



Turkish Journal of
GERIATRICS

Volume: 21 • Number:3 • Year: 2018



The Official Scientific Journal of Turkish Geriatrics Society

e-ISSN: 1307-9948

www.turkgeriatri.org



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Published four times (March, June, September, December) a year

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Turkish Geriatrics Society

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Turkish Journal of GERIATRICS

Volume: 21 • Number: 3 • Year: 2018

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TURKISH JOURNAL OF GERIATRICS

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344036
2018;21(3):285-293

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Received: 10/06/2018
Accepted: 25/07/2018

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RESEARCH

ASSESSMENT OF P WAVE/QT INTERVAL DISPERSION, TP-E INTERVAL, TP-E/QT RATIO AFTER TRANSCATHETER AORTIC VALVE IMPLANTATION IN GERIATRIC PATIENTS WITH AORTIC STENOSIS

ABSTRACT

Introduction: One of the most important reasons for a high mortality and morbidity rate in geriatric patients with calcific aortic stenosis is arrhythmias. Transcatheter aortic valve implantation is an alternative to conventional aortic valve surgery for high-risk patients because of its less-invasive nature. Although hemodynamic and functional recoveries are established after transcatheter aortic valve implantation, whether it leads to a decrease in the risk of atrial fibrillation, ventricular arrhythmia and sudden cardiac death remains unclear. Thus, this study aimed to evaluate the risks associated with aortic stenosis by assessing the rates of P wave dispersion for estimating the atrial fibrillation risk and QT interval dispersion, Tp-e interval, and Tp-e/QT ratio for ventricular arrhythmia and assessing sudden cardiac death risk before and after implantation.

Materials and Method: In a retrospective study, a total of 39 subjects [14 males (35.89%) and 25 females (64.11%); mean age=81.51±8.79 years] were enrolled. P wave/QT interval dispersion, Tp-e interval and Tp-e/QT ratio values before and 3rd months after implantation were calculated and compared.

Results: There was a statistically significant decline in P wave/QT interval dispersion, Tp-e interval, Tp-e/QT ratio values between preoperative, and 3rd, months (43.72±7.78 vs. 35.15±8.92, 61.64±17.36 vs. 49.41±12.64, 84.59±7.64 vs. 73.21±6.46, 0.21±0.01 vs. 0.18±0.01, respectively, p<0.001 for all comparisons).

Conclusion: P wave/QT interval dispersion, Tp-e interval and Tp-e/QT ratio were shown to be attenuated after transcatheter aortic valve implantation. These results indirectly offer that there may be a reduction in risk of atrial fibrillation, ventricular arrhythmias and sudden cardiac death.

Keywords: Aortic Valve Stenosis; Atrial fibrillation; Death, Sudden, Cardiac; Transcatheter Aortic Valve Replacement

ARAŞTIRMA

AORT DARLIĞI OLAN GERİATRİK HASTALARDA TRANSKATETER AORT KAPAK İMPLANTASYONU SONRASI P DALGA/QT İNTERVAL DİSPERSİYONU, TP-E İNTERVAL VE TP-E/QT ORANININ DEĞERLENDİRİLMESİ

Öz

Giriş: Kalsifik aort darlığı olan geriatric hastalarda mortalite ve morbiditenin önemli bir sebebi de aritmilerdir. Transkateter aort kapak implantasyonu daha az invaziv olması sebebi ile yüksek riskli hastalarda konvansiyonel cerrahiye alternatiftir. Transkateter aort kapak implantasyonu sonrası fonksiyonel ve hemodinamik düzelme olduğu iyi bilinmektedir, ancak implantasyon sonrası atriyal fibrilasyon, ventriküler aritmi ve ani kardiyak ölüm riskinde azalma olup olmadığı net değildir. Bu çalışmanın amacı bu riskleri değerlendirmektir. Bu amaçla atriyal fibrilasyon riskini tahmin etmek için P dalga dispersiyonu, ventriküler aritmi ve ani kardiyak ölüm riskini tahmin etmek için ise QT interval dispersiyonu, Tp-e interval ve Tp-e/QT oranı ölçülerek transkateter aort kapak implantasyonu öncesi ve sonrası karşılaştırılmıştır.

Gereç ve Yöntem: Çalışma geriye dönük olarak yapıldı. Transkateter aort kapak implantasyonu yapılan toplam 39 hasta çalışmaya dahil edilmiştir [14 erkek (%35.89) ve 25 kadın (%64.11); ortalama yaş: 81.51±8.79 yıl]. P dalga dispersiyonu, QT interval dispersiyonu, Tp-e interval ve Tp-e/QT oranı transkateter aort kapak implantasyonu öncesi ve sonrası (3. ayda) hesaplanmış ve karşılaştırılmıştır.

Bulgular: Transkateter aort kapak implantasyonu öncesi ve 3 ay sonrasında bakılan P dalga dispersiyonu, QT interval dispersiyonu, Tp-e interval ve Tp-e/QT oranı değerlerinde istatistiksel olarak anlamlı azalma olmuştur (43.72±7.78 vs. 35.15±8.92, 61.64±17.36 vs. 49.41±12.64, 84.59±7.64 vs. 73.21±6.46, 0.21±0.01 vs. 0.18±0.01, sırasıyla, p<0.001 tüm karşılaştırmalar için).

Sonuç: Transkateter aort kapak implantasyonu sonrası P dalga dispersiyonu, QT interval dispersiyonu, Tp-e interval ve Tp-e/QT oranı değerleri azalmaktadır. Bu sonuçlar bize dolaylı olarak atriyal fibrilasyon, ventriküler aritmiler ve ani kardiyak ölüm riskinde azalma olabileceğini düşündürülebilir.

Anahtar sözcükler: Aort kapak darlığı; Atriyal fibrilasyon; Ölüm, Ani, Kardiyak; Transkateter aort kapak replasmanı

INTRODUCTION

In the elderly population, calcific aortic stenosis is a major health-related problem. Mortality and morbidity rates are remarkably high after serious aortic stenosis becomes symptomatic (1). One of the most important reasons for a high mortality rate in patients with calcific aortic stenosis is malignant ventricular arrhythmias. Studies have revealed that sudden cardiac death risk is also high in patients with serious symptomatic aortic stenosis (2). Except for ventricular arrhythmias, the prevalence of atrial fibrillation (AF) that accounts for mortality and morbidity is elevated in elderly patients with symptomatic serious aortic stenosis (3-5).

In recent years, the use of transcatheter aortic valve implantation (TAVI) has gained considerable acceptance for patients considered inoperable because of a high surgical risk posed by their age and other comorbid conditions. Transcatheter aortic valve implantation is an alternative to conventional aortic valve surgery for high-risk patients because of its less-invasive nature. Moreover, patients receiving TAVI have been shown to exhibit evident recoveries in their hemodynamic status and functional capacities (6,7).

Several studies have reported that the attainment of P-wave dispersion (PWD), a difference between the widest and the narrowest in 12-lead electrocardiogram (ECG), demonstrates atrial remodeling and predicts AF (8). In addition, QT dispersion (QTd) is defined as the time between the longest and the shortest distances in 12-lead ECG. Apparently, QTd plays a role in estimating ventricular repolarization abnormalities and ventricular arrhythmias (9). Some other studies have reported the time between the points where T wave peaks and is deep in 12-lead ECG (Tp-e), thereby better predicting the ventricular repolarization abnormality (10). Furthermore, the ratio of Tp-e to QT (Tp-e/QT) exhibits repolarization abnormality (11).

Although hemodynamic and functional recoveries are established after TAVI, whether it leads to a decrease in the risk of ventricular arrhythmia and sudden cardiac death remains unclear. Thus, this study aimed to evaluate the risks associated with TAVI by assessing the rates of PWD for estimating the AF risk and QTd, Tp-e, and Tp-e/QT for ventricular arrhythmia and assessing sudden cardiac death risk before and after TAVI (in 3 months).

MATERIALS AND METHOD

This was a retrospective study in which the records of 50 patients who underwent TAVI between January 1, 2012, and November 30, 2017 were reviewed. Patients ineligible for surgical aortic valve replacement because of symptomatic serious aortic stenosis and high surgical risk were considered eligible for TAVI. Transcatheter aortic valve implantation was performed by a multidisciplinary cardiac team (cardiologist, cardiovascular surgeon, and anesthesiologist) on patients with EuroSCORE of $\geq 20\%$ or the Society of Thoracic Surgeon Score of $\geq 10\%$. Baseline demographic characteristics of all patients were recorded as echocardiographic characteristics.

The exclusion criteria in this study were as follows: patients with a history of permanent pacemaker implantation in the first 3 perioperative or postoperative months, the existence of persistent AF, exit depending on any cause within the first 3 perioperative or postoperative months, using any medication that affects the QT distance, and using an antiarrhythmic drug in the perioperative period. Based on these criteria, 2 patients with persistent AF, 2 with permanent pacemaker implantation in the perioperative period, and 7 who died either during the operation or in first 3 postoperative months were excluded. Thus, the remaining 39 patients were included. For all patients, their 3-month preoperative and postoperative ECGs, PWD, QTd, Tp-e, and Tp-e/QT ratios were reviewed and compared.



Next, echocardiographic data were evaluated on the basis of the American Society of Echocardiography (12) and European Association of Cardiovascular Imaging using standard two-dimensional (2D) and Doppler evaluation. Then, delta (Δ) values were obtained by deducting 3 months' values from baseline values for the left ventricular end diastolic diameter (LVEDD), left ventricular end-systolic diameter, left atrial diameter (LAD), interventricular septum (IVS), right atrial diameter, right ventricular diameter (RVD), PWD, QTd, Tp-e interval, and Tp-e/QT ratio. Furthermore, the ejection fraction (EF) was calculated using the modified Simpson method. In this study, LVEDD and LAD were measured in the parasternal long-axis imaging.

Transcatheter aortic valve implantation

All TAVI procedures were completed under general anesthesia in an operating room. In all patients, the transfemoral access was attained by puncturing the common femoral artery under fluoroscopic guidance. After the insertion of the delivery sheath, balloon aortic valvuloplasty was accomplished with rapid ventricular pacing for both balloon sizing and stenotic valve dilatation, after which an Edwards SAPIEN heart valve or Medtronic core valve was placed with rapid ventricular pacing following the valve positioning based on fluoroscopy. Then, anti-thrombotic therapy with aspirin (100 mg) and clopidogrel (75 mg) was prescribed for up to 1 month; aspirin was continued alone after the first-month control.

