results: Mean HADS-Anxiety score was 9.0 ± 3.7 and mean HADS-Depression score was 8.3 ± 3.7 in caregivers. Mean HADS-Anxiety score was 10.1 ± 3.4 and mean HADS-D score was 8.7 ± 3.6 in patients. The rates of anxiety disorder and depression in caregivers were 39.2% and 55.7%, respectively. The rates of anxiety disorder and depression in stroke patients were 40.2% and 50.5%, respectively. A positive correlation was found between HADS scores of caregivers and patients ($p < 0.05$). There was a significant negative correlation between the HADS scores of caregivers and SS-QOL scores of patients ($p < 0.05$). There was a statistically significant relationship between the quality of life of caregivers and the MRS, motor FIM and FIM-total scores of patients ($p < 0.05$).

Conclusion: As a result, mood disorders were common in stroke patients and their caregivers. Quality of life of caregivers was decreased. There was a relationship between the emotional state of patients and caregivers.

Keywords: Stroke; Caregivers; Anxiety; Depression; Quality of life



INTRODUCTION

Stroke is one of the most frequent causes of death in the world, affecting the elderly population in particular, which may result in significant functional disability and has a high socio-economic social burden. With increasing life expectancy, the problems caused by stroke have begun to increase too. A significant proportion of patients loses functional independence and requires continuous or temporary care following a stroke. Provided the unexpected and sudden nature of stroke, it is logical to assume that families are caught unprepared for adapting to the role of caregiver.

The role of caregivers in the treatment of diseases characterised by chronic and functional disability is greater than in other diseases. The caregiver, who is the person who lives with the patient and is most engaged in the care of the patient, is exposed to stress caused by physical, social, psychological and financial factors of the patient, their own, or the environment (1). Although caregiver burden varies according to the factors of the patient and caregiver, it is significantly effective in 25–54% of stroke caregivers (2). Factors considered to be related to caregiver burden are characteristics such as the severity of neurological deficits, functional and emotional state of patients, emotional state of caregivers, health status, duration of care and social support (3). Patient care may cause significant stress burden in caregivers and result in changes in mood. The increase in care burden is associated with the frequency of anxiety and depression in the caregiver (4). Better understanding of caregiver burden will also have positive consequences for patients.

Although many studies have focused on the incidence and prevalence of stroke, the number of studies on the effects of stroke on caregivers and its long-term outcomes is limited. Clarification of factors associated with both patients and caregivers that may affect caregiver burden will provide a better understanding of caregiver

burden after stroke and help reduce the financial and emotional burden of patient care. Caregiver burden was frequently examined in previous studies, and subsequent studies focused on factors that had an impact on caregiver burden. It was noted that the quality of life of the caregiver decreased in cases where caregiver burden was high (5).

Therefore, we aimed to evaluate the emotional state and quality of life of family caregivers of stroke patients, and to investigate the relationship between patient factors and these characteristics of caregivers.

MATERIALS AND METHOD

Ninety-seven patients with hemiplegia due to vascular stroke who were admitted to a tertiary rehabilitation hospital between 1 January 2017 and 30 June 2017 and their family caregivers were included in this cross-sectional study. This cross-sectional study was approved by the research ethics committee with the number of 2017/217.

Stroke patients who had ischaemic or haemorrhagic stroke at least 3 months ago included in the study. Patients with traumatic or tumour-related stroke, bilateral stroke, multiple stroke, aphasia and severe communication disorder, or other neurological disorders that could affect cognitive functions such as multiple sclerosis or Parkinson's disease, and a stroke duration of >24 months were excluded from the study. Inclusion criteria for caregivers were a caregiving duration of ≥ 3 months, family members and a mini mental state examination score of >24. The exclusion criteria for caregivers were professional caregivers, non-family members, caregivers with comorbid psychiatric disorders, or those who had previously given care for at least 1 month in the last two years.

Hospital Anxiety Depression Scale (HADS) was used for assessing the emotional state of the caregivers and Short Form-36 (SF-36) was used

for assessing their quality of life. Modified-Rankin scale and Functional Independence Measurement (FIM) were used for evaluating functional status, HADS was used for evaluating emotional state, and Stroke-Specific Quality of Life Scale (SS-QLS) was used for evaluating the quality of life of the patients.

Functional Independence Measurement (FIM)

FIM shows the level of independence of the individual in daily life activities (6). It consists of 18 items including self-care, sphincter control, transfer, movement, communication, social perception and cognitive status. The total score is between 18 and 126. Motor sub-dimension consists of 13 items and cognitive sub-dimension consists of 5 items. High FIM scores indicate a high level of independence. The Turkish validity and reliability study was conducted by Küçükdeveci et al. (7).

Modified-Rankin Score (MRS)

MRS is a widely used scale for expressing functional outcomes in stroke-related conditions. It is a seven-level categorical scale. In MRS, a score of 0 indicates full independence, whereas a score of 5 indicates very severe disability and 6 indicates death.

Stroke-Specific Quality of Life Scale (SS-QLS)

SS-QLS is a disease-specific quality of life scale and consists of 49 items that assess 12 domains: social role (5 items), mobility (6 items), energy (3 items), language (5 items), self-care (5 items), mood (5 items), personality (3 items), thinking (3 items), upper extremity function (5 items), family roles (3 items), vision (3 items), and work/productivity (3 items). The scores of these 12 domains are summed to obtain a total score of 49–245. Higher scores indicate a better quality of life (8).

Short form-36 (SF-36)

SF-36 is the most frequently used method for evaluating the quality of life of an individual (9).

It is a self-report scale and consists of 36 items and 9 subscales: physical function, physical role, emotional role, vitality/energy, mental health, social function, pain, general health and change in health. Higher scores indicate a better quality of life. The Turkish validity and reliability study was conducted (10).

Hospital Anxiety and Depression Scale (HADS)

It was developed in 1983 by Zigmond and Snaith to determine and evaluate the anxiety and depression risks of patients (11). The scale consists of 14 items in total. It consists of the subscales of depression and anxiety that consist of seven items each. Each scale is scored between 0 and 21. Higher scores indicate higher disease severity. Turkish validity and reliability study of this scale was conducted (12). Cut-off values used in previous studies were ≥ 8 for anxiety and $\geq 8-11$ for depression scale (13). A cut-off value of 8 was used for depression.

Statistical analysis

Statistical analyses were performed using SPSS version 20.0 package program. Descriptive statistics were summarised as number, percentage, mean \pm standard deviation, and median. The normality of the distribution of variables was examined using visual (histogram and probability graphs) and analytical methods (Shapiro–Wilk test). Numerical variables determined according to whether they were normally distributed were compared between two groups using independent samples t test and between three groups using one-way ANOVA test. Pearson and Spearman correlation tests were used in correlation analyses. A correlation coefficient of 0.05–0.30 was accepted as low or insignificant correlation, 0.30–0.40 as poor-moderate correlation, 0.40–0.60 as moderate correlation, 0.60–0.70 as strong correlation, 0.70–0.75 as very strong correlation, and 0.75–1.00 as perfect correlation. The homogeneity of the variances was evaluated by Levene test. In cases



Table 1. Demographic and clinical characteristics of stroke patients and their family caregivers

		Family caregivers			Stroke patients		
		Min-Max	Median	Mean±SD / n%	Min-Max	Median	Mean±SD / n%
Age (years)		25-75	52	49.9 ± 13	30-83	62	60.0 ± 12.4
Gender	Female			73 75.3			51 52.6
	Male			24 24.7			46 47.4
Marital Status	Married			64 66			72 74.2
	Single			27 27.8			7 7.2
	Widowed			6 6.2			18 18.6
Education	Illiterate			10 10.3			19 19.6
	Primary school			43 44.3			42 43.3
	Middle school			9 9.3			12 12.4
	High school			29 29.9			13 13.4
	University			6 6.2			11 11.3
Occupation	Housewife			65 67			47 48.4
	Occupation			23 23.7			22 22.7
	Worker			7 7.2			15 15.5
	Civil servant			2 2.1			13 13.4
Duration of Care (Months)		3-14	5	6.6 ± 2.9			
Disease Duration (Months)					4-16	7	7.5 ± 3.2
Stroke Aetiology	Ischaemic						73 75.3
	Haemorrhagic						24 24.7
Stroke Side	Right						38 39.2
	Left						59 60.8
Dominant Hand	Right						85 87.6
	Left						12 12.4

with significant differences, post-hoc analyses were performed with Tukey and Bonferonni tests. Numerical variables that did not show normal distribution were compared between two groups using Mann Whitney U test and between three and more groups using Kruskal–Wallis Test. Nominal data were evaluated between two groups using Chi-square test. P values less than 0.05 were

considered statistically significant in all statistical analyses conducted for the study.

RESULTS

The demographic and clinical characteristics of the caregivers and stroke patients are summarised in Table 1. All caregivers were family members,

including their spouse (48.5% n=47), children (37.1%, n=36), brother/sister (10.3%, n=10) and parents (4.1%, n=4).

The mean HADS-A score of the caregivers was 9.0 ± 3.7 (median 9, range 2–17), and the mean HADS-D score was 8.3 ± 3.7 (median 8, range 2–20) (Table 2). Of the caregivers, 39.2% (n = 38) had anxiety disorder (HADS-A ≥ 11) and 55.7% (n = 54) had depression (HADS-D ≥ 8). The individual SF-36 subscale scores of caregivers are given in Table 2.

The mean MRS score of stroke patients was 3.3 ± 0.8 (median 3, range 2–5), the mean FIM-motor score was 53.8 ± 15.7 (median 55, range 24–84), the mean FIM-cognitive score was 30.2 ± 2.9 (median 30, range 25–46), mean FIM-total score was 84.0 ± 17.3 (median 86, range 50–119), mean HADS-A score was 10.1 ± 3.4 (median 9, range 3–18), and mean HADS-D score was 8.7 ± 3.6 (median 8, range 2–19) (Table 3).

A total of 40.2% (n = 39) of the patients had anxiety disorder (HADS-A ≥ 11) and 50.5% (n = 49)

had depression (HADS-D ≥ 8). The mean SSQLS score of the patients was 144 ± 26 (median 149, range 92–196). The individual scores of the 12 domains assessed using SSQLS are given in Table 3.

A positive correlation was found between the HADS-A score of the caregivers and HADS-A ($p = 0.015$) and HADS-D ($p = 0.037$) scores of the patients. There was a positive correlation between the HADS-D score of the caregivers and HADS-A ($p = 0.028$) and HADS-D ($p = 0.022$) scores of the patients (Table 4).

There was a negative correlation between the HADS-A scores ($p = 0.037$) and HADS-D scores ($p = 0.040$) of the caregivers and SS-QLS scores of the patients (Table 4).

A positive correlation as noted between duration of care and HADS-A ($p = 0.041$) and HADS-D ($p = 0.014$) scores of the caregivers. There was a positive correlation between the age of caregivers and HADS-A score ($p = 0.007$). However, no correlation was noted between age

Table 2. HADS-A and HADS-D scores and SF-36 subscale scores of family caregivers

Family caregivers			
	Min-Max	Median	Mean \pm SD
HADS-A	2 - 17	9	9.0 ± 3.7
HADS-D	2 - 20	8	8.3 ± 3.7
SF-36 subscale scores:			
Physical function	35 – 100	80	78 ± 12
Physical role	0-100	50	53 ± 25
Emotional role	0-100	33	45 ± 30
Vitality/energy	15-95	45	49 ± 19
Mental health	24-88	56	58 ± 13
Social function	0-100	50	50 ± 18
Pain	10-100	45	49 ± 24
Overall health status	30-90	65	62 ± 15
Change in health	0-75	50	42 ± 16



Table 3. HADS-A and HADS-D scores, FIM scores, MRS score and SS-QLS scores of stroke patients

Stroke patients			
	Min-Max	Median	Mean ± SD
HADS-A	3 - 18	9	10.1 ± 3.4
HADS-D	2 - 19	8	8.7 ± 3.6
FIM-motor score	24 - 84	55	53.8 ± 15.7
FIM-cognitive score	25 - 46	30	30.2 ± 2.9
FIM-total score	50 - 119	86	84.0 ± 17.3
MRS score	2 - 5	3	3.3 ± 0.8
SF-36 subscale scores:			
Energy	3 - 13	8	7.7 ± 2.6
Family roles	3 - 12	8	7.4 ± 2.1
Language	14 - 25	22	21.0 ± 3.2
Mobility	6 - 25	17	15.5 ± 5.9
Mood	7 - 25	15	14.0 ± 3.8
Personality	3 - 14	8	8.4 ± 2.2
Self-care	6 - 21	12	12.3 ± 3.4
Social roles	6 - 20	13	13.0 ± 2.9
Thinking	7 - 15	11	11.4 ± 1.9
Upper extremity function	6 - 23	14	13.3 ± 3.9
Vision	9 - 25	14	13.8 ± 1.4
Work/Productivity	3 - 11	6	6.0 ± 2.3

and HADS-D score ($p = 0.245$). There was no correlation between HADS-A and HADS-D scores of caregivers and FIM scores of patients ($p > 0.05$) (Table 4).

A negative correlation was noted between physical role ($p = 0.045$) and emotional role ($p = 0.017$) subscales and HADS-A scores of the caregivers. No correlation was noted between SF-36 subscale scores of caregivers and HADS-D scores of patients. A positive correlation was noted between caregivers' emotional role subscale scores ($p = 0.036$) and SS-QLS scores of the patients (Table 5).

A negative correlation was noted between duration of care given by caregivers and physical role ($p = 0.018$), social function ($p = 0.040$) and

change in health ($p = 0.026$) subscale scores of the caregivers. A negative correlation was noted between caregiver age and physical function ($p < 0.001$), physical role ($p < 0.001$), emotional role ($p = 0.026$), vitality/energy ($p = 0.014$), social function ($p = 0.020$), pain ($p = 0.001$) and overall health ($p = 0.005$) (Table 5).

A positive correlation was noted between the physical role subscale scores of caregivers and motor FIM scores of the patients ($p = 0.038$). A positive correlation was noted between physical role subscale scores of caregivers and FIM-total scores of the patients ($p = 0.039$) (Table 5).

DISCUSSION

In the present study, 40.2% of stroke patients had

Table 4. The effect of patient variables on HADS-A and HADS-D scores of caregivers

		CAREGIVER	
		HADS-A	HADS-D
PATIENT	HADS-A*	R = 0.221, p=0.015	R = 0.223, p=0.028
	HADS-D*	R = 0.299, p=0.037	R = 0.158, p=0.022
	SSQLS**	Rho = -0.181, p=0.037	Rho = -0.200, p=0.040
	Modified Rankin scale*	R = 0.081, p=0.431	R = 0.086, p=0.402
	Duration of care*	R = 0.208, p=0.041	R = 0.250, p=0.014
	Age of caregiver	R = 0.273, p=0.007	R = 0.119, p=0.245
	FIM-Motor*	R = -0.103, p=0.316	R = -0.131, p=0.200
	FIM-Cognitive*	R = -0.044, p=0.670	R = -0.029, p=0.775
	FIM-Total*	R = -0.101, p=0.327	R = -0.124, p=0.226

* Pearson correlation analysis, r = correlation coefficient, rho = correlation coefficient

**Spearman correlation coefficient

anxiety disorder and 50.5% had depression. Anxiety disorder was found in 39.2% and depression was found in 55.7% of the caregivers. In previous studies, anxiety and depression rates in caregivers of stroke patients have been reported as 21%–56% and 18%–52%, respectively (4, 14-17). Depression and anxiety rates in caregivers of stroke patients in the present study were similar to the results of previous studies.

An important finding of this study was that the depression and anxiety levels of stroke caregivers had a markedly positive correlation with emotional state of the patients. In contrast, another study indicated that there was no significant correlation between anxiety and depression levels of patients and their caregivers (14).

In the present study, a positive correlation was found between the anxiety and depression levels of caregivers and duration of care. In addition, a positive correlation was noted between anxiety

level and age of the caregiver, but no correlation was noted between the age and depression level of caregiver. In the present study, no correlation was noted between anxiety and depression levels of caregivers and functional independence levels of patients.

In a previous study, factors increasing the burden of caregivers were reported to be duration of patient care, social support, depressive symptoms of patients, neurological and functional status of patients, high emotional stress, and poor functional status of patients (3). In the study by Epstein-Lubow et al. (15), it was found that the factors affecting the high frequency of depression in caregivers of stroke patients were female gender and low educational level of the caregiver, male gender and high stroke severity of the patient, and poor overall health of the caregiver.

In the present study, it was found that the quality of life of caregivers of stroke patients was



negatively affected. Similarly, in previous studies, the quality of life of caregivers of stroke patients has been suggested to decrease (18-20).

In the present study, nearly all subscales of caregiver quality of life measured by SF-36 were found to be negatively correlated with caregiver age. Emotional role subscales of caregivers were found to be correlated with quality of life of patients ($p = 0.036$). In addition, there was a negative correlation between emotional state of caregivers and quality of life of patients. Similar to our results, McPherson et al. reported that the quality of life of caregivers was lower than that of the general population and that all SF-36

subscales were correlated with the quality of life of stroke patients measured by SS-QLS (20). In a previous study, it was reported that age of the caregiver and functional status of the patients were crucial determinants of the quality of life of stroke caregivers (21).

In the present study, the quality of life of the caregivers was correlated with functional status and functional independence level of the patients measured by the Modified Rankin scale score, motor FIM and FIM total. In a previous study, it was reported that caregiver burden and quality of life were negatively correlated in caregivers of stroke patients, and the decrease in the quality of

Table 5. The relationship between patient variables and SF-36 scores of caregivers

		Physical function	Physical role	Emotional role	Vitality Energy	Mental health	Social function	Pain	Overall health	Change in health
HADS-A	R	0.063	-0.204	-0.242	-0.093	-0.146	-0.182	-0.104	0.024	-0.024
	p	0.542	0.045	0.017	0.363	0.155	0.074	0.309	0.813	0.819
HADS-D	R	0.113	-0.136	-0.188	-0.061	-0.058	-0.153	-0.045	0.133	0.026
	p	0.272	0.185	0.066	0.553	0.574	0.134	0.664	0.194	0.802
SSQLS	R	-0.106	0.198	0.213	0.061	0.116	0.155	0.107	0.028	0.159
	p	0.301	0.052	0.036	0.555	0.257	0.131	0.295	0.785	0.120
Modified Rankin scale	R	0.129	-0.210	-0.232	-0.041	-0.094	-0.150	-0.056	0.019	-0.102
	p	0.207	0.039	0.022	0.688	0.359	0.142	0.589	0.851	0.321
Duration of care	R	-0.199	-0.240	-0.068	-0.193	-0.077	-0.209	-0.080	-0.185	-0.226
	p	0.051	0.018	0.508	0.058	0.454	0.040	0.434	0.069	0.026
Age of caregiver	R	-0.528	-0.429	-0.226	-0.250	-0.112	-0.236	-0.336	-0.285	-0.034
	p	<0.001	<0.001	0.026	0.014	0.274	0.020	0.001	0.005	0.740
FIM-Motor	R	-0.126	0.211	0.198	0.049	0.080	0.142	0.059	-0.017	0.095
	p	0.219	0.038	0.052	0.636	0.438	0.165	0.565	0.867	0.354
FIM-Cognitive	R	-0.185	0.111	0.026	0.002	0.032	0.094	0.084	0.026	0.124
	p	0.069	0.279	0.803	0.988	0.759	0.358	0.413	0.803	0.225
FIM-Total	R	-0.145	0.210	0.184	0.044	0.077	0.145	0.068	-0.011	0.107
	p	0.155	0.039	0.072	0.667	0.451	0.158	0.509	0.913	0.296

* Pearson correlation test, r = correlation coefficient

life of caregivers was associated with the decrease in functional status of the patients evaluated with MRS and Barthel index (22). Another one has shown an inverse relationship between care burden and quality of life of caregivers (23).

In the present study, no correlation was noted between depression scores of patients and quality of life of their caregivers. Anxiety levels of the patients were found to be correlated with physical role and emotional role subdomains of quality of life of caregivers. In the study of Pinedo et al., it was reported that the quality of life of both patients and caregivers decreased, and similar to the results of the present study, the presence of depression in patients did not have a significant effect on the quality of life of caregivers (24).

There are certain strengths and limitations of the present study. The first strength of this study is that all evaluations were made face to face. The second strength is that Turkish validity and reliability studies were previously performed for all the scales used. The first limitation is that the cause-effect relationship could not be evaluated due to the cross-sectional design of the study.

Another limitation was the inclusion of patients and caregivers in the stroke rehabilitation unit in the study. Therefore, our findings included patients with clinically more severe neurological deficits. The results obtained may therefore not be generalisable to all stroke patients.

In conclusion, it was found that mood disorders occurred frequently in stroke patients and their family caregivers, and there was a correlation between the emotional states of patients and caregivers. In addition, the quality of life of caregivers decreased. Therefore, treatment of diseases that limit the functional independence of patients and require active involvement of caregivers such as stroke should not be conducted from just a patient-oriented perspective, but rather from a patient-caregiver-oriented perspective. Monitoring and paying attention to caregivers who have increased anxiety and depressive symptoms and decreased quality of life in the treatment and rehabilitation process will make a significant contribution towards better patient outcomes.

Conflict of Interest

No conflict of interest to disclosure.

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RESEARCH

PREVALENCE OF PHYSICAL RESTRAINT: A CROSS-SECTIONAL OBSERVATIONAL STUDY

ABSTRACT

Introduction: Physical restraint (PR) is commonly used in healthcare institutions worldwide and controversial strategies in the medical field. The purpose of this study was to determine the PR prevalence in adult patients at a university hospital in Turkey.

Materials and Methods: An observational and cross-sectional design was carried out. Prevalence rates were computed. A total of 6698 patients in 30 units were evaluated at 10 unit visits between July-September 2018. Patient and PR information form was used. Two researchers visited the units and proceeded with data collection. The study population consisted of all patients who were present in the hospital on the day of data collection.

Results: Among 6698 patients, 287 (4.3%) patients were restrained. The highest overall prevalence of 69.6% was in the surgical intensive care unit (ICU). The main reasons reported for using restraints were the prevention of pulling out medical devices (47 %). Age ($p = 0.000$) and units (e.g., surgical units, ICUs) ($p = 0.000$) were statistically significant predictors of PR. Age ($p = .000$) and units ($p = .000$) were statistically significant predictors of PR. The results show that for every additional 0.038 year in patients age, the patient becomes 1.038 times more likely to be restrained.

Conclusion: In Turkey, the rate of application of PR is similar to that of world figures. Age is a very important variable in the use of PR. As they get older, their risk of being exposed to PR increases.

Keywords: Patients; Prevalence; Nurses



INTRODUCTION

Physical restraint (PR) can be defined as connecting physical or mechanical devices to the patient's body or applying short-term physical force by a healthcare professional to the patient in order to restrict the mobility and to prevent easy movements (1, 2). PR is commonly used in healthcare institutions all over the world and remains to be one of the controversial strategies (3-7).

Use of restraint or failure to comply with established procedures may harm the patient physically, socially, and psychologically (1, 7, 8, 9, 10). Attempts should be made to reduce the PR detection rate and possible harm brought about by PR. It is important that nurses are willing to develop new strategies in order to reduce the rate of PR and possible harm.

Background

Several reports on the PR prevalence have been published by some countries and different healthcare institutions. In a PR study by Minnick et al. (11) conducted in intensive care units (ICUs) in the United States, it was reported that the prevalence of PR use was 50/1000 patients per day. In a study conducted in a hospital in Germany, the prevalence of PR was found to be 11.8% (12). Additionally, in a study carried out in ICUs in the Netherlands, PR prevalence was found to be 23%. The prevalence of PR in a nursing home in Spain was reported to be 20% (13), and it was reported to be 84.9% in another study conducted in long-term care centers (3). The prevalence of PR in a hospital in Israel was reported to be 2%–7.5% (6) and 23% in a hospital study conducted by Kalula and Petros (5) in South Africa. In a study conducted in ICUs in Jordan, the prevalence of PR use was found to be 35.8% (14). Limited number of studies were conducted in ICUs in Turkey (1,15, 16), and no study was conducted involving all units in hospital. The current study is the first study identifying the prevalence of PR of all adult units in one hospital

in Turkey.