Electrocardiographic features

Standard ECG (25 mm/s and 10 mm/mV) was retrospectively reviewed. Electrocardiogram was performed when a patient was in the supine position, and electrodes were placed at standard sites (13). All ECG recordings were scanned and recorded as digital media. In addition, all images were amplified 400% using Adobe Photoshop software to minimize faults during measurements, which were executed by 2 cardiologists who were blinded to

the patient and control groups. For each parameter, measurements were created from 3 consecutive beats in every derivation, and the average of these measurements was recorded. Then, PWD was assessed by evaluating the difference between the duration of the widest and the narrowest P waves in the ECG. The QT interval was assessed as the interval between the start of the Q wave and the end of the T wave. Next, QT corrected (CQT) on the authority of the heart rate was evaluated using the Bazett's formula: $CQT = QT / \sqrt{R-R \text{ interval}}$. The Tp-e interval was measured in precordial leads by evaluating the interval between the point where the T wave makes a peak and the point where it ends. Finally, the Tp-e/CQT ratio was calculated from these parameters.

Statistical analysis

Variables are presented as mean \pm sd or median (range, interquartile range [IQR]) for continuous data and as proportion for categorical data. Continuous variables with normal distribution were analyzed with paired sample t test. Shapiro Wilk test was used to identify whether continuous variables were normally distributed. Two-sided p values <0.05 were considered significant. The degrees of association between continuous variables were evaluated by using Pearson or Spearman's correlation tests as appropriate. Independent determinants of PWD and QTD were determined by standard multiple linear regression analysis. A two-sided p<0.05 was accepted as significant. Statistical analysis was performed using commercially available computer program (SPSS version 21.0 for Windows; SPSS, Inc., Chicago, Illinois, US).

RESULTS

In this study, 39 patients [14 males (35.89%) and 25 females (64.11%); mean age: 81.51 \pm 8.79 years] were enrolled. Table 1 summarizes baseline demographic characteristics of the study cohort. A statistically significant difference was observed between TAVI and the mean aortic valve and maximum aortic valve

gradients compared at 3 months postoperatively ($p < 0.001$, for both comparisons). Likewise, EFs pre- and postoperatively exhibited statistically significant differences. Table 2 summarizes comparisons of echocardiographic parameters before and after TAVI in the study patients. All parameters exhibited a statistically significant decrease in the 3 months' values before and after TAVI procedure of PWD, CQTD, Tp-e, and Tp-e/CQT parameters ($p < 0.001$, for all comparisons). Table 3 presents pre- and postoperative values of these parameters and their comparison, with their changes shown in Fig. 1. Table 4 presents the results of correlation analysis between changes in echocardiographic

measurements and those in PWD, CQTD, Tp-e, and Tp-e/CQT measurements. The correlation analysis revealed a statistically significant correlation between Δ PWD and Δ LVEDD, Δ LVESD, Δ IVS, and Δ LAD ($r = 0.47$, $p = 0.003$; $r = 0.402$, $p = 0.011$; $r = 0.381$, $p = 0.017$; and $r = 0.543$, $p < 0.001$, respectively); between Δ CQTD and Δ LVEDD, Δ LVESD, and Δ IVS ($r = 0.648$, $p < 0.001$; $r = 0.655$, $p < 0.001$; and $r = 0.379$, $p = 0.017$, respectively); between Δ Tp-e and Δ LVEDD, Δ LVESD, and Δ IVS ($r = 0.419$, $p = 0.008$; $r = 0.375$, $p = 0.019$; and $r = 0.333$, $p = 0.038$, respectively); and between the Δ Tp-e/CQT ratio and Δ LVEDD, Δ LVESD, and Δ IVS ($r = 0.677$, $p < 0.001$; $r = 0.754$, $p < 0.001$; and $r = 0.4$, $p = 0.012$, respectively).

Table 1. Baseline clinical characteristics of the study population.

Characteristics	Patients (n=39)
Sex, female gender, n (%)	25 (64.11)
Age (years)	81.51±8.79
Body mass index (kg/m ²)	26.58±2.6
Hypertension, n (%)	36 (92.3)
Diabetes mellitus, n (%)	10 (25.64)
Hyperlipidemia, n (%)	13 (33.33)
Smoking, n (%)	5 (12.82)
Coronary artery disease, n (%)	27 (69.23)
COPD, n (%)	8 (20.51)
Chronic renal disease, n (%)	7 (17.94)
Blood urea nitrogen (mg/dL)	28.31±11.22
Creatinine (mg/dL)	1.19±0.8
Hemoglobin (gr/dL)	11.92±1.97
White blood cell (/mm ³)	7376±2476
Platelets (100/mm ³)	214 (164-260)
STS Score	13.6±1.94
EuroScore	27.4±3.71
AVA (cm ²)	0.59±0.19

AVA: Aortic valve area, COPD: Chronic Obstructive Pulmonary Disease, STS: Society of Thoracic Surgeons



Table 2. Comparison of echocardiographic parameters before and after TAVI.

Parameter	Before TAVI	3 rd month after TAVI	p
Mean gradient (mmHg)	52.9±12.01	10.59±4.17	<0.001
Maximum gradient (mmHg)	81.72±15.79	17.44±6.06	<0.001
Ejection fraction (%)	49.67±9.2	51.77±8.08	0.005
LVEDD (mm)	45.25±2.51	42.71±1.65	<0.001
LVESD (mm)	30.92±2.10	28.56±1.97	<0.001
IVS (mm)	13.92±0.87	11.97±1.54	<0.001
LAD (mm)	40.15±3.07	37.48±2.29	<0.001
RAD (mm)	35.3±3.72	34.2±3.31	<0.001
RVD (mm)	29.25±1.69	29.02±1.38	0.083

IVS: Interventricular septum, LAD: Left atrial diameter, LVEDD: Left ventricular end diastolic diameter, LVESD: Left ventricular end systolic diameter, RAD: Right atrial diameter, RVD: Right ventricular diameter, TAVI: Transcatheter aortic valve implantation

Table 3. Comparison of PWD, CQTd, Tp-e and Tp-e/CQT ratio values before and after TAVI.

Parameter	Before TAVI	3 rd month after TAVI	p
PWD (msn)	43.72±7.78	35.15±8.92	<0.001
CQTd (msn)	61.64±17.36	49.41±12.64	<0.001
Tp-e (msn)	84.59±7.64	73.21±6.46	<0.001
Tp-e/CQT ratio	0.21±0.01	0.18±0.01	<0.001

CQT: Corrected QT interval, CQTd: Corrected QT interval dispersion, PWD: P wave dispersion, TAVI: Transcatheter aortic valve implantation, Tp-e: T wave peak-end interval

Table 4. Correlation analysis of P wave/corrected QT interval dispersion, Tpe interval, Tp-e/CQT ratio and various clinical variables.

Variable	ΔPWD		ΔCQTd		ΔTp-e		ΔTp-e/CQT	
	r	p	r	p	r	p	r	p
ΔLVEDD	0.47	0.003	0.648	<0.001	0.419	0.008	0.677	<0.001
ΔLVESD	0.402	0.011	0.655	<0.001	0.375	0.019	0.754	<0.001
ΔIVS	0.381	0.017	0.379	0.017	0.333	0.038	0.4	0.012
ΔLAD	0.543	<0.001	0.165	0.315	0.059	0.72	0.215	0.188
ΔRAD	0.193	0.238	0.031	0.326	0.261	0.108	0.015	0.402
ΔRVD	0.016	0.921	0.118	0.474	0.231	0.156	0.117	0.48

CQT: Corrected QT interval, CQTd: Corrected QT interval dispersion, IVS: Interventricular septum, LAD: Left atrial diameter, LVEDD: Left ventricular end diastolic diameter, LVESD: Left ventricular end systolic diameter, PWD: P wave dispersion, RAD: Right atrial diameter, RVD: Right ventricular diameter, TAVI: Transcatheter aortic valve implantation, Tp-e: T wave peak-end interval.

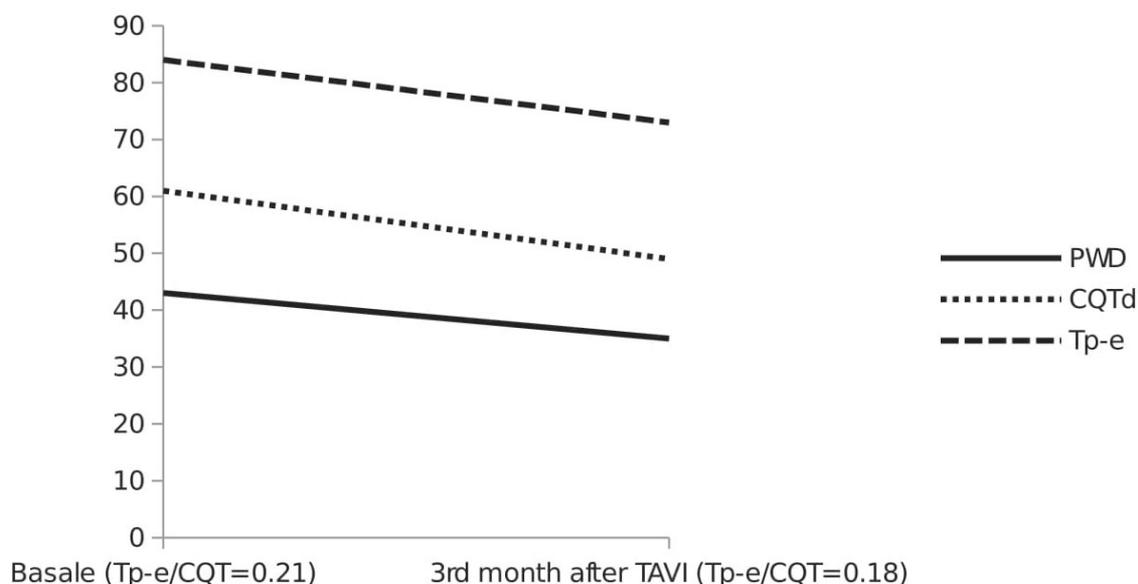


Figure 1. Change of PWD, QTd, Tp-e and Tp-e/CQT ratio values of subjects before and after TAVI.

DISCUSSION

To the best of our knowledge, this is the first study investigating PWD, CQTd, Tp-e, and Tp-e/CQT values before and after TAVI. Based on our findings, these values exhibited a statistically significant reduction after TAVI. In addition, the change in these values correlated with that in cardiac cavities. Thus, patients with calcific aortic stenosis and conventional surgery who could not be operated because of high risk, but underwent TAVI, suggested a decline in AF, ventricular arrhythmia, and sudden cardiac death postoperatively, and this decline could be attributed to a change in the cardiac cavity after TAVI.

Patients with aortic stenosis exhibit a high prevalence of AF. In addition, approximately one-third of patients with serious aortic stenosis have paroxysmal or persistent AF. Perhaps, the presence of common risk factors, such as age and hypertension, might explain the more frequent occurrence of AF in patients with aortic stenosis

(14). Besides common risk factors, another possible cause could be an increase in the left ventricular and left atrial wall pressures, resulting from aortic stenosis (15). A chronic afterload increment results in left atrial enlargement and a reduction in its functions; this enlargement during the chronic period results in fibrosis in the left atrial myocardium. Reportedly, increased left atrial fibrosis increases the risk of AF development (16). In addition, the result of the increased wall pressure in cardiac cavities after TAVI might exacerbate the risk of AF. A study has reported that advanced aortic stenosis correlated with left atrial dysfunction and that the left atrial compliance and contractility, which was assessed using speckle tracking echocardiography, significantly improved after TAVI (17). In addition, the recovered left atrium compliance and contractility might indirectly decrease in its left atrial fibrosis (17), possibly contributing to an increase in the functional and hemodynamic capacities with an increase in the left atrial contribution. Based on this study, a decrease in PWD correlates with a decrease in



LAD, which supports these explained mechanisms. These physiopathological mechanisms may result in a decreased risk of AF development after TAVI in patients with advanced-stage aortic stenosis.