In the studies, the features of patients at the risk of PR application were also investigated. Patients at the risk for PR are as follows: the elderly (12), those who are more dependent on nursing care, those who are sedated, those with aggressive behavior (17), those attached to mechanical ventilators (18), and those who are comatose (19). Other situations that may subject patients to PR are the work environment and workload of nurses (1). Determining the characteristics of patients subjected to PR is very important for the identification of patients at risk.

PR is generally considered and applied for the benefit of the patient, such as preventing the patient from falling off the bed; preventing them from pulling out the connected tubes, drains, and medical devices; and ensuring control over the patient's behaviors (3, 16, 20). However, improper use of restraint material or failure to comply with established procedures may harm the patient physically, socially, and psychologically. These physical damages include decreased muscle tone, orthostatic hypotension, urinary and fecal incontinence, increased risk of nosocomial infection, edema of the lower extremities, pressure sores, chronic constipation, contracture, malnutrition, pneumonia, skin and tissue injuries, and muscular atrophy (1, 9). The negative psychological and social effects include fear, increased confusion, panic, anger, cognitive and behavioral symptoms, increased anxiety, insomnia, delirium, shame, resistance and disobeying, decreased self-esteem, decreased self-confidence, apathy, depression, and impaired body image (7, 8, 10). Regulations and standards for PR procedures have been set in many countries to minimize the damages caused by PR. Turkey was able to set quality standards for PR in 2011 (21).

The patient and family members should be well informed about the procedure, and obtaining

informed consents aside from physician's directive is required for the application of PR. The responses of patients to PR should be carefully and properly monitored, evaluated, and recorded. The PRs should be removed at regular intervals to check for circulation and skin condition, and patients should be assessed whether continuation of PR application is safe (20). Nurses should be aware of the specific policies and procedures for the proper use and monitoring of PR. However, the studies in Turkey showed that informed consent for PR or physician's directive were not carefully applied, registration and reporting were not carefully performed, patients were not sufficiently monitored, and the standards for PR application were not fully met (20, 22).

Literature review showed that there are studies identifying the prevalence of PR use in several countries (2, 3, 4, 5, 14). However, none of these studies includes all units in one hospital, and their samples are not as large as the current study. Determining the prevalence of PR allows for the planning of interventions to minimize the frequency of use of PR. In addition to this, the study can help the aware of elder people who under risk for PR. To know the risk of elderly about PR can improve the elderly care. For these reasons, this study was conducted to determine the PR prevalence in adult patients hospitalized during certain periods of time at a university hospital in Turkey and to identify the characteristics of patients on PR.

METHOD

Design

An observational and cross-sectional design was carried out.

Data Collection and Sample

Data from one University Hospital, which is in the western part of Turkey, were collected. All adult units (internal medicine units, surgical units, ICUs, emergency department, psychiatry

units) aside from pediatric units and operating rooms in the University Hospital were included in the study. A total of 6698 patients in 30 units were observed. Patient and physical restraint information form was used. The form was prepared by researchers to obtain information about the patient's characteristics (age, gender, clinics, NG tube, foley catheter etc.) and physical restraint information (types of physical restraints, reasons for physical restraints, fall risk assessment scale). These information were obtained from their hospital records and through observation.

The total number of patient beds in adult units is 754 in this hospital. In these units, the total number of patients hospitalized in 3 months from July to September 2017 was 10.527 (requested from X Hospital Information Unit). Among these studies, the research by Ragan et al. (6) in Israel with the lowest prevalence (2%) was used for sample calculation. The study population was accepted as 10.527, and deviation was 0.2%, with 95% confidence interval and 6191 target samples. Between July 2018 and September 2018, a total of 6698 patients were evaluated spontaneously at 10 unit visits. The study population consisted of all patients who were present in the hospital on the day of data collection to determine prevalence. There is no any special inclusion criteria.

Through simple random sampling, 10 days were selected for visit to the unit; half of the visits were during night shifts. Nurses did not know the days of the visits to prevent bias. Von Elm et al.'s (23) epidemiological observational study guide (The Strengthening the Reporting of Observational Studies in Epidemiology-STROBE) was used (See Supplementary File 1). Two researchers visited the units and proceeded with data collection. For the aim of the current study, PR was defined as any device, material, or tool attached to a patient to restrict his or her mobility and/or to prevent disruption of medical treatment. According to this definition, a patient would be considered to be



restrained if one or more body parts were tied to the bed. This would include tying patients' wrist or ankle to their bed. After the identifying patients who were physically restrained, the researchers asked nurses reasons for restraint.

Data Analysis

Prevalence rates were computed. Data analysis was performed by the researchers using the SPSS 22.0 software. Categorical data were summarized based on their frequency, whereas continuous data were summarized based on their mean and standard deviation. Logistic regression analysis was performed and used to compute the odds ratio. Significance was set at $p < 0.05$.

Ethical Considerations

Approval of conducting the study was obtained from one University Hospital and Ethical Committee of the one University Institute of Health Sciences. Informed consent was not required because the data were collected anonymously. The names or private information of patients was not recorded to prevent any ethical violation.

RESULTS

Sample

A total of 6698 patients were observed in 30 units every 2 weeks. The study is comprised of 10 observations. The mean age of the 6698 patients was 58.88 years (17.62), and 50.8% were male. The number of restrained patients was 287; their mean age was 70.84 years (16.81); a total of 54.7% were male; a total of 74.6% had nasogastric (NG) tube; a total of 90.2% had Foley catheter; a total of 50.5% had central venous catheter; and 56.8% were intubated (Table 1). The mean of iTAKI was 15.53 (3.46), (min-max: 6–31); all restrained patients had a high fall risk. The "iTAKI fall risk scale" is a scale consisting of 19 risk factors, including the risk factors that may cause patients to fall. Min-max score of original scale is 0–51.

Prevalence and Types of PRs

Among the 6698 patients, 287 (4.3%) patients were restrained. The prevalence of restraint use varied depending on the units. The highest overall prevalence of 69.6% was observed in the surgical ICU, whereas the lowest was 0% in the psychiatry, urology, thoracic surgery, cardiovascular surgery, plastic surgery, ocular diseases, gynecology–obstetrics, physical therapy, infectious diseases, and dermatology unit. The most common types of PRs were extremity and wrist restraint (99.7%). The least common types of PRs were the elbow restraint (0.3%) (Table 1).

Reasons for PRs

The main reasons reported by nurses for using PRs were for patients' safety (for prevention) (47.0%), agitation (26.8%), avoid pulling out attached medical devices (10.1%), confusion (3.8%), falling history (0.3%) (Table 1).

Factors Predicting PRs

A model that integrates the variables described the restraint use. Table 2 shows the results of the logistic regression, which indicates factors predicting restraint use to patients. The model contains four predictors (age, gender, day or night shifts, units). Age ($p = 0.000$) and units ($p = 0.000$) were statistically significant predictors of PR (Table 2).

The prevalence of restraint use in the morning shifts was 46% and in night shifts was 54%, and shift ($p = 0.238$) was not statistically a significant predictor for PR application. Gender ($p = 0.979$) was not a statistically significant predictor for PR application (Table 2).

The model explains 39% of the observed variability in applying PR. The results show that for every additional 0.038 year in the age, the patient becomes 1.038 times more likely to be restrained. When separate models were established for each unit and age, the use of PR was found to be significant in internal disease areas (odds ratio =

Table 1. Distribution of emergency diagnoses and outcomes of the study population according to age groups

Patients Characteristics	n (6698)
Age	
Mean (SD)	58.88 (17.62)
Gender	
Male (%)	3402 (%50.8)
Female (%)	3296 (%49.2)
Clinics	
Internal medicine clinics	3123 (%46.6)
Surgery clinics	2586 (%38.6)
Intensive care units	480 (%7.2)
Emergency department	274 (%4.1)
Psychiatric clinics	235 (%3.5)
Shifts	
Day	3281 (%49.0)
Night	3417 (%51.0)
Restrained Patients	n (287)
Age	Age
Mean (SD)	Mean (SD)
(ITAKI) Fall Risk Assessment Scale	15.53 (3.46)
Gender	
Male	157 (%54.7)
Female	130 (%45.3)
Clinics	
Internal medicine clinics	46 (%16.0)
Surgery clinics	39 (%13.6)
Intensive care units	192 (%66.9)
Emergency department	10 (%3.5)
Shifts	
Day	132 (%46.0)
Night	155 (%54.0)
Types of Physical Restraints	
Wrist	286 (%99.7)
Elbow	1 (%0.3)
Reasons for Physical Restraints	
Prevention of pulling out medical devices	135 (%47.0)
Agitation	77 (%26.8)
Confusion	11 (%3.8)
Falling history	1 (%0.3)
History of pulling out the medical devices	29 (%10.1)
More than one reason	34 (%11.8)
NG tube	
Yes	214 (%74.6)
No	73 (%25.4)
Foley catheter	
Yes	259 (%90.2)
No	28 (%9.8)
Central venous catheter	
Yes	145 (%50.5)
No	142 (%49.5)
Intubated	
Yes	163 (%56.8)
No	124 (%43.2)

5.555), surgical units (odds ratio = 3.485), and ICUs (odds ratio = .27).

DISCUSSION

The current study is the first study identifying the prevalence of PR of all adult units in one hospital in Turkey. The hospital where the study was conducted was under the large maximum-care hospital category, which is one of Turkey's leading healthcare organizations, with a total capacity of 1000 beds. In the literature, the studies identifying the prevalence of PR were mostly on specific areas such as ICUs (14, 15, 22), long-term care centers and home cares (3). The number of studies investigating almost all adult care unit of a hospital is quite limited (4-6).

Prevalence and Types of PRs

In this study, the prevalence of PR was determined to be 4.3% in a university hospital. Eskandari et al. (4) found that the prevalence of PR was 3.39%, and Raguan et al. (6) found it to be 3.51%. Krüger et al. (12) determined the prevalence to be 11.8%. In the study conducted by Kalula and Petros (5) in South Africa, the PR rate was found to be 23%. The results of the research conducted on the prevalence of PR in hospitals are observed to be accumulated in a wide range of 2%–25% (12). It is thought that this situation is caused by the different units involved in the prevalence studies. The prevalence of PR is observed to be high in studies where ICUs are involved (4, 12). In this current study, it can be observed that the highest prevalence of PR is in ICUs when comparing the units. This is similar to the results of other studies (12). In addition, because the definition of PR in the study and the protocols applied depending on the countries are different, the prevalence may differ in line with the researches. An important variable in terms of differences is the attitude of health care professionals toward PR. It is thought that the knowledge, attitude, and experiences of nurses on the subject matter are important. In



Turkey, the standards for PR were defined in 2011, and patient's safety was taken into the scope of quality. It is known that there is a lack of training programs accessible to every nurse in the country. In a study by Bakır et al. (22) conducted in Turkey that is related to the attitude toward PR and application of PR (2016), more than half of the respondents (73.8%) gave wrong answers in the information section about PR. As a result of this research, it can be accepted that the issue of PR use has not yet been fully adopted.

In the current study, the most common types of PRs were wrist restraints (99.7%). In the literature, it can also be seen that wrist restraints are commonly

used. Eskandari et al. (4) reported that 83.4% of the individuals were restrained from their wrists. In the study by Turgay et al. (16), it was also reported that wrist and ankle restraints were commonly used. Suliman (14) stated that the most common restraint type was wrist or finger restraints. The most common reason for PR explained by nurses was to prevent patient from pulling out attached medical devices from their bodies, which can be prevented by restraining the wrists.