Life-threatening serious ventricular arrhythmia in patients with advanced-stage aortic stenosis increases the incidence of sudden cardiac death (1). Reportedly, an increase in the chronic afterload is associated with a decrease in the left ventricular systolic function and left ventricular hypertrophy with high systolic ventricular overload (18). In addition, a decrease in the left ventricular EF resulting in high systolic overload in patients with serious aortic stenosis correlates with complex ventricular arrhythmias (19).

A study has reported an elongation in the recovered QT interval in patients with aortic stenosis with low EF (20). Kasapkara et al. have reported that QTd decreased in the first week after TAVI in 100 patients with serious aortic stenosis and that ventricular arrhythmia risk might be decreased in these patients. In addition, they inferred that the decrease could be a consequence of a reduction in left ventricular hypertrophy after TAVI (21). Notably, surgical conventional aortic valve replacement in patients with serious aortic stenosis reduces the risk of ventricular arrhythmia in the long-term follow-up. Some studies have attributed this decrease to a decrease in the diameter of muscle fibers, resulting in a reduction in the ventricular mass (2, 19). Moreover, a decline of approximately 43% in the left ventricular mass during the first 2 years after surgery occurs in patients with serious aortic stenosis undergoing surgical replacement (22). An increased left ventricular mass increases the oxygen need and is associated with myocardial ischemia (23). Reportedly, ischemia is decreased in patients with surgically recovered aortic stenosis (24). Ischemia developing in the hypertrophic left ventricular might increase the repolarization defect and ventricular arrhythmia and sudden cardiac death risk. Besides, an increase in interstitial fibrosis in hypertrophic myocardial tissue and increased fibrosis results

in electrical conduction abnormalities. This study suggests that ECG parameters that indicate the ventricular repolarization abnormality are associated with echocardiographic parameters that indirectly imply that the left ventricular size and mass are due to the mechanisms described above.

This study has some limitations. First, the number of patients examined was low, which necessitates further studies with more number of patients to validate our findings. Second, the follow-up time was relatively short, and the long-term effects of these findings remain unclear. Patients might develop silent arrhythmias, which clinicians and patients cannot feel, making it difficult to detect these arrhythmias.

In conclusion, this study establishes that the 3 months' control after TAVI, PWD, CQTd, TP-e, and TP-e/CQT ratios decreases, which are proportional to the decrease in the diameter of the cardiac cavity, measured using echocardiography. Accordingly, ventricular repolarization abnormalities, ventricular arrhythmias, and sudden death risks decrease in elderly patients with serious aortic stenosis after TAVI.

Conflict of interest

The authors declare that they have no conflicts of interest. The authors have indicated they have no financial relationships relevant to this article to disclose.

Ethical approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

ACKNOWLEDGMENTS

The authors would like to thank the cardiology fellows for their valuable contributions.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344040
2018;21(3):294-303

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Received: 03/06/2018
Accepted: 01/08/2018

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RESEARCH

SEX-RELATED DIFFERENCES ON MORTALITY IN PATIENTS AGED 80 YEARS OR OLDER WITH ACUTE MYOCARDIAL INFARCTION: THERE IS STILL A GAP

ABSTRACT

Introduction: Sex-related differences on cardiovascular mortality in patients with acute coronary syndrome have been debated for decades. Although the gap between the two sexes has begun to close, women still have higher all-cause mortality. However, there is little data with respect to elderly women, particularly for those over 80 years. Therefore, we sought to determine all-cause mortality of elderly women with acute myocardial infarction and to compare it to men.

Materials and Method: This retrospective study evaluated patients 80 years or older who were admitted to the cardiology clinic due to acute myocardial infarction between May 2015 and November 2017. The primary outcomes of the study were in-hospital, 30-day, and long-term all-cause mortality.

Results: Two hundred twenty patients (126 women and 94 men) were included in the final analysis. Median follow-up was eight months. Long-term all-cause mortality of women was significantly higher compared to men [n=52 (41.3%) vs. n=26 (27.7%), respectively; p=0.03]. There was no significant sex difference for both in-hospital and 30-day mortality, although women had more events. Kaplan-Meier analysis revealed lower cumulative survival for women (log-rank: p=0.02), and Cox regression analysis found that female sex was as an independent risk factor for mortality [hazard ratio=1.7 (95% confidence interval=1.06-2.72); p=0.02].

Conclusion: Sex-related differences on mortality continue to be a critical issue, even for elderly patients with acute myocardial infarction. Since women have significantly higher long-term all-cause mortality, they should strictly be treated according to the guidelines and every effort should be made for risk reduction with close follow-up.

Keywords: Acute coronary syndrome; Coronary artery disease; Aged; Aged, 80 and over; Gender identity

ARAŞTIRMA

AKUT MIYOKARD ENFARKTÜSÜ GEÇİREN 80 YAŞ VE ÜZERİ HASTALARDA CİNSİYET İLE İLİŞKİLİ FARKLILIKLARIN MORTALİTE ÜZERİNE ETKİSİ: HALA BİR FARK VAR

Öz

Giriş: Akut koroner sendrom gelişen hastalarda cinsiyet farkının kardiyovasküler mortalite üzerine olan etkisi uzun yıllardır tartışılmaktadır. Her iki cinsiyet arasındaki fark kapanmaya başlamış olsa da, kadınların hala tüm nedenlere bağlı ölüm oranları daha yüksektir. Öte yandan, özellikle 80 yaş üstü yaşlı kadınlarla ilgili çok az veri bulunmaktadır. Bu nedenle bu çalışmada akut miyokard enfarktüsü geçiren yaşlı kadınların tüm nedenlere bağlı mortalitelerinin belirlenmesi ve erkeklerle karşılaştırılması amaçlanmıştır.

Gereç ve Yöntem: Bu retrospektif çalışmada, Mayıs 2015-Kasım 2017 tarihleri arasında akut miyokard enfarktüsü nedeniyle kardiyoloji kliniğine yatırılan 80 yaş ve üzeri hastalar değerlendirilmiştir. Çalışmanın temel sonlanım noktası hastane içi, 30 günlük ve uzun süreli tüm nedenlere bağlı ölümlerinin belirlenmesidir.

Bulgular: Çalışmaya toplam 220 hasta (126 kadın ve 94 erkek) dahil edilmiştir. Ortalama takip süresi 8 aydır. Kadınların uzun dönemde tüm nedenlere bağlı mortalitesi erkekler göre anlamlı derecede yüksek bulunmuştur [sırasıyla n=52 (% 41.3) ve n=26 (%27.7); p=0.03]. Öte yandan, kadınların gerek hastane içi gerekse 30 günlük mortalitesi daha yüksek olmasına rağmen, istatistiksel açıdan cinsiyetler arası fark bulunmamıştır. Kaplan-Meier analizinde kadınların kümülatif sağkalımı daha düşüktür (log-rank: p=0.02) ve Cox regresyon analizi, kadın cinsiyetin mortalite için bağımsız bir risk faktörü olduğunu göstermiştir [tehlike oranı=1.7 (%95 güven aralığı=1.06-2.72); p=0.02].

Sonuç: Akut miyokard enfarktüsü geçiren hastalarda cinsiyetin mortalite üzerine olan etkisi yaşlılarda da önemini korumaktadır. Kadınların uzun vadede tüm nedenlere bağlı ölüm oranları önemli ölçüde yüksek olduğundan, bu hastalar klavuz önerilerine göre tedavi edilmeli ve yakından takip edilerek risk azaltımı için her türlü çaba gösterilmelidir.

Anahtar sözcükler: Akut koroner sendrom; Koroner arter hastalığı; Yaşlı; Yaşlı, 80 ve üzeri; Cinsiyet kimliği



INTRODUCTION

Numerous studies have found that women with coronary artery disease (CAD) have worse prognoses than men, and this sex-related difference in outcomes was relevant across the spectrum of acute coronary syndromes (ACS) (1,2). The higher morbidity and mortality of women are most likely multifactorial in origin, which include pathophysiological differences of acute myocardial infarction, baseline risk burden, and various clinical presentations that lead to misdiagnosis or treatment delays (3,4). Although this gap has been steadily decreasing the past two decades due to strict implementation of evidence-based therapies, women still experience less favorable outcomes than men, particularly in the context of ACS (5).

However, data is scarce in elderly women with CAD, particularly in those who are very elderly (age 80 years or older) as these patients are either excluded or underrepresented in major clinical trials (6). The underlying pathologies, clinical presentations, and treatment strategies of these patients substantially differ from their younger counterparts (7). First, elderly patients are generally undertreated due to multiple co-morbidities, although recent guidelines recommend the same therapies regardless of age (8). Second, clinical signs and symptoms may be subtle, leading to delays with the appropriate treatment (9). Third, a substantial proportion of patients cannot be fully revascularized because of extensive and severe CAD with heavy calcification, all of which are considered as bad prognostic factors for percutaneous coronary intervention success (10). Besides these age-related differences, sex-related factors that were previously believed to play an important role for the mortality difference between the two sexes are no longer relevant in this age group. Those who are 80 years or older lose the protective effect of estrogen, and the baseline differences in clinical risk factors between the two sexes diminish. Therefore, based on these physiological changes and the lack of available data, it is unclear whether elderly women still have worse mortality compared to elderly men. Thus, in our study, we sought to determine all-cause mortality of

elderly women (aged 80 years or older) with ACS, and to compare it to men.

MATERIALS AND METHOD

Patients

In this retrospective cohort study, the data of elderly patients (aged 80 years or older) who were admitted to our cardiology clinic between May 2015 and November 2017 were retrospectively evaluated, and those who had an ACS diagnosis were included. The diagnosis of ACS was based on the presence of at least two of the following: typical chest pain, dynamic electrocardiographic changes, and/or elevated troponin levels consistent with acute ischemia. Patients who underwent elective percutaneous coronary intervention (PCI) due to stable CAD, and those who had end-stage malignancy with a life expectancy of less than one year were excluded. Ethical board approval was obtained from the local ethics committee both for retrospective archive search and for prospective mortality analysis.