Reasons of PRs

Similarly, in other studies, it was found that most of patients were subjected to PRs for the purposes of prevention (4, 5, 16). Eskandari et al. (4) stated

Table 2. The relationship between patient variables and SF-36 scores of caregivers

Predictors	B	SE	Wald	Odds ratio	95%CI Odds ratio		P value
					Lower	Upper	
Age	.038	.005	60.104	1.038	1.029	1.048	.000*
Gender	-.004	.143	.001	.996	.752	1.319	.979
Shift	-.168	.142	1.393	.845	.640	1.117	.238
Internal medicine clinics	1.715	.164	108.912	5.555	4.025	7.665	.000*
Surgery clinics	1.248	.176	50.559	3.485	2.470	4.916	.000*
Intensive care units	-3.595	.142	638.828	.27	.21	.36	.000*
Emergency department	451	.332	1.849	1.570	.819	3.010	.174
Psychiatric clinics	17.544	2491.951	.000	.000	.000	-	.994
Hosmer and Lemeshow Test		Chi-square		df	P value		
		39.290		8	.000*		
-2Log likelihood		Cox & Snell R square		Nagelkerke R square			
1544.033		.116		.389			

that the reason for the use of PR was to prevent patients from pulling out attached tubes and catheters. In this study, when the characteristics of patients being restrained are analyzed, it can be seen that 74.6% had NG tube; a total of 90.2% had Foley catheter; a total of 50.5% had central venous catheter; a total of 56.8% were intubated; and 10.1% had history of pulling out attached medical devices. Based on the İTAKİ fall risk scale, the mean score was 15.53. Nurses consider PR as an application to be performed for the patient's safety (20).

Factors Predicting of the PRs

Older age and gender. In our study, it was concluded that the age variable posed a risk for PR and that the elderly patients displayed higher prevalence of PR. In the literature, Heinze et al. (24) and Krüger et al. (12) also found that the use of PR increased with age. The results of the research conducted by Suliman (14) in the literature on age are striking. Suliman (14) found that patients were more likely to be bound to their beds in a younger age and that this situation was attributed to the fact that young patients are stronger and are attached to more medical devices. However, in the same study, it was seen that the mean age of the sampling was 60.2 years, and it was also observed that the group sample studied was younger than those in other studies. This difference is thought to be because of having a young sampling group.

Whether or not gender is a risk factor for the use of PR is a controversial issue. In the current study, it was found that there was no difference between the two genders. Likewise, Suliman (14) and Luk et al. (17) found that gender was not associated with the PR use. In studies that found gender to be influential, Eskandari et al. (4), Kalula and Petros (5), and Ragan et al. (6) found that male patients had higher incidence of PR. In contrast, Heinze et al. (24) found that female patients had higher incidence of PR.

Day and night shifts. In the literature, it is

emphasized that the frequency of PR application is higher during night shifts (4, 6, 15). Eskandari et al. (4) found that patients were more likely to be restrained in the night shifts (psychiatric wards 87.3%, nonpsychiatric wards 82.9%), and Akansel (15) found this value to be 87.3% in the night shift. Suliman (14) found that the rate of PR application was 3.6 times more during night shifts and stated that nurses are more likely to restrain patients during busy times and in busy places. During night shifts, the shortage in healthcare workers may make the job of supervising patients' movements more difficult for nurses. On the contrary, Minnick et al. (11) concluded in their study that the type of shift did not affect the application of PR. The current study found no difference in day and night shifts unlike other recent studies in the literature. It is thought that this is due to the similarity of day and night nurse rates in the hospital.

Comparing units. When the units were investigated separately, internal medicine units or ICUs had higher prevalence of PR. Patients in the internal medicine units have diseases such as cancer, cerebrovascular diseases, delirium, and dementia. In addition, the mean age of patients in internal medicine units is 61 years, considering that age is a significant risk factor for the application of PR. It is thought that the characteristics of patients' diseases and higher mean age increase the risk for PR. Although there are more young patients admitted to surgical units, it is thought that PR are used because of the state of consciousness caused by surgery, excessive catheter, and presence of drainage.

The mean age of patients hospitalized in ICUs is 66 years. Patients admitted to ICUs have many features such as sedation, delirium development, changes in consciousness levels, intubation, and presence of catheters and drains. It is well known in the literature that more PRs are used because of the characteristics of patients in ICUs (14, 15). Similarly, the highest rate of PR application was



found in ICUs (66.9%).

The use of PR in psychiatric units is a controversial issue in the literature. Eskandari et al. (4) stated that there is a rate of 13.6% of PR use in psychiatric units. However, contrary to this study, Kalula and Petros (5) concluded that no PR was applied in psychiatric units. This is thought to be related to "seclusion" or "mechanical restraint" or "physical restraints" used in psychiatric units.

There is not enough information in the literature on the use of PR in emergency departments. Wong et al. (25) stated that only 0.5% patients had restraint orders in emergency departments. In the current study, being admitted to emergency departments did not pose a risk for PR. This situation is thought to be because of the fact that there are generally acute cases in emergency departments. It was concluded that very few patients admitted to the emergency department had to be restrained because of clouding of consciousness and deterioration of the general condition.

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CONCLUSION

In Turkey, the rate of PR application is similar to that of the worldwide figures, and often they are applied in general hospitals. Age is a very important variable to be considered in PR application. As patients get older, their risk of being exposed to PR increases. The prevalence of PR is varied depending on units. Being in internal medicine, admission to surgical and intensive care units increases the probability of the use of PRs on patients. In this study, it was concluded that day or night shifts or gender does not pose a risk for PR.

Relevance to Clinical Practice

Determination of prevalence of PR allows for the planning of interventions to minimize the frequency of use of PR. With this study, the PR prevalence in the general hospital has been revealed. In particular, ICUs are the places where PR is most commonly used. Older patients are under risk to PR. Therefore, attempts should be made to reduce the PR detection rate, especially in these places. This study may help nurses to find new strategy in ensuring safety that is less restrictive.

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RESEARCH

PROTECTING OLDER WORKERS' HEALTH IN LEGAL TERMS COMPARATIVELY EUROPEAN ACQUIS IN THE LIGHT OF ILO R162

ABSTRACT

Introduction: This article discusses the specific laws, regulations, and recommendations aimed at protecting older workers against occupational accidents and illnesses and whether they are properly regulated by Turkish legislation compared with the European Union acquis, in order to protect older workers against discrimination, and to make their working conditions more appropriate for their ages, in the light of International Labour Organization Recommendation No. 162.

Materials and methods: This conceptual article was prepared by evaluating the legal framework for protection of the occupational health and safety of older Turkish workers, through a comparison of Turkish law, International Labour Organization Recommendation No. 162, and the European Union acquis, and consideration of the facts reported in the relevant literature, using the document analysis method.

Results and Conclusion: Neither Turkish labour law nor European Union acquis include sufficient regulation to protect the health and safety of older workers at work. Older workers' health should be protected specifically by social law, without driving them to poverty. Changes in the regulation of working conditions that would be supported by the social security system have been proposed to protect the health of older workers as a specially protected group.

Keywords: Aging; Ageism; Legislation; Occupational health; Work

INTRODUCTION

The number of older workers is increasing all over the world as a result of population aging. This situation is due to increasing life expectancy at birth. Birth rates, however, are decreasing, especially in developed countries (1). More older workers are required to work because legal retirement ages are rising and earlier access to pensions was limited in many countries after the 1990s when social security deficits become a menace to the sustainability of pensions within social insurance systems (2, 3). Therefore, many older workers continue to work because they cannot retire. In addition, old-age pensions and benefits are not sufficient for living in general. As a result, participation in the employment market is increasing among members of this population.

According to the European Agency for Safety and Health at Work (EU-OSHA), the employment rate of people aged 55-64 years in European Union (EU) countries increased from 39.9% in 2003 to 50.1% in 2013. However, according to the European Commission, the employment rate of this age group is not sufficient for sustainable growth of the European social market, citing the rate to be 46%, compared with 62% in the United States and Japan. The European Commission's EUROPE 2020 Strategy Communication of 2010 (4) targeted the employment rates of older workers to secure the future of welfare systems. As a result, the employment rate of people aged 55-64 years increased to 58.7% in the EU in 2018 (5). The employment rate of these workers was 33.2% in Turkey in 2019 according to Organisation for Economic Co-operation and Development (OECD) data (6). However, it was estimated to be much higher when shadow (informal) employment was included (33.42%) in the official numbers for 2018 (7). There is a need for social protection programs that prevent poverty among elderly adults as a disadvantaged social group (8), and the low participation rate of people aged 55-64 years in the workforce is supposed to be a negative effect on the elderly poverty which would increase

that need. That is why increasing participation rate of older workers to employment is in favour of the sustainability of social security systems not only related by pensions but as a whole.

On the other hand, because aging is associated with physical and psychological issues, older workers may encounter work-related problems that differ from those encountered by younger workers. These problems can be classified into two categories: age discrimination and being more vulnerable to occupational hazards and working conditions (1,2). However older workers can be affected from work-related problems in different ways since there are some inequalities depending on the quality of the work they do and the social, economic and cultural conditions of the countries they live. Blue-collar workers are especially less educated and employed in jobs require more physical power compared to white-collar workers, and not wanted to be employed when they get older because of being under the higher risk of work accidents and occupational diseases and less productive due to the decreasing of the physical capacity by age. On the other hand, white-collar workers are wanted in workplaces because of being more competent in time by gaining experience accompanied to their knowledge. But age becomes a disadvantage at last by affecting the mental and physical capacity negatively for all (9).

In the past decades, the International Labour Organization (ILO) General Conference has adopted certain proposals regarding older workers based on a specific recommendation from 1980. International Labour Organization Recommendation No. 162 (ILO R162) puts forward standards that promote equal opportunity for older workers and fair treatment of this population, for their protection and transition to retirement. It is stated in first article of ILO R162 that it will be applied 'to all workers who are liable to encounter difficulties in employment and occupation because of advancement in age', without declaring any specific age range because the experience of



aging is not solely dependent on age. The World Health Organization Working Group on Aging and Working Capacity agreed that the terms 'older workers', 'aging workers' could be used to describe workers aged 45 years and above (10). However, older workers are generally described as being between 55 and 64 years of age in official documents and reports of European agencies.

This conceptual article discusses whether specific rules are regulated properly within Turkish legislation compared with the EU acquis to protect older workers against discrimination, and to make their working conditions more appropriate for their ages, in order to protect their health in the light of ILO R162. First, this article explains two types of problems older workers may encounter and how international law reflects these two types of problems. Then related provisions in Turkish law are explained with a discussion alongside the policies and reports prepared. Some proposals aimed at protecting the health of older workers have been put forward at last. These proposals focus on improvements in working conditions and fulfilling the legal obligations of the state and employers with regard to occupational health and safety; these proposals also emphasise the fact that the health of older workers should be protected specifically by social law without driving them to poverty, because the elderly are more vulnerable to fatal diseases, as has been demonstrated during the COVID-19 pandemic (11).

MATERIALS AND METHODS

A content analysis of the legislation, doctrine, and reports was conducted. The materials of the study are ILO R162 and reports of ILO as the universal legal approach to the subject, and the work for improving policies and legislation on European Union level and Turkish law in the sense of protection of health and safety of aging workers. Policy efforts for putting forward the legislation for protecting the health and safety of older workers in

Europe and the legal rules in Turkey are examined from two aspects as regulated by ILO R162 with the help of the research and reports about the subject below.

EXAMINATION OF EUROPEAN ACQUIS AND TURKISH LAW IN THE LIGHT OF ILO R162

International Labour Organization Recommendation No. 162 suggests that each member state should put forward social policies to promote equality of opportunity and treatment for all workers regardless of their age. This recommendation promotes the improvement of working conditions and the working environment at all stages of working life and supports the transition period to retirement through laws and practices, and the participation of the representative organizations of employers and workers. Measures should be taken to improve working conditions, such as adapting the job to the worker through technological and environmental changes, reducing normal daily and weekly hours of work for dangerous work, promoting the gradual reduction of work during a prescribed period until retirement, increasing the number of paid annual holidays on the basis of length of service or of age, enabling older workers to organize their work and leisure time (particularly by providing the opportunity for part-time employment and offering flexible working hours), facilitating the assignment of older workers to jobs performed during normal daytime working hours and not as shift work (1).