Clinical, laboratory, and procedural data were retrieved from hospital records. Clinical evaluation included age, sex, ACS type, heart failure (Killip classification), hypertension, diabetes mellitus, accompanying comorbidities, stroke, history of coronary revascularization, history of coronary revascularization (PCI and/or bypass surgery), and in-hospital medications. Laboratory data included admission creatinine, estimated glomerular filtration rate, maximal creatinine, initial and maximum Troponin I values, and other routine biochemical parameters. When evaluating the PCI findings, final "thrombolysis in myocardial infarction" (TIMI) flow was used as the criteria to assess procedure success—TIMI-3 flow was considered as successful reperfusion. The severity and extent of CAD was analyzed using SYNTAX score (<http://www.syntaxscore.com>). These calculations were performed by two interventional cardiologists in a blinded fashion. Both pre-procedural and post-procedural (residual) SYNTAX scores were calculated, where appropriate, in order to assess the completeness of revascularization and

residual atherosclerotic burden. The diagnosis of acute kidney injury was determined using the Acute Kidney Injury Network criteria, in which an increase of at least 50% in serum creatinine was considered mandatory for diagnosis (11).

Clinical outcomes

The primary outcomes of the study were in-hospital, 30-day, and long-term all-cause mortality. In-hospital mortality was evaluated through the review of hospital records, whereas 30-day and long-term mortality were identified prospectively via the national death notification system.

Statistical analysis

Continuous variables are displayed as mean±standard deviation if normally distributed, or median and interquartile range if not normally distributed. Distribution of data was assessed using the Kolmogorov-Smirnov test. Categorical variables are reported as number and percentage. Continuous variables were compared between groups using independent sample T-test. Categorical data were compared using the chi-squared or Fisher's exact test. Event-free survival curves were generated using the Kaplan-Meier method, and differences in survival curves between the two sexes were assessed using the log-rank test. A two-tailed *p*-value of <0.05 was considered statistically significant.

To assess the independent predictors of mortality, we built a Cox proportional hazards model, which included sex, undergoing coronary angiography, diabetes mellitus, hypertension, acute kidney injury, maximum serum troponin level, total cholesterol, ACS type, and heart failure Killip classification greater than 1 as covariates. When building the model, covariates that were found to be significant in the univariate analysis (*p*<0.10), or those that were believed to have clinical significance, were entered into the model. To avoid interactions among variables, we checked for correlations using Pearson correlation coefficient test, or chi-squared test for dichotomous variables. Statistical analysis was performed using SPSS 20 software (SPSS Inc., Chicago, IL, USA).

RESULTS

Among 3,450 patients who were screened for eligibility, 220 patients were included in the final analysis (Figure 1). Median follow-up was 8(IQR 2-20) months (maximum 31 months). Baseline clinical characteristics, medications, and outcomes are presented in Table-1. Of the 220 included patients, 126 (57.3%) patients were women. The majority of patients (n=145, 65.9%) had non-ST elevation myocardial infarction. There was no significant sex difference for baseline risk factors, renal function, acute kidney injury, left ventricular ejection fraction, and the rate of coronary angiography. Men had a higher frequency of bypass surgery history than women [n=16 (17.0%) vs. n=7 (5.6%), respectively; *p*=0.006].

Baseline laboratory findings are presented in Table 2. Women had lower admission hemoglobin (11.8, IQR 10.5-13.0 g/dL vs 12.5, IQR 11.1-14.2 g/dL *p*=0.005) and higher total cholesterol values (167, IQR 140-203 mg/dl vs 157, IQR 124-189 mg/dL; *p*=0.02) than men, respectively. Platelet count was also higher in women compared to men (235, IQR 187-295 $\times 10^3/\text{mm}^3$ vs. 210, IQR 164-260 $\times 10^3/\text{mm}^3$, respectively; *p*=0.002).

Procedural details are presented in Table-3. Overall, 145 (65.9%) patients underwent coronary angiography, and among those, 107 (73.8%) patients underwent PCI. There was no statistical difference between the groups in terms of percentage of patients who underwent coronary angiography, admission and residual SYNTAX scores, post-intervention TIMI flow, and types of implanted stents. The only statistical difference between the groups was the median length of bare metal stents (BMS), which was longer in women than men (30, IQR 18-43 vs. 18, IQR 15-20 mm, respectively; *p*=0.02).

In terms of clinical outcomes, although women had higher incidence of in-hospital and 30-day mortality, there was no statistical difference between women and men [19 (15.1%) vs. 10 (10.6%), respectively; *p*=0.33 for in-hospital mortality, and 31 (25.2%) vs. 14 (14.9%), respectively; *p*=0.06 for 30-day



mortality]. However, long-term mortality (maximum 31 months), was significantly higher in women than men [52 (41.3%) vs. 26 (27.7%), respectively; $p=0.03$] (Figure-2). Multivariate Cox regression analysis revealed that sex (women) (hazard ratio [HR]=1.7 [95% confidence interval [CI]=1.06-2.72]; $p=0.02$), maximum serum Troponin I values (HR=1.007 [95%

CI=1.003-1.011]; $p=0.02$, and heart failure Killip classification greater than 1 (HR=3.58 [95% CI=2.28-5.61]; $p=0.001$) were independent predictors of mortality (Table 4). Kaplan-Meier analysis also showed that women had statistically worse long-term survival than men (log-rank; $p=0.02$) (Figure 3).

Table 1. Baseline characteristics, medications and mortality rates of the study patients according to their sex.

	Total (n=220)	Women (n=126 57.3%)	Men (n=94 42.7%)	P	
Age (years)	85±3.6	85±3.3	85±3.8	0.20	
NSTEMI	145(65.9%)	89(70.6%)	56(59.6%)	0.08	
Hypertension	149(67.7%)	92(73.0%)	57(60.6%)	0.052	
Diabetes mellitus	60(27.4%)	35(27.8%)	25(26.9%)	0.88	
Prior	PCI	33(15.1%)	15(12.0%)	18(19.4%)	0.13
	CABG	23(10.5%)	7(5.6%)	16(17.0%)	0.006
	STROKE	18(8.3%)	9(7.3%)	9(9.6%)	0.53
	CHF	29(13.3%)	17(13.7%)	12(12.8%)	0.83
CRF (eGFR<60 ml/min)	107(49.1%)	68(54.8%)	39(41.5%)	0.051	
Acute kidney injury	40(18.3%)	28(22.6%)	12(12.8%)	0.06	
Coronary angiography	145(65.9%)	80(63.5%)	65(69.1%)	0.38	
LVEF	43.1±11.4	43.8±11.3	42.3±11.7	0.35	
Heart failure Killip>1	55(25.0%)	37(29.4%)	18(19.1%)	0.08	
Inotropic support	31(14.1%)	21(16.7%)	10(10.6%)	0.20	
ASA	201(91.8%)	117(93.6%)	84(89.4%)	0.25	
Clopidogrel	179(81.7%)	107(85.6%)	72(76.6%)	0.08	
Ticagrelor	13(5.9%)	3(2.4%)	10(10.6%)	0.01	
Anticoagulants	24(11.1%)	16(13.0%)	8(8.5%)	0.29	
In-hospital mortality	29(13.2%)	19(15.1%)	10(10.6%)	0.33	
30-day mortality	45(20.7%)	31(25.2%)	14(14.9%)	0.06	
Long-term mortality	78(35.5%)	52(41.3%)	26(27.7%)	0.03	

NSTEMI, non ST elevation myocardial infarction; PCI, percutaneous coronary intervention; CABG, Coronary artery bypass grafting; CHF, congestive heart failure; CRF, chronic renal failure; eGFR, estimated glomerular filtration rate; LVEF, left ventricular ejection fraction.

Table 2. Baseline laboratory findings of the study patients.

Variable	Women (n=126 57.3%) Median (IQR 25-75)	Men (n=94 42.7%) Median (IQR 25-75)	p
Glucose (mg/dl)	144(117-211)	135(107-177)	0.09
Leukocyte (x10 ³)	9.8(7.8-13.2)	9.4(7.4-12.1)	0.16
Platelet count(x10 ³ /mm ³)	235(187-295)	210(164-260)	0.002
Hemoglobin (gr/dl)	11.8(10.5-13.0)	12.5(11.1-14.2)	0.005
Urea (mg/dl)	48.9(36.5-71.8)	50.6(39.0-69.5)	0.66
Creatinine (mg/dl)	1.0(0.7-1.3)	1.1(0.9-1.5)	0.41
eGFR (ml/min)	55.9(39.4-79.6)	65.6(44.4-80.3)	0.18
Admission Troponin I ng/ml	1.7(0.3-7.1)	0.6(0.1-3.0)	0.052
Maximum Troponin I ng/ml	7.4(1.6-26.3)	10.8(1.1-38.8)	0.71
Total cholesterol (mg/dl)	167(140-203)	157(124-189)	0.02
LDL cholesterol (mg/dl)	93(71-121)	93(69-120)	0.36
HDL cholesterol (mg/dl)	45(33-52)	40(32-47)	0.06
Triglyceride (mg/dl)	108(84-143)	101(74-134)	0.14
ALT (mg/dl)	16(10-30)	14(12-26)	0.34
AST (mg/dl)	26(19-58)	25(17-60)	0.84
CRP (mg/L)	9.7(3.5-33.6)	7.4(2.1-29.5)	0.67

IQR, interquartile range; eGFR, estimated glomerular filtration rate; LDL, Low-density cholesterol; HDL, High-density cholesterol; ALT, alanine transaminase; AST, aspartate aminotransferase; CRP, C reactive protein

Table 3. Angiographic and procedural characteristics of very elderly patients according to their sex.

Variable	Overall n=145	Women n=80	Men n=65	p
Number of PCI	107(73.8%)	57(71.2%)	50(76.9%)	0.44
Admission Syntax Score	20(27-10)	20(26-9)	22(28-12)	0.35
Residual Syntax Score	6(18-0)	5(20-0)	6(16-2)	0.68
Mean BMS length (mm)	20(39-18)	30(43-18)	18(20-15)	0.02
Mean DES length (mm)	28(38-18)	26(33-18)	28(45-19)	0.20
Timi-3 flow post-PCI	77(72.0%)	37(64.9%)	40(80.0%)	0.08
3-vessel disease	77(53.1%)	41(51.2%)	36(55.4%)	0.62
BMS	42(39.3%)	25(43.9%)	17(34.0%)	0.29
DES	40(37.4%)	20(35.1%)	20(40.0%)	0.60
BMS PLUS DES	10(9.3%)	6(10.5%)	4(8.0%)	0.74

BMS, bare metal stent; DES, drug eluting stent; PCI, percutaneous coronary intervention; TIMI, thrombolysis in myocardial infarction



Table 4. Cox logistic regression analyses of variables related to mortality.