1. Protection of Older Workers Against Discrimination

Discrimination against individuals and groups is a serious problem that can be addressed through laws that protect human rights. Age discrimination can cause serious health problems (12), which is why employment discrimination should be considered an occupational health issue. Because the perspective of the study

focuses on to adapt the working conditions in legal terms in order to protect health and safety of older workers, laws against age discrimination is taken into account as a tool to serve to this end. International and national laws protecting older workers from discrimination, as a disadvantaged group, emerged after the 1950s. The US Age Discrimination in Employment Act was enacted in 1967 'to protect applicants and employees 40 years of age and older from discrimination on the basis of age in hiring, promotion, discharge, compensation, or terms, conditions or privileges of employment' (13). Laws preventing age discrimination in employment have been enacted in Canada, Japan, New Zealand, and Austria (1). Age discrimination is considered an important issue by the United Nations (UN) and ILO because research has found evidence of its prevalence (14). The ILO Convention on Discrimination (Employment and Occupation) Convention, 1958 (No. 111) covered the subject, and ILO Older Workers Recommendation, No. 162, 1980 (ILO R162) is specific regulation against age discrimination (15). The UN adopted the International Plan of Action on Aging at the First World Assembly on Aging in Vienna in 1982, and the UN Principles for Older Persons in 1991, against age discrimination in general, which provided the foundation for the Madrid International Plan of Action on Aging 2002 (15). European Union Council Directive 2000/78/EC aimed to ensure equal treatment of individuals regardless of their religion or beliefs, disability, age, or sexual orientation for equal access to employment and occupational opportunities, and membership to certain organizations, which included the protection of the elderly against discrimination (16).

Nevertheless, age equity in employment has moved closer to realization because of the above-mentioned first efforts. According to an article in the Harvard Business Review, age was considered to be a competitive disadvantage by two-thirds of companies, which is consistent with other data

showing that two-thirds of individuals aged 45 to 74 experienced age-related discrimination (17).

The EU has been criticized for having a conservative outlook on age-based distinctions, and an 'anti-ageist vision' has been suggested for its legal and policy framework to overcome injustice and prejudices based on age (18). The UN's World Population Aging 2019 report proposes that the elimination of age-related discrimination, including age barriers in employment, would increase productivity and promote economic growth. The report also points out that social policies that increase the participation of older persons in the formal market can contribute to the protection of rights and dignity (19). It is a fact that effective laws can protect older workers against discrimination by protecting their health at work.

2. Providing Fair Working Conditions to Older Workers

One Turkish study found that older workers have more physical health problems compared with younger workers, and, as demonstrated in similar studies conducted in different countries, working positively affects the health of older workers (20). Working conditions, such as long working hours without the amount of rest required for people in their age group, can lead to health problems even more for older workers than for other age groups. Working conditions should support the maintenance of health among older workers, especially against problems caused by postural and psychological stress, excess workload, hot and noisy environments, insufficient lighting, shift work, night work, and long working hours. It is recommended that the conditions that are harmful to the health of older workers first be itemized, then the priorities should be determined, and finally the items should be reorganized. Working conditions, equipment, and training should be specifically tailored according to the needs of older workers (9). Occupational accidents and diseases may be prevented through these procedures. The risk of catching occupational diseases cannot



be significantly different because all employees work in the same workplace and are exposed to similar conditions; however, older workers can be more susceptible. In addition, older workers have chronic health problems, such as high blood tension and respiratory and circulatory system problems. As has been apparent during the COVID-19 pandemic, diseases caught at work can pose a greater health risk to older workers than to younger workers. Older workers may also place other workers at risk because they are unable to react and move easily and quickly. It is suggested that employers take appropriate precautions in the workplace in order to protect not only older workers but all workers. In addition, although the rate of occupational accidents encountered by older workers is lower than that of younger workers, because of having more experience and behaving more carefully, these accidents can be much more fatal for the former group (21).

Flexible work programs are the most common and offer the most effective method of maintaining motivation and productivity at work. They increase work satisfaction and productivity among older workers by decreasing work stress, absence, and fatigue. They also contribute to a better work-life balance. Another type of program that offers flexibility is gradual transition programs. These programs give older workers who only have a few years left before retiring the option to reduce their daily or weekly working hours. Through these programs, older workers can remain employed (utilizing their work experience) as they prepare for retirement (22).

Measures to Improve the Situation Older Workers were included in the agenda of the Council of Europe Steering Committee for Social Affairs for the adoption of the provisions of ILO R162 by member states, and a Draft Recommendation for Europe was formulated in 1980 (23). However, the only regulation enacted was a special provision for protection of the elderly in general (Article 23 of the European Social Charter [Revised] from

1996). Turkey has been a member state of the Council of Europe since 1950, and has adopted two main treaties on human rights: the European Convention on Human Rights and the European Social Charter, with some exceptions. The provision in the Revised European Social Charter is about providing a decent life to members of the general public, and does not specifically discuss older workers. There are specific provisions in the Charter for other worker groups that need special protection, such as employed women in maternity and child workers. There are no specific rules that protect older workers apart from those of the EU Occupational Safety and Health Framework Directive (89/391 EEC) and recommendations; however, research and policy discussions led by Eurofound and EU-OSHA, agencies of the EU, are ongoing.

3. Legislation for Protection of Older Workers Against Discrimination and Providing Fair Working Conditions to Older Workers in Turkish Law

According to Article 10 of the Turkish Constitution, everyone has equal protection under the law, but 'measures to be taken for women, children, the elderly, disabled people, widows and orphans of martyrs, invalids, and veterans shall not be considered a violation of the equality principle'. Article 49, on economic and social rights, states that 'Everyone has the right and duty of the work' and 'The State shall take the necessary measures to raise the standard of living of workers, and to protect workers and the unemployed in order to improve the general conditions of labour, to promote labour, to create suitable economic conditions for prevention of unemployment and to secure labour peace'. The first paragraph of Article 50, titled Working Conditions, Right to Rest and Leisure, which states, 'No one shall be required to perform work unsuited to his/her age, sex and capacity', could be said to specifically refer to older workers. However, the same Article goes on to state that 'minors, women, and physically

and mentally disabled persons, shall enjoy special protection with regard to working conditions', before putting forward the general rule that 'all workers have right to rest and leisure'. Older workers are not specifically mentioned among the groups that required special consideration with regard to working conditions. Article 61 designates the elderly as one of the groups requiring special social protection in terms of social security but nothing is indicated about their rights at work. As a result, unsuitable work for one's age is banned in general, yet older workers are not mentioned within the groups to be protected, especially regarding working conditions. However, the fact that these measures offer protection to the elderly based on general principles of equality could serve as a legal basis for special laws to protect older workers' health. Discrimination based on age is forbidden by the Law on Turkish Human Rights and Equality Institution, but criticised by justifying the discrimination in employment under some particular conditions at the same time (24).

There are only two provisions concerning older workers in Turkish Labour Law. The first is Occupational Health and Safety Law No. 6331, which was enacted in 2012. The Law is based on EU 89/391 EEC. Article 10 (1)/d states that 'the situation of female workers and other workers such as young workers, older workers, disabled, pregnant or breastfeeding workers who need specific policies' should be considered as one of the points for assessment of the risks to health and safety of workers.

The second is regulated by Article 53 of Labour Law No. 4857 ('Right for Annual Paid Leave and Periods for Leave'). The amount of annual paid leave for workers ranges between 14 and 26 days, depending on seniority, according to this article, and cannot be less than 20 days for workers aged 18 years or less, and aged 50 years or more. Even though the amount of annual paid leave is regulated in favour of older workers, it is less than the minimum 4 weeks of annual leave stipulated in

the Social Charter (Revised). Turkey was exempted when it ratified the Charter.

RESULTS AND CONCLUSION

According to a 2019 UN report, the aging population can positively affect economic growth while fiscal sustainability is maintained if appropriate social policies, based on the special conditions of each country, are implemented (19). Increasing the participation rate of older workers in the formal employment market is one method of achieving this aim. Nevertheless, the provision of healthy working conditions for older workers is necessary and is part of their basic rights. Measures that take into account the physical and mental changes that occur due to aging (23) should be implemented to improve working and environmental conditions among older workers. Neither European nor Turkish legislation sufficiently upholds the recommendations of ILO R162, even though European law contains better provisions and practices with regards to working conditions, not specifically for older workers, but all workers in general. Working conditions of older workers should be regulated by taking into account the specific needs of this population. Health and dignity could be protected at work through legislation and practice that reflect policy and research findings and focus on the 'right to life' as a basic human right. Flexible daily working hours and weekly working days can be provided without any loss of income with the support of the social insurance system, and annual paid leave periods can be increased. The impact of the work on health can be traced by occupational health surveillance. Measures should be taken to prevent discrimination due to age, which is partly caused by technological changes and intergenerational differences. The importance of protecting the health of older workers has been particularly apparent during the COVID-19 pandemic (11), which could be a topic for further research. States are obliged to develop regulations and build



supporting organizations to monitor employer implementation of policies, with the help of social security systems. The health and safety of older workers and the protection of their right to life should be guaranteed, without driving them to poverty.

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RESEARCH

REDUCING AGEISM IN TURKISH-SPEAKING UNIVERSITY STUDENTS: THE ROLES OF INTERGROUP CONTACT AND PERSPECTIVE TAKING

ABSTRACT

Introduction: Existing research findings support the prevalence of ageism and its negative effects on the well-being of older adults. Despite such data, very little research has been conducted on ageism, particularly in non-Western cultures.

Materials and Methods: This study aimed to explore the roles of knowledge (regarding older people), intergroup contact (both quantity and quality), and perspective taking in predicting ageist attitudes of Turkish-speaking university students. A convenience sample of 266 (145 females and 121 males) undergraduate students participated in the study. The age of the students in the whole sample ranged from 17 years to 36 years ($M = 22.08, SD = 2.60$).

Results: We hypothesized and found that those with more knowledge, contact, and perspective taking skills showed reduced ageist attitudes than their counterparts. Path analysis also showed that perspective taking mediated the relationship between intergroup contact and reduced ageist attitudes.

Conclusion: Implications are drawn for the development of interventions aimed at targeting ageist attitudes particularly for students pursuing gerontology-related occupations.

Keywords: Ageism; Student; Empathy; Attitudes

INTRODUCTION

According to the United Nation's (UN) World Population Ageing 2019 Report findings, the population of older adults is growing in nearly all countries around the world. The population of people aged 80 or above is estimated to triple in the next 30 years, and those over age 65 will double by 2050 (1). The World Health Organization (WHO) research findings show that the number of older adults is rapidly increasing as people are living longer because of improved medical treatments and living conditions. In addition, fertility rates have fallen significantly, changing the demographic balance in favor of older adults (2). Presently, approximately two-thirds of the world's older adult population live in developing regions (1). The population is aging rapidly everywhere, and Turkey is no exception. According to the Turkish Statistical Institute's (TÜİK) 2014 data, the population of 65 and over is 8% of the total population of Turkey. This percentage is expected to rise to 10.2% by 2023, to 20.8% by 2050, and to 27.7% by 2075 (3).

The EURAGE research team surveying 55,000 people from 28 countries; 21 of the 27 European Union (EU) member states (all but Austria, Ireland, Italy, Lithuania, Luxembourg, and Malta); two EU candidate countries (Croatia and Turkey); two European Economic Area countries (Norway and Switzerland); and Israel, Russia, and Ukraine found that 44% of the participants thought that age discrimination was a serious or a very serious issue. Thirty-five percent of the participants reported unfair treatment because of age. Of all the 28 countries in the European region, respondents from Turkey had the lowest perceptions of age discrimination and 31% of participants indicated no age discrimination in Turkey (4). Despite these findings, one in five people in Turkey reported experiencing unfair treatment because of their age.

The European Commission Report states that

the growing older adult population will need new social, economic, and mental health policies implemented by governments; such policies will put additional strain on countries' governments and their resources (5). In general, aging is regarded as a negative process (6). According to lifespan developmental psychologists, aging is a complicated individual process that starts with conception and ends with death. Every person's trajectory of aging is unique, and the potential for development captures the whole lifespan. Ageism is being considered the greatest threat to the achievement of "successful aging," "healthy aging," "aging well," or "resourceful aging" in the 21st century (7). The negative connotations associated with aging have received intense attention by psychologists and social scientists.

"Ageism" was a concept first used by Butler in 1969. Butler explains ageism as stereotyping and discriminating against people simply because of their older age. Butler claims that ageism is very similar to racism and sexism (6). Unlike Butler, Iversen, Larsen, and Solem find ageism different from sexism and racism, because age is continuous and everyone experiences ageism at some point (8). Palmore extends the meaning of ageism by defining it as any prejudice or discrimination against or in favor of any age group, showing both negative and positive sides of ageism; however, he says the negative side is observed more frequently than the positive side (9). Iversen and colleagues offer a new definition for ageism, stating that it has three classic components, namely, the cognitive (stereotyping), affective (prejudice), and behavioral (discrimination) components; they also report that individuals mistakenly think, feel, and act toward others based on their chronological age (8).

According to Palmore (9), "positive ageism" lowers the status of older adults in the community and supports a limited view of the older people. People perceive positive ageism behaviors as thoughtful and kind (such as the elderly being cute, kind, or wise) yet not ageist. By contrast,



“negative ageism” has essentially connected old age with cognitive decline, senility, lack of libido, physical illnesses, and incompetence. Both positive and negative ageism can be reinforced via stereotypes, both positive and negative (10).

There are concrete efforts to reduce racism and sexism, but less advancement has been made to diminish ageism (11). The implicit nature of ageism makes it go unnoticed or ignored as a form of discrimination (9).

Knowledge has been found to be a critical determinant of ageist attitudes. Palmore claims that the first step in fighting against ageism should be raising people’s awareness and increasing knowledge about old age. According to Palmore, one challenge facing the fight with ageism is lack of sufficient knowledge on being old. He claimed that the more young people become knowledgeable about older adults, the less ageist attitudes they will adopt. In line with Palmore’s studies, greater knowledge of aging was found to be associated with improved attitudes toward older adults (12). Usta, Demir, Yönder, and Yıldız also found that Turkish nursing students who had completed a course on older adults’ health had significantly lower ageism scores than their peers (13).

According to Allport’s intergroup contact theory, when different groups find the chance to come together and cross group boundaries with positive relationships, more mutual understandings develop (14). Allport’s contact theory also suggests that facilitating contact is not sufficient. Some optimal conditions should be set, such as coming together with equal status, working cooperatively for some common goal, and doing all these with institutional support (11).

Age segregation is known to increase aging stereotypes and prejudices. Many research studies suggested that negative attitudes toward older adults are adopted early in childhood. Children develop clear age categories very early and hold

negative stereotypes for age-related out-groups (11). Several studies have demonstrated that quantity of contact is associated with diminished prejudice (15). However, a significant number of findings suggested that quality of contact plays a more critical role in prejudice reduction than quantity of contact (16). In this regard, Schwartz and Simmons found that undergraduates who reported high quality contact had significantly more positive attitudes to the elderly than those with low quality of contact (17). Similarly, Tam, Hewstone, Harwood, Voci, and Kenworthy found that the greater the quality of younger adults’ contact with elderly people, the more positive explicit attitudes they held toward the elderly (18). In terms of contact between grandparents and grandchildren, researchers have found that the greater the quality of one’s relationship with a close grandparent, the more positive their attitude is toward elderly adults as a whole (19).

Empathy is a psychological construct that means grasping others’ perspectives and relating to their feelings and experiences (20). Empathic concern and perspective taking are two components of dispositional empathy. Perspective taking is the cognitive process for looking at the world through somebody else’s lenses and understanding the person more. Prior research has found that perspective taking works as a mediator in reducing several types of prejudice including racism, ethnic prejudice, and homophobia (19). Galinsky and Moskowitz found that taking the perspective of older adults results in reduced ageist stereotyping. Perspective taking was found to be a mediator in which younger people felt empathy toward the older adult, identifying with him/her and increasing their understanding (21). Konrath, O’Brien, and Hsing provided some empirical evidence that current cohorts of university students report lower empathy scores than university students from previous cohorts. These results were supported by findings that young adults of today (people born in the 1980s–1990s) report higher levels of narcissism

and individualism than the previous cohorts, thereby suggesting the necessity of targeting such groups' empathy levels (22).

To date, very little research has been conducted in Turkish-speaking populations regarding ageism, particularly with younger cohorts, who are most in need of ameliorating their negative attitudes toward the older generations. Therefore, the study aimed to shed light on a neglected area of research in our region by exploring the underlying possible predictors (knowledge, contact, and perspective taking) of ageist attitudes of Turkish-speaking university students. Those with more knowledge, contact, and perspective taking skills were hypothesized to show reduced ageist attitudes than their counterparts. In line with previous findings, perspective taking was expected to mediate the relationship between contact and ageist attitudes.

MATERIALS AND METHOD

A convenience sample of 266 (145 females and 121 males) undergraduate students participated in the study and were all students at Eastern Mediterranean University (EMU). Participants were randomly approached in classroom settings as well as on the campus. They were invited to participate in the study and complete the questionnaire. In the sample, 108 participants were from the field of psychology (40.6%), 86 were from the field of health sciences (32.3%), and 72 participants were from the field of engineering (27.1%). The age of the students in the whole sample ranged from 17 years to 36 years ($M = 22.08$, $SD = 2.60$). All the participants were born in Turkey.

This study was a cross-sectional survey. After providing consent, participants were given the package of questionnaires including the following scales:

Intergroup Contact Scale. Participants indicated the quantity of positive past contact they had with

older people (23). This was assessed with three items each, e.g., "in everyday life, how frequently do you have positive interactions with older adults?" (1 = never/not at all, 7 = very frequently/a lot). Additionally, participants ranked the quality of past contact on 7-point bipolar scales (15), such as "superficial-deep" "unpleasant-pleasant." Both scales were reliable (for quantity of contact, Cronbach's $\alpha = .92$; for quality = .71). To obtain a single index of frequent and positive contact, the scores of quantity and quality of contact were multiplied. This procedure is common (16), because it simultaneously considers both aspects of contact.

Interpersonal Reactivity Index. Interpersonal reactivity index (IRI) was used to assess participants' different dimensions of empathic dispositions. IRI is a 28-item scale divided into four subscales, namely, Empathic Concern, Perspective Taking, Fantasy, and Personal Distress (20). To correctly assess perspective taking of the elderly, the Perspective Taking (PT) subscale alone was used. The subscale had items like "I try to look at everybody's side of a disagreement before I make a decision." Participants rated their thoughts and feelings on seven items ranked on a 5-point Likert scale ranging from does not describe me well (1) to describes me well (5). Cronbach's α was .66.

Facts on Aging Quiz. Palmore's original Facts on Aging Quiz 1 (FAQ 1) is a 25-item True or False quiz. The statements aim to measure knowledge on physical, mental, and social effects of aging and common myths about aging (9). A sample item was "The majority of old people – age 65-plus – are senile." Two psychologists both fluent in Turkish and English translated and back translated the FAQ 1. In the process of translation of FAQ 1 into Turkish, seven statements such as "health and socioeconomic status of older people (compared to younger people) in the year 2025 will probably be about the same or worse" were found to be irrelevant to the Turkish context, so they were not



included. High scores indicate high knowledge on aging.

Fraboni Scale of Ageism. To assess ageist attitude, the Fraboni Scale of Ageism (FSA) originally developed by Fraboni, Saltstone, and Hughes was utilized (24). The reliability, validity, and psychometric properties of the Turkish version of the FSA were assessed by Kutlu and colleagues in 2012 (25). The Turkish adaptation, which has 25 items such as “Many old people are stingy and hoard their money and possessions,” is rated on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). High scores suggest ageist attitudes. Cronbach’s α in the current study was .83.

Lastly, a demographic form was used to collect data about the participants’ demographic information. Participants were thanked and debriefed.

This study was approved by Ethics and Research Committee of EMU with the meeting date of 16 April 2015, decision number: 15/4-29.

RESULTS

To assess the relationship between the study variables, Pearson’s product correlation analysis was conducted. As shown in Table 1, a number of significant correlations were obtained. As expected, a negative correlation was found between ageism and contact, knowledge, and PT.

Hierarchical regression was conducted to assess the roles of age, gender, quantity \times quality of contact, PT, and knowledge of aging to predict the dependent variable, namely, ageist attitudes. Examination of the data revealed no significant multicollinearity among variables as no values approached or exceeded the limits in any of the regression models (highest VIF = 1.14; lowest tolerance levels = .88). In the first step, the demographic variables age and gender were included. The total variance in the dependent

Table 1. Pearson’s correlations between age, intergroup contact, perspective-taking, knowledge and ageism scores.

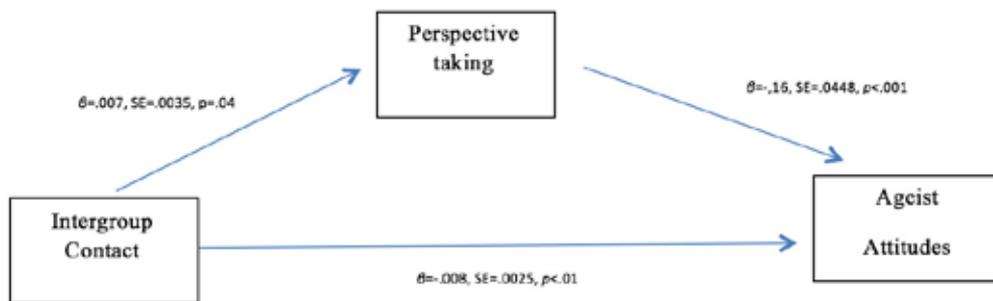
	1	2	3	4	5
1. Age	-				
2. Contact (quantity \times quality)	-.03	-			
3. Perspective Taking	-.12*	-.10	-		
4. Knowledge	.04	-.01	-.10	-	
5. Ageism	-.11	-.21**	-.19**	-.16*	-

Note: * $p < .05$; ** $p < .01$

variable explained by the first step was 1.8%, but the model was not significant ($F(2, 261) = 2.37, p = .096$). After including the remaining variables in the second step, total variance explained by the model was 10.1% ($F(5, 261) = 5.77, p < .001$). After controlling for age and gender, R square change = .08, F change ($3, 256$) = 7.91, $p < .001$. In the final model, quantity \times quality of contact ($\beta = -.20, p = .002$), PT ($\beta = -.15, p = .016$), and knowledge of aging ($\beta = -.14, p = .02$) predicted ageist attitudes.

On the basis of the results of regression analysis, path analysis was conducted whereby two variables, PT and knowledge regarding the elderly, were thought to mediate the relationship between contact (quantity \times quality) and ageist attitudes. Bootstrapping analysis was conducted to test for the two mediators using SPSS Process Macro (Model 6) developed by Hayes (2013). The pathway between contact and PT was significant ($B = .007, p = .04$), as was the link between PT and ageist attitudes ($B = -.16, p < .001$). The indirect effect of contact and ageist attitudes was mediated by PT ($B = -.0012, SE_{boot} = .0007, 95\% CI [-.0031, -.0001]$). However, the indirect effect of contact on ageist attitudes via knowledge was not significant ($B = .0002, SE_{boot} = .0004, 95\% CI [-.0005, .0012]$; see Figure 1).

Figure 1. Mediation model of the role of perspective taking in the contact-ageism relationship



DISCUSSION

Unlike sexism and racism, ageism has always been a less explored area of research. Despite a growing body of research accumulating in the West with regard to ageism, ageism is not the same in non-Western cultures. Therefore, the purpose of this study was to explore the possible predictors of ageism, namely, contact, knowledge, and PT, in a group of Turkish students.

The results revealed that high scores of knowledge on aging, frequent and good quality contact with older adults, and high PT would predict low ageism scores than their counterparts. The strongest unique contribution predicting low ageism scores was contact. This result was consistent with previous findings (17, 18, 19) where high quality contact was found to result in positive intergroup attitudes in both general contact with elderly people and in the context of grandparent-grandchild relationships.

In the current study, the findings on the cognitive component of empathy (i.e., PT) yielded results parallel to Galinsky and Moskowitz's such that it predicted low levels of ageist attitudes (21).

The literature on empathic concern and PT relates them to prosocial behavior, volunteerism, and other-oriented sensitivity (22), which might help explain the link to positive ageist attitudes. Path analysis showed a mediation effect of PT between quality of contact and ageist attitudes in line with the work by Harwood and colleagues, who also found that high levels of PT mediate the effect of contact on negative attitudes toward the elderly (19).

Palmore's claims about the increasing factual knowledge on aging reducing ageism were supported in the current study (9). In the regression model, the variable "knowledge on aging" significantly predicted low ageism scores as hypothesized. In today's youth-oriented cultures, myths about old age contribute to ageist discourse and ageism (9, 12, 25). Ignorance on aging inevitably strengthens such myths.