Variable	Univariate analysis			Multivariate analysis		
	HR	95% CI	p	HR	95% CI	p
Gender (women)	1.70	1.06-2.72	0.02	1.61	1.005-2.59	0.04
Undergoing coronary angiography	0.74	0.47-1.16	0.19			
Diabetes mellitus	0.97	0.59-1.58	0.90			
Hypertension	1.04	0.64-1.69	0.85			
Acute kidney injury	1.96	1.19-3.24	0.008			
Maximum Troponin I	1.007	1.003-1.011	0.001	1.005	1.001-1.009	0.02
Total cholesterol	0.99	0.99-1.00	0.22			
ACS type (STEMI)	1.73	1.10-2.73	0.01			
Prior revascularization	0.71	0.40-1.25	0.24			
Killip>1	3.58	2.28-5.61	<0.001	3.34	2.11-5.28	0.001

HR, hazard ratio; CI, Confidence interval; ACS, acute coronary syndrome; STEMI, ST elevation myocardial infarction

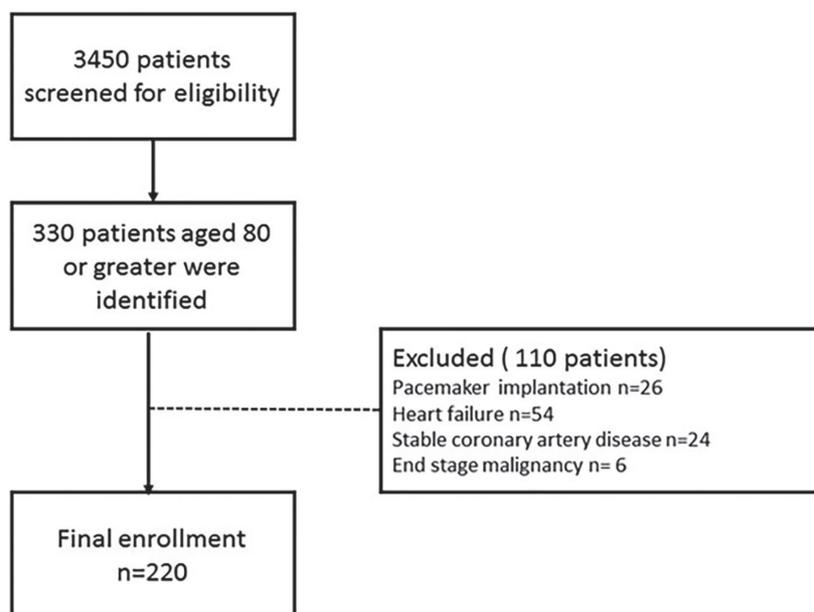


Figure 1. Patient inclusion flow chart.

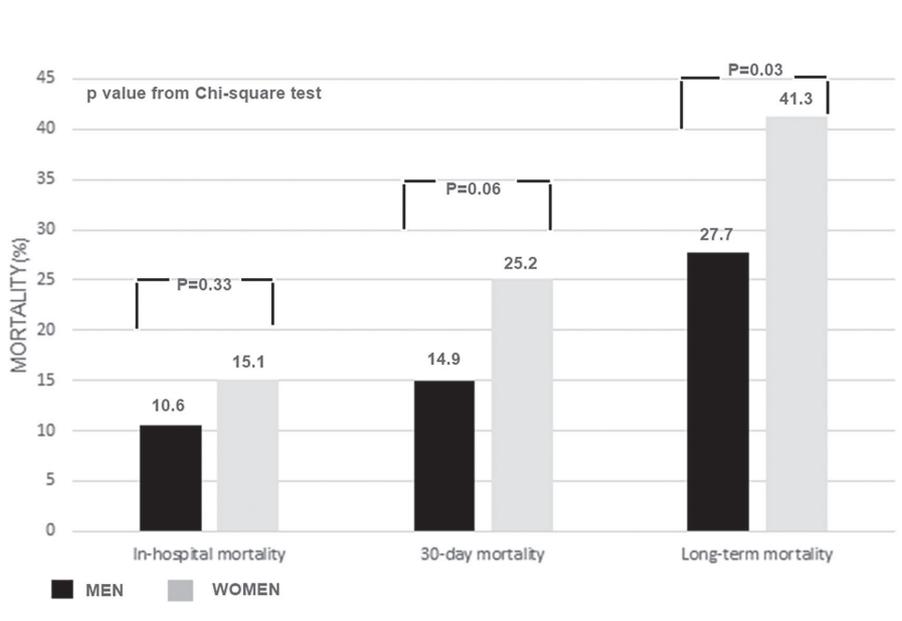


Figure 2. In-hospital, 30-day, and long-term mortality rates of patients according to sex.

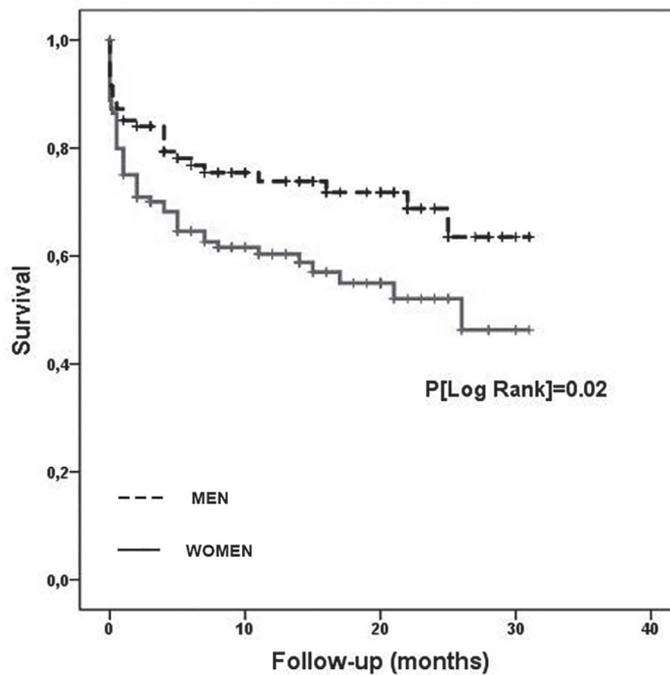


Figure 3. Kaplan-Meier survival plot for men and women with acute myocardial infarction.



DISCUSSION

In our study, we found that elderly women with acute myocardial infarction had a higher incidence of long-term all-cause mortality compared to men. This difference persisted after adjusting for multiple confounding factors, and thus, female sex appears to be an independent risk factor. On the other hand, although women had more in-hospital and 30-day events, there was no statistically significant difference between sexes.

The underlying factors related to our study results seem to be multifactorial. Generally, the higher mortality of women has been attributed to differences in baseline risk factors between the two sexes (12). Since women develop CAD later in life, particularly after menopause, they have much more comorbidities that increase the incidence of long-term cardiovascular events (13). Besides this, Poon et al. showed that cardiovascular risk in women is generally underestimated, which is typically attributed to atypical symptoms and presentations which lead to delays in hospital admission and thus under treatment and increased mortality (14,15). Historically, women tended to receive less thrombolytic therapy, PCI, and thionopiridines, all of which are possible factors leading to increased mortality (16). Of note, one recent registry demonstrated that women still had an increased risk of adverse clinical outcomes with ACS, even if they underwent an early invasive strategy and coronary revascularization (17). Moreover, women also have issues with secondary prevention. For example, EUROASPIRE IV study showed that women were less likely to receive evidence-based therapy and reach target lipid or blood pressure levels (18). The reason behind this observation remains to be established.

On the other hand, elderly patients, especially those over 80 years, have specific problems that are confined to this age group. For example, these patients are generally reluctant to undergo invasive

procedures and do not receive contemporary evidence-based therapy. In addition, the burden of CAD is typically greater, which makes complete revascularization more challenging. Further, the vagueness of symptoms which applies to both sexes is frequent and as demonstrated in numerous previous trials, this leads to a significant delay to the appropriate therapy particularly for octogenarians (8).

In our study, although the rate of coronary angiography and subsequent revascularization were low in both sexes, there was no statistical difference between the groups. In addition, there was no sex difference with respect to baseline risk factors and admission and residual SYNTAX scores. Therefore, the previously proposed mechanism suggesting that baseline clinical risk burden increases the mortality of women with ACS may not be relevant in very elderly patients. The Italian Elderly ACS Study investigated sex-related outcomes in elderly patients with ACS and found similar baseline risk factors and in-hospital mortality for both sexes (19).

Another important finding from our study was the percentage of BMS implantation, which was approximately 40%. The type of stent implantation was based on the operators' discretion, and this rate is far greater than the expected rate for younger patients. Moreover, in our study, women received more BMSs than men, and the median length of the implanted BMSs were longer. This difference might have affected our study results; because it is evident that drug-eluting stents decrease both stent restenosis and major adverse cardiac events, as long as the patient complies with dual antiplatelet therapy (20). Furthermore; acute and chronic renal failure, Killip class >1 heart failure, and post-PCI slow flow was also more frequent in women, although it did not reach statistical significance.

Due to the retrospective design of our study, one important factor that we were unable to take into account was the patients' frailty, which may

have impacted overall survival (21). In addition, secondary prevention efforts and adherence to medications may have also played a role. Nevertheless, elderly women appeared to have higher mortality incidence particularly in the long-term and this survival difference was most likely related to many factors including socio-economic status, and co-morbid conditions.

There were some limitations for our study. First, this was a single-center retrospective study although it included an underrepresented, real world population. Second, none of the patients underwent bypass surgery, which was mainly due to patients' refusal to undergo the surgery, and this might have affected our results. Third, although we evaluated all-cause mortality, which was a hard endpoint, we did not assess for major adverse cardiac events separately. Finally, the lack of out of hospital medication and adherence was also a limitation.

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In conclusion, elderly women (age 80 years or older) with acute myocardial infarction have a higher incidence of long-term all-cause mortality compared to men. This sex-related difference remained significant, even after adjusting for multiple confounding factors. Previously proposed mechanisms for increased mortality of relatively younger women may not apply in this decade of life. Therefore, elderly women with CAD should be followed up closely and treated aggressively according to the guideline recommendations.

Conflict of interest

The authors declare that there is no conflict of interest associated with this work.

ACKNOWLEDGEMENTS

We thank Fatih Ergün for his contribution during archive search and data entry. There was no funding resources.



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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344043
2018;21(3):304-312

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Received: 25/01/2018
Accepted: 05/09/2018

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RESEARCH

PREDICTORS OF FUNCTIONAL BALANCE IN OLDER ADULTS LIVING IN A COMMUNITY

ABSTRACT

Introduction: Various factors may affect the functional balance of older adults. This study aimed to investigate the factors associated with functional balance in older adults living in a community.

Materials and Method: In total, 160 people ≥ 65 years of age were included in the study. The Cumulative Illness Rating Scale was used for scoring comorbidities. Functional balance was evaluated with the Activities-specific Balance Confidence scale. The Hospital Anxiety and Depression Scale was used for assessing emotional state. Finally, cognitive status was evaluated with the Mini-Mental State Examination. The factors associated with functional balance were determined using multivariate logistic regression analysis in patients with lower balance confidence.

Results: The mean age was 71.3 ± 5.8 years. The group of participants with lower balance confidence (Activities-specific Balance Confidence score ≤ 67) had increased age, height, lower extremity pain, sleeplessness, falling frequency, hypertension, ischaemic heart disease and anaemia ratios, number of drugs used, female ratio and single living ratio; higher Cumulative Illness Rating Scale, Hospital Anxiety and Depression Scale scores and significantly lower ($p < 0.05$) Mini-Mental State Examination scores. The multivariate reduced model analysis revealed that age, height, marital status, number of drugs, number of comorbidities and the anxiety score had statistically significant effects ($p < 0.05$) on functional balance.