Several implications can be drawn from this research. One such implication is the assessment of the level of knowledge on aging in students, especially those in service professions such as nursing, social work, and psychology. This work can be used as guidance for improving their curricula,



and departments can be encouraged to include gerontology-related courses to their training such as “the psychology of aging.” Such courses will increase knowledge and PT. For example, service learning can be incorporated into the curriculum, whereby students get the opportunity to provide meaningful service to the elderly community and then bring these experiences to the classroom in group discussions or diary sharing. Such educational and intergenerational programs often involve planned meetings and interactions between younger and older generations which help to increase knowledge about the aging process as well as help to dispel any negative stereotypes or myths held toward the elderly (26). Additionally, workshops focused on aging can be organized in which the process of aging can be explored, knowledge enhanced simply by using the PAQ to increase correct knowledge and challenge incorrect preconceptions (2). Replacing students’ myths regarding older populations and the aging process will clearly lead to a reduction in ageist attitudes, laying an important foundation for future careers in related fields.

Additionally, contact was found to be one of the foremost important panaceas to ageist attitudes; therefore, more intergenerational contact and integration is necessary between different age groups. To enable social integration of adults, some efforts have been made to create age-friendly environments. On the basis of these ideas, WHO has developed the project of age-friendly cities where older adults are actively engaged and socially integrated within their communities to bring generations together (2). A number of intergenerational recreation programs, volunteer programs, educational programs, and daycare programs have been implemented, but they are

often with mixed results without long-lasting effects (11). To be successful, such interventions hoping to utilize the power of intergroup contact need to be based on empirical findings such as those obtained in this research. Practitioners developing such interventions should ensure that the program has the potential to develop high quality contact in the form of close interpersonal relationships, which particularly encourage participants to consider others’ perspectives and empathize with one another. To enable the disclosure of information and enhance the knowledge base of each age group, incorrect information should be dispelled and missing information should be supplied so that the contact is a positive and successful one. Such endeavors are possible in internship programs as part of the curricula for students training in gerontology-related fields.

In terms of the limitations, the data obtained from this research are cross-sectional in nature, so they do not allow for causation to be drawn and alternative models are also plausible. Future studies should aim at replicating the findings by using longitudinal or experimental designs. Additionally, we targeted Turkish-speaking young adults at university because of previous speculations that younger cohorts of university students have lower empathy levels than their predecessors (22). However, future research should also examine ageism in both younger and older populations to examine whether different mechanisms might be at play in various age groups.

In conclusion, further research on aging in non-Western cultures needs to be undertaken to guide policymakers, researchers, and educators on the path to more positive attitudes toward older populations.

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RESEARCH

A BIBLIOMETRIC ANALYSIS OF THE MOST CITED ARTICLES IN GERIATRIC ANESTHESIA

ABSTRACT

Introduction: The objective of this study is to evaluate the 100 most cited publications in the literature related to geriatric anesthesia in terms of bibliometric properties.

Material and Methods: After obtaining the approval of the ethical committee for this descriptive cross-sectional study, the first 100 most cited relevant publications were determined using appropriate keywords in the “advanced mode” feature of the “Institute for Scientific Information Web of Science” search engine. The data were then entered into SPSS 20.0 software program. The Kruskal Wallis test and Mann Whitney U test were used for the comparison of the groups.

Findings: The literature analysis conducted in this study revealed a total of 24,340 publications in the field of geriatric anesthesia over the 1975 through 2020 period.

58% of the 100 most cited articles were published between 2000 and 2009, with a total citation average rate of 195.23 ± 126.26 and an annual citation average rate of 10.53 ± 6.66 . 33% of these studies were pain- related while 28% were related to cognitive functions.

77% of journals originated from the United States and 23% from the United Kingdom.

There was a significant relationship between the publication year of the article and the total number of citations per year ($p < 0.001$).

Conclusion: The present article is the first study in the literature to evaluate the top 100 most cited studies related to geriatric anesthesia. Owing to their unique physiology that must be considered, geriatric anesthesia is also rapidly gaining ground on the path once covered by pediatric anesthesia.

Keywords: Geriatrics; Bibliometrics; Anesthesia



INTRODUCTION

It is possible to encounter medical publications in different national and international clinical and surgical branches conducted to determine the most cited articles (1-4). When a scientific article cites another scientific article as a reference, it is defined as citing that article. The large number of scientific article citations shows the strength of the impact of a particular article. More cited scientific articles and higher-impact journals are considered higher-quality publications (2).

The first bibliographic study was published in 1987 in "The Journal of the American Medical Association (JAMA)" by Garfield under the title "The 100 Most Cited Articles Published in JAMA" (3). Since that time, a great deal of articles has been examined and presented as "the most cited articles" not only in general journals but also in specific journals (4, 5). While Ahmad et al. (6) identified the top 100 most cited articles in the field of bariatric surgery between 1945 and 2014, Amina et al (7) investigated the top 50 most cited articles in bariatric and endocrine surgery from 1950 to 2000. However, the number of bibliometric studies on anesthesia is quite limited. In their study, Correl et al. (8) investigated the change in academic areas of interest related to inhalation anesthetics, whereas Vlassakov et al. (9) studied local anesthetic agents. These studies shed light on clinicians and researchers to show the tendency to publish anesthesiology. The number of bibliometric studies on anesthesia is very limited. In their study, Correl et al. (8) investigated the change in academic interest in inhalation anesthetics, Vlassakov et al. (9) and local anesthetic agents. These studies shed light on clinicians and researchers to show the tendency to publish anesthesiology. On the other hand, the number of bibliometric studies on anesthesia is quite limited. In their study, Correl et al. (8) investigated the change in academic interest in inhalation anesthetics, Vlassakov et al. (9) and local anesthetic agents. These studies pave the way to show clinicians and researchers

the tendency to publish articles on anesthesia.

Age could cause imbalances in human' body in an unexpected way which is a physiological process that induces changes in the functions and structure of organs, tissues and progresses with atrophy (10). In the United States (USA), 48% of all hospital care days are dedicated to geriatric cases. At least one of every four surgical cases is at age 65 years or older (11).

The number of geriatric patients will increase in the next two decades. Therefore, it is essential for every anesthetist to know geriatric anesthesia well, to follow the future of developments and studies. The most significance three parts for geriatric surgery are appropriate anesthesia techniques, preoperative examination of the patient cautiously, optimum personalized surgical method (12). Bibliometric studies may be a guiding light in geriatric anesthesia as in other areas where they are applicable. It is possible to access the database as well as valuable information such as academic personal citation statistics and mean citation indexes by using the Web of Science search engine (1, 13, 14). The objective of this study is to examine the most frequently cited internationally published articles on geriatric anesthesia scanned through the Institute for Scientific Information (ISI) Web of Science (WOS) search engine with respect to authors, countries and institutions, and to analyze which journals these articles were published through a bibliometric analysis.

MATERIAL AND METHOD

The study, planned as a descriptive cross-sectional study, was conducted using the "advanced mode" feature of the ISI and WOS search engine after obtaining the approval of the ethics committee (Decision no: 5316-GOA 2020/05-19). The appropriate search keys were used. (These key words are in adnex 1) The scan was conducted on with the inclusion all articles published from 1975 to January 2020. The 100 most cited publications

among internationally published articles on geriatric anesthesia were determined and listed. The contents of the articles were reviewed one by one by the first author. Topics related to geriatric anesthesia, specialties of the authors as well as journals in which they were published were recorded. The total number of citations for each publication, the number of citations per year, authors, information related to the study and the journal were all determined using WOS. Articles with sections such as letter to the editor, case study and poster presentation were excluded from the study.

Statistical Analysis

Statistical analyses of the data obtained in the research were entered into the SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) 20.0 program and the entered data were then analyzed. The Kruskal Wallis test and Mann Whitney U test were used for the comparison of the groups. The statistical method used to investigate the significance of the difference between groups is shown in Table 1. A p value below 0.05 was regarded as a significant difference.

RESULTS

It was found that there were 24,340 publications in the WOS search engine over the 1975 through January 2020 period. While the most cited study had 693 citations, the lowest number of citations among the top 100 most cited studies was 95. The distribution of the 100 most cited articles in the field of geriatric anesthesia according to the number of articles cited by the first authors is shown in adnex 2. The average number of citations of the 100 most cited studies was established as 195.23 ± 126.26 . The annual citation rates of the studies ranged from 31.50 to 2.84, and the mean was found to be 10.53 ± 6.66 .

The most cited study is "Influence of age and gender on the pharmacokinetics and

pharmacodynamics of remifentanil .1. Model development" published by Minto, CF et al. in 1997 in the journal of "ANESTHESIOLOGY".

An examination of the top 100 most cited studies in the field of geriatric anesthesia revealed that the first three areas were pain (33%), cognitive functions (28%) and out-come (16%), respectively. The first three journals with the most top-100 publications were "ANESTHESIOLOGY" (21%), "PAIN" (20%), "BRITISH JOURNAL OF ANAESTHESIA" (12%), respectively.

84% of the 100 most cited articles in the field of geriatric anesthesia were in SCI (Science Citation Index) and 16% in journals indexed in SCI-E (Science Citation Index Expanded). The distribution of the articles in terms of Q indexes was Q1 65%, Q2 28%, Q3 6%, Q4 1% respectively.

The authors' country of origin was 50% United States, 38% European countries, 5% Canada and 7% other countries. 77% of journals originated from the United States and 23% from the United Kingdom. The respective top 100 most cited articles in geriatric anesthesia are shown in adnex 2.

58% of the 100 most cited articles in the field of geriatric anesthesia were published between 2000 and 2009 (Graphic 1).

There was a significant relationship between the publication year of the article and the number of citations per year ($p < 0.001$). The author's country of origin, the country of the journal and the index of the journal were found to have no significant relation with the total and annual citations rates ($p > 0.05$). The distribution of the articles according to their characteristics is presented in Table 1.

The specialties of the first authors of the articles were 45% anesthesia, 11% geriatrics, 10% psychiatry, 10% algology, 3% internal medicine, and 22% other branches, respectively. Of the 100 most cited studies in geriatric anesthesia, 43% were randomized controlled trials, 21%

**Table 1.** The Characteristics of the 100 Most Cited Articles about Geriatric Anaesthesia in the Literature.

	Subgroups	N	Overall Citation Number mean \pm SD	Annual Citation Number mean \pm SD	p Value (Overall Citation Number)	p value (Annular Citation Number)
Year¹	<1990	12	168,33 \pm 81,04	4,75 \pm 2,22	0,326	<0,001
	1991-1994	6	279,66 \pm 150,88	9,87 \pm 5,39		
	1995-1999	16	268,81 \pm 210,57	11,51 \pm 9,17		
	2000-2004	32	158,25 \pm 94,94	9,40 \pm 5,05		
	2005-2009	26	175,11 \pm 103,54	11,80 \pm 6,43		
	2010-2014	8	157,12 \pm 38,86	18,13 \pm 4,62		
Journal Index²	SCI	84	190,17 \pm 126,32	11,00 \pm 5,63	0,608	0,541
	SCIE	16	221,75 \pm 126,61	10,44 \pm 6,87		
Journal Q¹	Q1	65	200,04 \pm 139,53	10,65 \pm 7,04	0,772	0,948
	Q2	28	186,85 \pm 104,54	10,70 \pm 6,27		
	Q3	6	174,50 \pm 76,27	8,70 \pm 5,25		
	Q4	1	241,00	8,61		
Journal Type¹	Anesthesia	55	197,03 \pm 137,67	10,80 \pm 7,49	0,557	0,222
	Pain	33	208,39 \pm 125,18	11,19 \pm 6,10		
	Geriatrics	12	150,75 \pm 46,40	7,47 \pm 1,95		
EU or non-EU²	Europa	38	214,23 \pm 131,91	11,06 \pm 6,92	0,241	0,535
	Non-Europa	62	183,58 \pm 122,29	10,20 \pm 6,53		
Authours' Nationalities¹	USA	50	180,40 \pm 118,63	9,98 \pm 6,23	0,183	0,885
	Canada	5	170,20 \pm 96,45	8,31 \pm 3,45		
	Europa	38	214,23 \pm 131,91	11,06 \pm 6,92		
	Other	7	215,85 \pm 171,67	9,77 \pm 10,53		

1. Kruskal-wallis test.

2. Mann withney-U test.

were prospective, 10% were compiled, 7% were retrospective, 6% were analytical cross-sectional studies, and the remaining 5% were meta-analyses.