Conclusion: In clinical practice, it will be useful to consider such factors while evaluating balance in older adults. In this study, the predictors of balance confidence in older adults included age, height, marital status, number of drugs used, number of comorbidities and anxiety level.

Keywords: Aged; Accidental falls; Balance, Postural

ARAŞTIRMA

YAŞLILARDA FONKSİYONEL DENGENİN BELİRLEYİCİLERİ

Öz

Giriş: Yaşlılarda fonksiyonel dengeyi etkileyebilecek çok sayıda faktör mevcuttur. Bu çalışmanın amacı toplumdaki yaşlılarda fonksiyonel denge ile ilişkili faktörlerin araştırılmasıdır.

Gereç ve Yöntem: Çalışmaya dahil edilme kriterlerine uyan 65 yaş ve üzeri olan 160 kişi alındı. Komorbiditelerin değerlendirilmesinde Kümülatif Hastalık Değerlendirme Skalası kullanıldı. Fonksiyonel denge, Aktivitelere-özgü Denge Güven Skalası ile değerlendirildi. Emosyonel durumun değerlendirilmesinde Hastane Anksiyete ve Depresyon Ölçeği kullanıldı. Kognitif durum ise Mini Mental Durum Değerlendirmesi ile değerlendirildi. Denge güveni düşük, düşme riski yüksek olan hastalarda çok değişkenli lojistik regresyon analizi ile fonksiyonel denge ile ilişkili bileşenler belirlendi.

Bulgular: Katılımcıların ortalama yaşı 71.3 ± 5.8 yıl idi. Denge güveni düşük olan (ABC skoru ≤ 67) grupta yaş, boy, alt ekstremitte ağrısı, uykusuzluk, düşme sıklığı, hipertansiyon, iskemik kalp hastalığı ve anemi oranları, kullanılan ilaç sayısı, bayan cinsiyet, tek başına yaşama oranları daha fazla idi; Kümülatif Hastalık Değerlendirme Skalası, Hastane Anksiyete ve Depresyon Ölçeği skorları anlamlı olarak daha yüksekti, Mini Mental Durum Değerlendirmesi skoru ise anlamlı olarak daha düşüktü ($p < 0.05$). Çok değişkenli indirgenmiş modelde fonksiyonel denge üzerinde yaş, boy, medeni durum, ilaç sayısı, ek hastalık sayısı, anksiyete düzeyinin anlamlı ($p < 0.05$) etkinliği gözlemlenmiştir.

Sonuç: Yaşlılarda fonksiyonel denge üzerinde birçok faktörün etkili olabileceği klinik pratik yaklaşımda göz önünde bulundurulmalıdır. Bununla beraber bu çalışmada yaşlılarda denge güveninin belirleyicileri yaş, boy, medeni durum, kullanılan ilaç sayısı, ek hastalık sayısı ve anksiyete düzeyi olarak belirlenmiştir.

Anahtar sözcükler: Yaşlı; Düşmeler; Denge



INTRODUCTION

Aging is associated with progressive decline in physical and psychological health, increased risk of disability and the number of comorbidities. Balance disorder and related complications rise in parallel with the size of the ageing population. More than 27% of the 37.3 million adults aged ≥ 65 years have reported balance problems according to data obtained from the National Health Interview Survey conducted in the United States (1). It has also been reported that of the more than seven million older adults with balance problems, only half have sought medical advice for the deficit (2). Furthermore, it has been shown that approximately one-third of older adults fall (3). Injurious fall is a problem that causes serious disability, that is why fall prevention and balance assessment are important in older adults. Higher postural sway, balance and walking problems are related to the fall risk (4). Balance has been shown to be an important predictor of falls within the elderly population.

There are many intrinsic factors for balance disorder in older adults, such as vestibular or visual disorders, neurological disorders such as Parkinson's disease or peripheral neuropathy, psychological problems, dizziness, low blood pressure, cognitive disorders and muscle strength decrease (4,5). Certain drugs can result in balance disorders either directly or by causing dizziness. In addition, some characteristics of the person, such as posture, mobility or trunk muscle strength, may affect balance (6). Older adults with a recurrent history of falls may experience increased mediolateral sway during narrow base stance (7). Postural stability is required for safe walking and to prevent falls.

Routinely evaluating the balance status of elderly patients should be integrated into primary care practice in order to diagnose increased fall risk and prevent falls. The aim of this study is to identify and evaluate factors that affect the functional balance status of older adults living in a community. In this context, we would like to predict important

intrinsic factors allowing health care professionals to successfully monitor balance confidence for the older adults.

MATERIALS AND METHOD

A total of 200 adults aged 65 years or older living in a community referred to the outpatient clinics of our rehabilitation hospital between 25/02/2016 and 08/03/2017 were screened for this cross-sectional study. Those with communication problems, serious visual disorders and/or neurological problems such as Parkinson's disease or history of stroke were not included in the study. The remaining 160 subjects were included in the study cohort. Informed consent was obtained from all participants. This study was approved by the hospital ethics committee.

Evaluations were conducted by face to face interviews. Demographics and prescription drug use were recorded. The Cumulative Illness Rating Scale (CIRS) was used for scoring comorbidities. Functional balance was evaluated with the Activities-specific Balance Confidence (ABC) scale. The Hospital Anxiety and Depression Scale (HADS) was used for assessing emotional state. Finally, cognitive status was evaluated with the Mini-Mental State Examination (MMSE).

The ABC scale is a preferred test for the evaluation of balance confidence, particularly in active older adults (8). The 16-item ABC scale assesses balance impairment and fall risk. The scale quantifies subject confidence in performing specific indoor and outdoor activities and is suitable for older adults whose activity level is moderate to high. Total scores range between 0 and 100. Scores < 50 indicate a low functional level, between 50 and 80 a moderate functional level and > 80 a high functional level (9). Furthermore, Lajoie et al. reported that a score of 67 was indeed a reliable means of predicting a future fall (10). The test has been translated into various languages. The reliability and validity of the Turkish version of the

ABC scale has been studied in symptomatic knee osteoarthritis. Interclass correlation coefficient (ICC) value was 0.95. Test-retest reliability of ABC-Turkish version was high ($t=1.90$, $p=0.063$). ABC-Turkish version had a high internal consistency reliability. Cronbach α value was 0.97 (11).

The CIRS was developed by Linn et al. to investigate the comorbidities associated with multiple health conditions (12). The original CIRS evaluated comorbidities related to 13 systems, whereas the modified CIRS consisted of the 14 systems including cardiac, vascular, haematologic, respiratory, otorhinolaryngologic, upper gastrointestinal, lower gastrointestinal, hepatic and pancreatic, renal, genitourinary, musculoskeletal, dermatologic, neurologic, endocrine, metabolic, breast and psychiatric systems (13). A higher CIRS score indicates a higher number of comorbidities for the subject.

The HADS is an easy and reliable screening test to assess symptoms of anxiety and depression. The scale can be used both for inpatients and outpatients and can be completed within 2 to 5 minutes. The test has a two-factor structure with 14 items. Seven items assess anxiety while seven items assess depression. The items are scored on a four-point scale with the total score ranging between 0 and 21. Scores between 0 and 7 indicate normal emotional status, whereas scores greater than 7 reveal an anxiety or depression disorder (14). The reliability and validity of the Turkish version of HADS has been studied in healthy college students and inpatients (15).

The MMSE is a reliable test for the evaluation of cognitive function (16). Orientation, memory, attention, calculation, language and construction functions are assessed with total scores ranging between 0 and 30. Higher scores indicate better cognitive functions. The reliability and validity of the Turkish version of the MMSE test has been studied (17).

Statistical analysis

Power analysis was performed. Sixty percent power was calculated for 164 persons. For definitive statistics of data, mean, standard deviation, median, minimum, maximum, frequency and ratio values were utilised. The distribution of the variables was scored by the Kolmogorov–Smirnov test. The Mann–Whitney U test was used for analysis of the quantitative independent data, while the Chi-square test was used for the analysis of qualitative independent data. Considering that the fall risk is high for the patients with an ABC score below 67 (10), the components related with functional balance were stated by multivariate logistic regression analysis. The SPSS 22.0 programme was used for the analysis. $P<0.05$ was considered statistically significant.

RESULTS

Participant demographic and clinical features are shown in Table 1. Patients were classified according to balance confidence measured by ABC scale. The percentage of older adults with ABC scores ≤ 67 was 37,5% ($n=60$). Age, height, female, single living, lower extremity pain, sleeplessness, fall frequency, hypertension, ischaemic heart disease, anaemia, daily medicine amounts and number of additional diseases were significantly higher ($p<0.05$) in the lower balance confidence (LBC) group (ABC score ≤ 67) than in the higher balance confidence (HBC) group (ABC >67). The features for the participants of both groups are shown in Table 2. The CIRS scores and the HADS anxiety and depression scores were significantly higher ($p<0.05$) in the LBC group than in the HBC group. MMSE test scores were significantly lower ($p<0.05$) in the LBC group than in the HBC group (Table 3). In the multivariate reduced model, age, height, marital status, daily medicine amount, number of additional diseases and anxiety level were found to have a significant ($p<0.05$) effect on balance confidence (Table 4).



Table 1. Demographic and clinical characteristics.

Variable	Min-max	Mean (SD)/n-%
Age,y	65-87	71.3 (5.8)
Sex	Male	39 - 24.4%
	Female	121 - 75.6%
Height, m	140-185	158.3 (8.9)
Weight, kg	40-112	77.6 (14.0)
BMI, kg/m ²	0-50	30.9 (6.1)
Marital status	Single	53 - 33.1%
	Married	107 - 66.9%
Walking distance, m	5-5000	628 (737)
Lower extremity pain		127 - 79.4%
Insomnia		87 - 54.4%
Falls		58 - 36.3%
Hypertension		123 - 76.9%
Ischemic heart disease		41 - 25.6%
COPD		18 - 11.3%
Depression		25 - 15.6%
Diabetes		54 - 33.8%
Anemia		16 - 10.0%
Hip and/or knee OA		70 - 43.8%
Number of drugs used	0-15	4.4 (2.8)
Number of additional diseases	0-7	3.0 (1.5)
ABC scale	11-100	76.0 (23.9)
CIRS	0-9	4.3 (1.8)
MMSE	8-30	20.9 (5.0)
HADS- Anxiety	0-18	6.2 (4.7)
HADS-Depression	0-20	6.3 (4.3)

sd, standard deviation; BMI, body mass index; COPD, chronic obstructive pulmonary disease; OA, osteoarthritis; ABC, Activities-specific Balance Confidence; CIRS, Cumulative Illness Rating Scale; MMSE, Mini Mental State Examination; HADS, Hospital Anxiety and Depression Scale.

Table 2. Clinical characteristics according to the balance confidence.

Variable		Lower Balance Confidence Group (ABC score ≤ 67)	Higher Balance Confidence Group (ABC score >67)	p
		Mean (sd)/n-%	Mean (SD)/n-%	
Age		73.4 (6.9)	70.1 (4.7)	0.003 ^m
Sex	Male	8 - 13.6%	31 - 30.7%	0.015 ^{x²}
	Female	51 - 86.4%	70 - 69.3%	
Height, m		160.3 (9.3)	155.0 (9.3)	0.000 ^m
Weight, kg		78.2 (13.0)	76.5 (15.6)	0.451 ^m
BMI, kg/m ²		30.5 (5.0)	31.5 (7.7)	0.150 ^m
Marital status	Single	31 - 52.5%	22 - 21.8%	0.000 ^{x²}
	Married	28 - 47.5%	79 - 78.2%	
Walking distance, m		307 (373)	815 (829)	0.000 ^m
Lower extremity pain		52 - 88.1%	75 - 74.3%	0.036 ^{x²}
Insomnia		42 - 71.2%	45 - 44.6%	0.001 ^{x²}
Falls		28 - 47.5%	30 - 29.7%	0.024 ^{x²}
Hypertension		51 - 86.4%	72 - 71.3%	0.028 ^{x²}
Ischemic heart disease		21 - 35.6%	20 - 19.8%	0.024 ^{x²}
COPD		8 - 13.6%	10 - 9.9%	0.480 ^{x²}
Depression		11 - 18.6%	14 - 13.9%	0.421 ^{x²}
Diabetes		19 - 32.2%	35 - 34.7%	0.752 ^{x²}
Anemia		10 - 16.9%	6 - 5.9%	0.025 ^{x²}
Hip and/or knee OA		24 - 40.7%	46 - 45.5%	0.549 ^{x²}
Number of drugs used		5.5 (3.2)	3.8 (2.3)	0.000 ^m
Number of additional diseases		3.4 (1.6)	2.7 (1.4)	0.009 ^m

^mMann-Whitney U test / ^{x²}Chi-square test.

ABC, Activities-specific Balance Confidence; BMI, body mass index; COPD, Chronic obstructive pulmonary disease; OA, osteoarthritis.



Table 3. Comorbidity, cognitive and emotional status according to the balance confidence.

Variable	Lower Balance Confidence Group (ABC score ≤ 67)		Higher Balance Confidence Group (ABC >67)		p
	Mean (sd)/n-%		Mean (SD)/n-%		
CIRS	4.8 (1.8)		3.9 (1.7)		0.002^m
MMSE	19.1 (4.9)		21.9 (4.8)		0.000^m
HADS- Anxiety	7.9 (5.1)		5.1 (4.2)		0.000^m
	≤7	30 - 50.8%	74 - 73.3%	0.003^{x2}	
	8-10	9 - 15.3%	15 - 14.9%		
	≥11	20 - 33.9%	12 - 11.9%		
HADS- Depression	8.4 (4.5)		5.1 (3.6)		0.000^m
	≤7	19 - 32.2%	74 - 73.3%	0.000^{x2}	
	8-10	21 - 35.6%	16 - 15.8%		
	≥11	19 - 32.2%	11 - 10.9%		

^mMann-Whitney U test / ^{x2}Chi-square test.
 ABC, Activities-specific Balance Confidence; CIRS, Cumulative Illness Rating Scale; MMSE, Mini Mental State Examination; HADS, Hospital Anxiety and Depression Scale

DISCUSSION

Functional balance predictors identified in this cohort were age, height, marital status, number of daily prescription drugs used, number of comorbidities and HADS anxiety scores. Many factors affect balance in older adults. The ability to identify such factors is an important step toward fall risk prevention and reduction.

In accordance with our results, ageing may lead to both balance disorder and a slowing of mobility (18-20). Balance disorder incidence increases as the population ages, as does the frequency of comorbidities. In addition, the amount of daily prescription drug usage increases in parallel with increasing age. Due to the side effects of certain medicines, dizziness or a balance disorder can be observed. Previous studies have also stated that ageing and the amount of daily drug intake are

important factors for balance disorder in older adults (18-21). Polypharmacy and the combination of certain medicines such as opioids should be considered as a risk factor for balance and falls in older adults (22).

In a previous study, the predictors of balance measured by the Berg Balance test were reported as age, medicine and daily activities measured by the Barthel index in older adults (18). Moreover, fall risk was higher in older adults utilising ≥3 prescription medicines daily. Another study reported that factors related with balance measured by the Berg Balance Scale were age and level of independence in the performance of daily activities measured by the Barthel index in 70 years or older adults with a mean age of 70.5±5.0 years (20). The side effects of some drugs, internal ear infection, heart diseases and ear crystal disorders are other factors that may lead to balance problems (2).

In this study, one of the predictors of functional balance was the presence of an anxiety disorder. Psychological factors such as depression, anxiety and stress can accelerate sensorimotor and cognitive disorders in older adults (23). Anxiety and depression are often observed in older adults. The association between dizziness, balance disorders and anxiety disorders was noted. In a previous study, depression and anxiety rates were reported as 11% and 18%, respectively, in patients with dizziness complaints (24). In our study, the depression ratio was 15.6%. In the group with higher fall risk, depression and anxiety scores were also high. Although the anxiety score was deterministic on balance, there was no such correlation with depression scores. The possible reason for this might be the positive response to antidepressant drug treatment.

Balance disorders were diagnosed in nearly half of the group of elder patients with type II diabetes. Cordiero et al. studied a cohort of 91 older adults with type II diabetes and a mean age of 74.4 ± 5.9 years. Factors associated with functional balance were daily activities, step strategy, proprioception, orthostatic hypotension and sensory disorders. In addition, the factors related with mobility were age, daily activities, step strategy and proprioception (19). The ratio of balance disorder measured by TUG has been reported as 44.4% in elder patients with chronic obstructive pulmonary disease (COPD). In the same study, it was concluded that the predictors of functional balance disorder are body mass index, number of prescription medicines used daily, decreased recreational activities and depression status (21). Diabetes and COPD were not determined as a predictor of balance disorder in the present study. This may be due to the difference in disease severity and/or the lack of sensorimotor examination in our study.

In this study, the balance confidence was good in 55.6% of the older adults studied. Balance confidence was moderate or poor in the remaining, and such results are consistent with the previous studies' results. In the group with higher falling risk and lower balance confidence, age, height, female ratio, being single ratio, lower extremity pain, sleeplessness, hypertension, ischaemic heart disease and anaemia ratios, amount of daily drug intake and number of comorbidities were higher. In a study published by Patel et al. with 7601 patients ≥ 65 years of age with medicare beneficiaries, the recurrent fall ratio for the past year was higher in patients with chronic pain (25). In addition, the number of painful regions was propounded to be related with both balance and falling prevalence. Paker et al. reported that the mean ABC score was 53.5% in patients with knee osteoarthritis with a mean age of 64.7 years (11). This situation indicates that the mean balance confidence is moderate in patients with symptomatic knee osteoarthritis.

This study has some strong and weak points. The strong ones are the adequacy of the number of participants and the power of the study. However, due to the cross-sectional design of the study, the causality related to the factors that affect balance in elders could not be explained, and factors that might affect balance, such as vestibular and visual functional disorders, osteoarthritis severity and polyneuropathy existence could not be evaluated.

In conclusion, factors associated with balance confidence in older adults were age, height, marital status, number of daily prescription drugs used, number of comorbidities and HADS anxiety scores. These factors may be utilised in clinical practice to identify patients with functional balance disorders. Furthermore, this type of analysis can be implemented in an effort to prevent falls in older adults.



Table 4. Predictors of balance confidence.

Variable	Univariate Model			Multivariate Model		
	OR	%95 CI	p	OR	%95 CI	p
Age	0.905	0.852 - 0.961	0.001	0.918	0.852 - 0.989	0.025
Sex	0.354	0.150 - 0.834	0.018			
Height, m	0.923	0.965 - 0.884	0.000	0.938	0.987 - 0.892	0.013
Weight, kg	0.991	1.015 - 0.969	0.462			
BMI, kg/m ²	1.027	1.083 - 0.973	0.337			
Marital status	3.976	1.982 - 7.974	0.000	2.647	1.123 - 6.239	0.026
Walking distance, m	1.002	1.001 - 1.003	0.000			
Lower extremity pain	0.388	0.157 - 0.961	0.041			
Insomnia	0.325	0.164 - 0.646	0.001			
Falls	0.468	0.240 - 0.910	0.025			
Number of drugs used	0.798	0.701 - 0.908	0.001	0.807	0.693 - 0.939	0.006
Number of additional diseases	0.749	0.600 - 0.935	0.009	0.852	0.674 - 0.942	0.012
Hypertension	0.389	0.165 - 0.921	0.032			
Ischemic heart disease	0.447	0.217 - 0.921	0.029			
COPD	0.701	0.260 - 1.887	0.481			
Depression	0.702	0.296 - 1.667	0.423			
Diabetes	1.116	0.564 - 2.210	0.752			
Anemia	0.309	0.106 - 0.902	0.032			
Hip and/or knee OA	1.220	0.636 - 2.338	0.550			
CIRS	0.751	0.619 - 0.911	0.004			
MMSE	1.124	1.049 - 1.204	0.001			
HADS-Anxiety	0.880	0.819 - 0.945	0.000	0.867	0.796 - 0.944	0.001
HADS-Depression	0.821	0.753 - 0.896	0.000			

BMI, body mass index; COPD, chronic obstructive pulmonary disease; OA, osteoarthritis; CIRS, Cumulative Illness Rating Scale; MMSE, Mini Mental State Examination; HADS, Hospital Anxiety and Depression Scale.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344044
2018;21(3):313-322

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Received: 01/05/2018
Accepted: 03/09/2018

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RESEARCH

ASSESSMENT OF ORAL HEALTH-RELATED QUALITY OF LIFE AMONG ELDERLY PATIENTS WITH PERIODONTAL DISEASE

ABSTRACT

Introduction: The aim of this study was to assess the impact of oral health-related quality of life in elderly patients with periodontal disease.

Materials and Method: In total, 110 elderly patients (age range 65 to 92) were included in this study. The Geriatric Oral Health Assessment Index questionnaire was used to determine the perceived oral health-related quality of life of the participants. Gingival index, plaque index, clinical attachment level, probing pocket depth, and bleeding on probing measurements were performed to determine the periodontal status.

Results: The total Geriatric Oral Health Assessment Index score was significantly higher among elderly patients with severe periodontitis (25.69±6.80) than among those with gingivitis (21.35±7.01). Higher scores indicate a poorer oral health-related quality of life among elders with periodontal disease. Furthermore, this score was significantly associated with gingival recession, mobile teeth, and oral malodor (p<0.05).