While anesthesiologists and algologists mostly publish their articles in journals related to their own fields, psychiatrists predominantly publish articles in journals related to pain. Geriatric specialists were found to be publishing articles also in journals related to various other areas of medicine led by pain. When research subjects in the field of geriatric anesthesia are examined, it can be seen that pharmacology was studied at a greater scale in the 1990s, and then subject selection inclined

towards pain between 2000 and 2009 (Graphic 2).

As hip fractures are the most common cases of geriatric anesthesia in the operating room, an examination of the articles in terms of hip fracture revealed that the studies examining hip fracture patients in these articles was found to be 14%. Articles that did not examine hip fracture cases focused on pain (32%), cognitive functions (23%) and outcome (10%), respectively (Table 2).

Discussion

Our study, which examines the citation rates of international articles on geriatric anesthesia, is the first study in this context. In the present study, we

Table 2. Topic Distribution of the Subjects Related to Hip Fracture Patients in the First 100 Most Cited Articles in Geriatric Anesthesia

Hip Fracture	Articles Subjects			
	Pain No. (%) [*]	Cognitive No. (%) [*]	Outcome No. (%) [*]	Other No. (%) [*]
Hip fracture -	32 (37,2)	23 (26,7)	10 (11,6)	21 (14,3)
Hip fracture +	1(7,1)	5 (35,7)	6 (42,9)	2 (14,3)
Total	33 (33,0)	28 (28,0)	16 (16,0)	23 (23,0)

* percentage of row

examined the most cited internationally sourced articles on geriatric anesthesia using the ISI and WOS search engines, reviewed these articles by authors, countries of origin and institutions, and evaluated journals in which they were published.

It is a fact that some bibliometric studies have been conducted in various disciplines on a worldwide and national basis, but there are very few bibliometric studies in the international literature in the field of anesthesiology (13).

The present study showed that the first three journals with the most frequently cited publications in the field of geriatric anesthesia were "ANESTHESIOLOGY" (21%), "PAIN" (20%), "BRITISH JOURNAL OF ANAESTHESIA" (12%) respectively, whereas 77% of journals originated from the United States and 23% from the United Kingdom. Also, 50% of the authors of the articles are of US origin.

Bould et al. (15) reviewed articles on anesthesia, intensive care and pain that were published in SCI journals between 1997 and 1998. They reported that the United States published more original articles than any other country and articles from high-income countries were likely to be more frequently published than middle-income

countries, notably Turkey, China and India. The journal in which Bould et al. made this publication is "Anesthesia", a UK-based journal. Britain is the second country in the world, after the USA, to dominate the geriatric anesthesia literature. In a bibliometric analysis conducted by Yilmaz et al (16), the authors evaluated the scientific performance of publications in the field of general anesthesia in Turkey as well as on a global basis. According to the results of that study, the total number of publications in Turkish-based anesthesia journals displayed a significant decline between 2004 and 2009. However, they observed that the publication rate increased again after 2009. The study established that the first five countries with most publications in the field of anesthesiology included developed countries like the USA, the UK, Germany, France and Canada, whereas Turkey ranked 14th in the world.

The most remarkable feature of the most cited article in our study, conducted by Minto et al. and published in 1997, is that it highlights accurate dose management of short-acting opioids in geriatric anesthesia, such as widely-used remifentanyl (17). Although published in 2014, the most recent publication in our list, which could quickly enter the list of top 100 articles with an annual rate of 22.5 citations, belongs to Griffiths R. et al. In that publication, which highlighted the significance of geriatric anesthesia, it was reported that the elderly were at relatively higher risk compared with young surgical patients in terms of mortality and morbidity following elective and (especially) emergency surgery, which is a proof of the demand for such publications in this field. (18).

Journals that basically address scientific issues publish studies evaluating citation indexes and publication quality on a variety of topics. The high number of citations scientific articles receive does not necessarily reflect the relevant strength of that article on a particular topic. The most commonly used indicators in the evaluation of scientific



Figure 1. The Distribution of the Most Cited Articles by Year

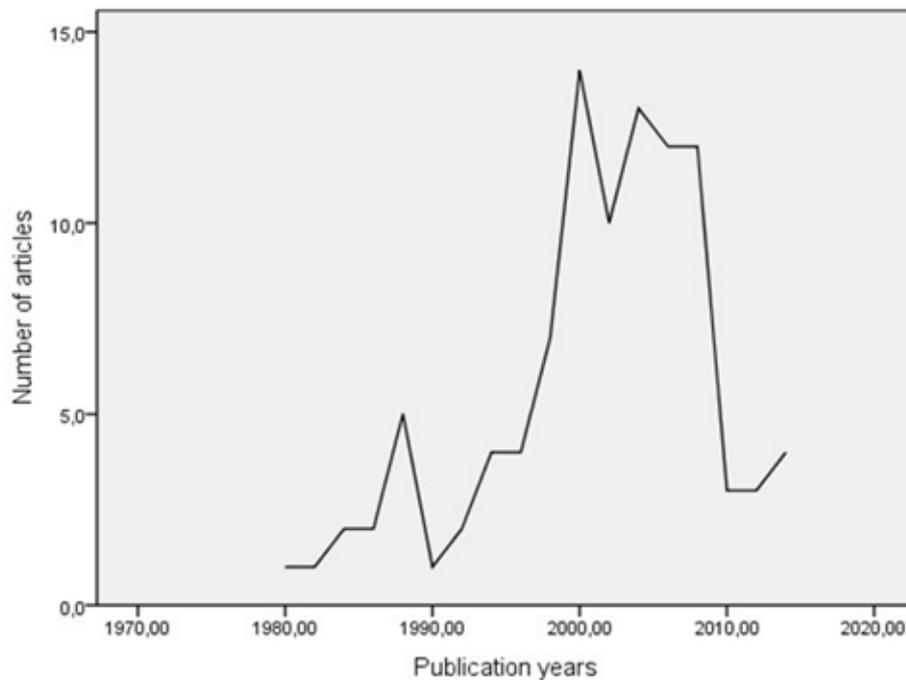
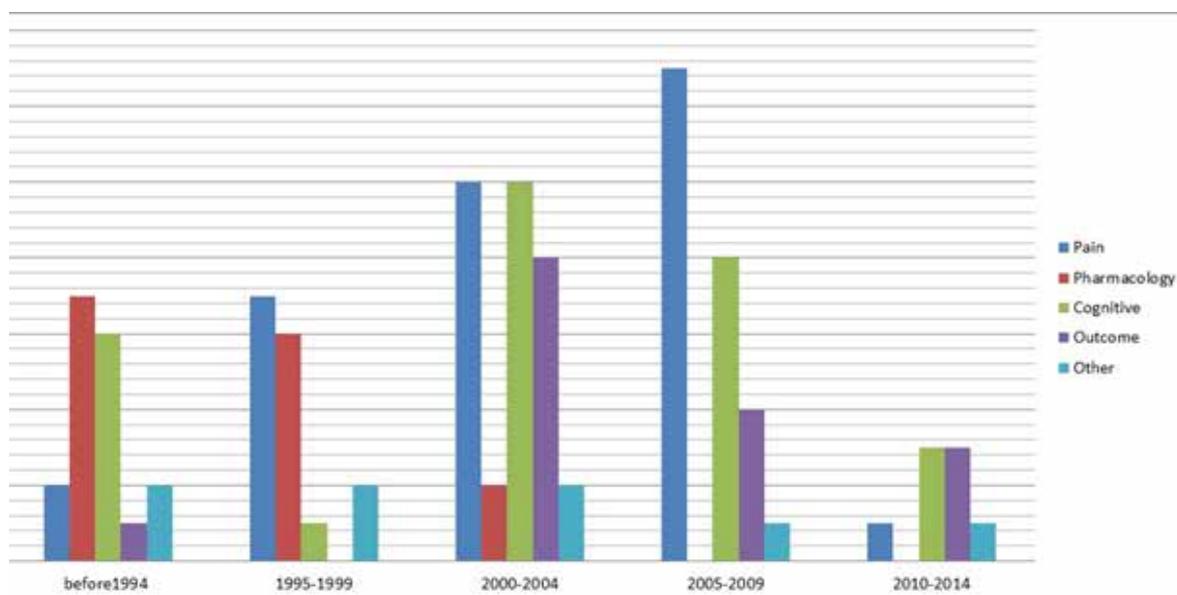


Figure 2. The Distribution of Subject Areas of the Top 100 Articles Cited in Geriatric Anesthesia by Year



journals include the number of citations and the average by years. Although more frequently cited scientific articles and journals are accepted more scientifically efficient, there is also a limit to these indicators. In a study they carried out in 2017-2018, Mchugh et al. (19) analysed 12,544 citations on the WOS citation index published by 12 anesthetic journals in 2016 and found the median number of citations made per item as 3.3 (2.6-4.1). Their analysis may provide information to authors and editors on issues such as where to submit work, what editorial policy to pursue and what journal strategy to follow, respectively.

In a study they carried out in 2013, Yoon et al. (20) identified the top-cited articles in the field of radiology between 1945 and 2012. These articles were then classified among themselves as neuroradiology, interventional radiology, breast imaging and ablation of hepatic tumors. In our study, an examination of the 100 top-cited studies in the field of geriatric anesthesia revealed that the first three areas were pain (33%), cognitive functions (28%) and out-come (16%), respectively.

In a study conducted in the field of anesthesiology and intensive care in Scandinavian countries as well as the UK (21), the number of publications in annual journals between 1981 and 2000 was examined during the 20-year period in Sweden, Norway, Finland and Denmark. For comparison, data from the UK were also analyzed. It was reported that there was a significant increase in Finland and Norway compared to other countries during this period, and the percentage of cited papers in these countries also increased in the last 20 years. In our study, it was found that the period during which the most cited studies in the field of geriatric anesthesia was conducted was the years from 2000 to 2009 (58%). However, it was observed that this rate declined by 8% over the period 2010-2014. Nevertheless, in order to be among the top 100 in the number of citations, it is necessary to surpass the citation rate of studies that

receive citations in previous years, so we believe that the publications should not be considered to be declining after 2009. The study conducted by Cheng et al (13) can help us better understand the contribution of anesthesiology research activities to the world over the past 20 years. The authors examined a total of 64,199 articles published from 1995 to 2014, with 1,084,491 cited times. The total number of articles published by journals showed a slight increase in the second decade. Over 45% of these articles were published by the top five journals that have maintained their ranking over 20 years. It was found that most publications originated from North America and European countries, of which the United States had the highest number of publications and citations. Most of the institutions are academic universities and hospitals. More than half of the top 25 institutions (in rankings) are located in the United States, and Harvard University accounted the highest number of articles and citations among all institutions.

Like pediatric cases, geriatric anesthesia, too, has sensitive aspects that make them unique and require more evaluation and attention. The geriatric age group also has a unique physiology that must be considered. Even with these accompanying comorbidities, traumas experienced and adaptation mechanisms, this physiology may display a wider spectrum than pediatric anesthesia. Results for pediatric patients undergoing anesthesia have improved over the years thanks to improvements in monitoring and equipment, safer and more easily titratable anesthetic agents, and possibly the practice of sub-specialization (22). Geriatric anesthesia has been progressing over the years on the way to be practiced by anesthesiologists specially educated for the care of the elderly, just like pediatric anesthesiologists.

When research subjects in the field of geriatric anesthesia are examined, it can be seen that pharmacology was studied at a greater scale in



the 1990s, and then the subject selection inclined towards pain between 2000 and 2009. While anesthesiologists and algologists mostly publish their articles in journals related to their own fields, psychiatrists predominantly publish articles in pain-related journals. It was found that geriatric specialists were publishing articles also in journals related to various other areas of medicine led by pain.

The most important limitation of our study is the fact that the search keys are determined by the WOS search engine itself. Consequently, some related studies cannot be included in the list

obtained at the end of the search. However, this rate is very low and is not only true for this study. In fact, all studies addressing this subject have the same limitations.

As a result, bibliographic writings created by using scientific search engines have a guiding role in determining where to focus in scientific research. It is recommended that such studies are updated and rewritten at certain time intervals in order to perform a substantial data analysis.

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COVID-19 Pandemic and The Mental Health of Elderly

Özlem Erden AKI

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