Conclusion: As the severity of periodontal disease increases, a poorer oral health-related quality of life is observed. Having an overview of the adverse effects of periodontal problems on the daily life of elderly patients will facilitate the understanding of the relationship between general health and oral health. Additionally, the assessment of oral health-related quality of life may play an important role in clinical practice regarding identification of patients' oral health conditions and treatment needs and improving patient communication.

Keywords: Aged; Quality of Life; Periodontal Diseases

ARAŞTIRMA

PERİODONTAL HASTALIĞI OLAN YAŞLI HASTALARDA AĞIZ SAĞLIĞIYLA İLİŞKİLİ YAŞAM KALİTESİNİN DEĞERLENDİRİLMESİ

Öz

Giriş: Bu çalışmanın amacı yaşlılarda periodontal hastalığın, ağız sağlığı ile ilişkili yaşam kalitesi üzerine etkisini değerlendirmektir.

Gereç ve Yöntem: Çalışmaya 110 yaşlı hasta (yaş aralığı 65-92 arasında olan) dahil edildi. Bireylerin algılanan ağız sağlığı ile ilişkili yaşam kalitesini belirlemek için Geriatrik Ağız Sağlığı Değerlendirme Endeksi anketi kullanıldı. Periodontal durumu belirlemek için plak indeksi, gingival indeks, sondalamada kanama, sondalanan cep derinliği ve klinik ataşman seviyesi ölçümleri yapıldı.

Bulgular: Şiddetli periodontitise sahip yaşlılardaki toplam Geriatrik Ağız Sağlığı Değerlendirme Endeksi skoru (25.69±6.80), gingivitis olan yaşlılara göre (21.35±7.01) anlamlı derecede yüksekti. Daha yüksek puanlar periodontal hastalığa sahip yaşlılar arasında daha kötü bir ağız sağlığı ile ilişkili yaşam kalitesi olduğunu gösterdi. Geriatrik Ağız Sağlığı Değerlendirme Endeksi skoru dişeti çekilmesi, diş mobilitesi ve ağız kokusu ile ilişkili bulundu (p<0.05).

Sonuç: Periodontal hastalığın şiddeti arttıkça daha düşük bir ağız sağlığı ile ilişkili yaşam kalitesi skoru gözlenmektedir. Yaşlılardaki periodontal problemlerin günlük yaşamdaki olumsuz etkilerini belirlemek, genel sağlık ve ağız sağlığı arasındaki ilişkiyi de anlamaya yardımcı olacaktır. Ek olarak, ağız sağlığı ile ilişkili yaşam kalitesinin değerlendirilmesi, hastanın ağız sağlığı durumunu ve tedavi gereksinimlerini tanımlamak ve hastalarla iletişimi geliştirmek açısından da klinik uygulamalarda önemli bir rol oynayabilir.

Anahtar sözcükler: Yaşlı; Yaşam Kalitesi; Periodontal Hastalıklar

INTRODUCTION

Periodontal diseases are complex inflammatory diseases characterized by progressive destruction of peripheral connective tissue and the alveolar bone; they continue to be a major oral health problem (1). Although aging induces changes in the oral mucosa, jawbones, and teeth, periodontal disease is not a natural consequence of aging. Periodontal diseases, and consequently tooth loss, among the elderly are considered to be caused by systemic diseases, drugs, psychological issues, and a decreased interest in or ability to perform oral hygiene practices (2).

Periodontal disease is the most common cause of tooth loss in the elderly and can lead to deterioration of eating habits and chewing function among them, negatively affecting the quality of life (QoL) (3). Furthermore, periodontal disease is associated with clinical symptoms such as persistent oral malodor, chronic inflammation, bleeding on brushing, redness, and loosening of affected teeth (1). These clinical symptoms may significantly affect QoL because oral health has a major impact on the functional, structural, aesthetic, physiological, and psychosocial aspects of life (4).

Oral health-related quality of life (OHRQoL) is a multidimensional concept that includes the nutrition of individuals, their sleeping habits, the variables affecting their communication with other individuals, and their satisfaction with oral health (5). The relationship between patient-centered outcomes and periodontal treatment has recently been explored from a wider perspective (6,7). Needleman et al. explored the effect of oral health on quality of life in a group of patients with periodontal disease (8). After the aforementioned study, the number of studies investigating the effect of periodontal disease on QoL increased (1,9).

Periodontal disease is a common problem among the elderly all over the world and is the leading cause of oral health problems among elderly people (3). However, studies on QoL in the

elderly have been conducted regarding conditions such as dental caries, xerostomia, or tooth loss (10,11). Little has been reported about OHRQoL associated with periodontal disease or health in the elderly population (12).

“The assessment of OHRQoL has an important role in clinical practice as well as in oral health research (13). The Geriatric Oral Health Assessment Index (GOHAI), one of the most comprehensive assessment instruments for OHRQoL measurement, was developed to be used in the elderly population. It is a 12-item measurement tool that measures oral physical functioning problems reported by the patient while also assessing psychosocial effects resulting from oral diseases (14).

The aim of this study was to determine the effects of periodontal disease on quality of life of the elderly, considering that a better understanding of the perceived effects of periodontal disease among elderly individuals may help plan and improve patient care and reduce their anxieties.

MATERIALS AND METHOD

The study protocol was approved by the Ethics Committee of Cumhuriyet University (decision no.:2017-01/29). The study was performed in accordance with the relevant guidelines of the Declaration of Helsinki. The information about the study purpose, content, and procedures was provided either verbally or in writing in the participant information and approval form. Patients willing to participate in the study have signed this form.

Study population

In total, 240 elderly patients (age range 65 to 92) were recruited from the Periodontology Department, Faculty of Dentistry, Gaziosmanpasa University, between December 2016 and June 2017. Four patients refused to participate, and 126 patients met the exclusion criteria. Consequently, 110 patients were included in the study.



Inclusion criteria included presence of at least 15 teeth and good general health. Smokers and individuals with any systemic disease that may affect periodontal status were excluded from the study because smoking and systemic diseases, such as cardiovascular disease or diabetes, may increase the risk of periodontal disease and have a greater impact on QoL. Patients who had undergone periodontal treatment in the last 6 months, suffered from tooth pain due to deep caries, or had psychiatric disorders were also excluded from the study.

Periodontal examination

Another group of 15 randomly selected patients who were not included in the study population were evaluated to estimate the reliability of measurement methods prior to the implementation. A duplicate examination of periodontal measurements was performed within 24 h of the initial evaluation. The kappa values of periodontal data were all over 0.78.

After recording the demographic characteristics of each patient, a detailed periodontal examination was performed. Plaque index (PI) (15), gingival index (GI) (15), probing pocket depth (PPD), bleeding on probing (BOP), and clinical attachment level (CAL) measurements were performed. PPD was measured in millimeters from the gingival margin to the base of the periodontal pocket. CAL was calculated as the distance in millimeters from the cemento-enamel junction to the bottom of the periodontal pocket. BOP was recorded based on the presence or absence of bleeding up to 60 s after probing at the experimental sites. The measurements were performed using a periodontal probe (Hu-Friedy Co., Chicago, IL, USA) at six sites per tooth (mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual, and distolingual), excluding third molars. Chronic periodontitis and gingivitis were diagnosed based on the clinical and radiographic criteria by one calibrated examiner (OG). Gingivitis was diagnosed if gingival inflammation was present without loss of connective tissue attachment and probing pocket

depth >3 mm. Moderate chronic periodontitis was diagnosed if periodontal attachment loss of ≥ 4 mm and probing pocket depth 3-5 mm in over 30% of the remaining teeth was present. Severe chronic periodontitis was diagnosed if periodontal attachment loss of ≥ 6 mm and probing pocket depth >5 mm in over 30% of the remaining teeth was present (16).

Assessment of quality of life

The impact of periodontal disease on QoL of elderly patients was assessed using GOHAI; it is a 12-item measurement tool developed as a self-reported oral health assessment index, especially for use in the elderly population. This index evaluates the effects of oral conditions on QoL of the elderly in three dimensions: physical function (item 1-4), psychosocial impacts (item 6, 7, 9, 10 and 11), and pain and/or discomfort (item 5, 8 and 12) (14). Elderly patients answered the negatively framed questions more easily and appropriately (17). Therefore, three items in the GOHAI questionnaire (items 3, 5, 7) were expressed negatively. Each of the 12 items is scored from 1 to 5 (always = 5, often = 4, sometimes = 3, seldom = 2, never = 1). Consequently, the total score ranged from 12 to 60, with higher scores indicating a poorer OHRQoL. The Turkish version of GOHAI showed acceptable reliability and validity (18).

Furthermore, the patients were asked to provide a checklist of symptoms related periodontal disease, such as gingival recession, swollen gums, loose teeth, mobile teeth, and oral malodor, comparing these to symptoms in past years.

Statistical analysis

Data were analyzed using the statistical package SPSS 11.0 (SPSS Inc., 2002). With an effect size of 0.29 and to provide a 5% confidence interval was considered appropriate a sample size of at least 108. Variations in mean self-reported periodontal disease symptoms and GOHAI scores were investigated using bivariate analysis using t-tests for independent samples. One way variance analysis

(One way ANOVA) was employed to examine the differences in GOHAI and subscales scores of elders between the different periodontal statuses. Pearson correlation coefficients were used to measure correlations of the association between clinical periodontal measurements and GOHAI scores. The values of Cronbach's alpha were calculated to assess the internal consistency.

RESULTS

In this study, 110 patients (56 females and 54 males) completed the GOHAI questionnaire. Sociodemographic characteristics of the elderly patients are presented in Table 1. The number of patients with gingivitis, moderate chronic periodontitis, and severe chronic periodontitis were 31, 40, and 39, respectively. Of all the patients, 90.9% were primary school graduates (Table 1).

In Table 2, the general distribution of responses according to GOHAI items were shown. The effect of oral health on QoL of the elderly was shown to be important in terms of physical function, pain, discomfort, and psychosocial effects. Approximately 12% of the elderly had difficulty eating due to teeth and gum problems, and about 30% of them had problems chewing or biting. Furthermore, 20% of the elderly were unhappy with the appearance of their gums and teeth (Table 2).

As presented in Table 3; individual subscales, internal consistency, and the mean scores for GOHAI. Cronbach's alpha values were 0.778 and 0.714–0.736 for GOHAI and individual subscales, respectively.

The comparison of GOHAI and subscale scores according to periodontal disease status such as gingivitis, mild periodontitis, and severe periodontitis is shown in Table 4. A significant difference in total score and physical function subscale was found between elderly patients with gingivitis and those with severe periodontitis. However, the differences in psychosocial impact

and pain and discomfort subscales were not significant.

OHRQoL of elderly patients was found to be associated with self-reported periodontal symptoms (Table 5). The GOHAI score was found to be significantly associated with gingival recession, mobile teeth, and oral malodor. Swollen gums, loose teeth, and sore gums were not found to be associated with the GOHAI score.

The correlations between GOHAI scores and periodontal clinical measures are shown in Table 6. Psychosocial impacts subscale score was found associated with 3-5 mm probing pocket depth. Pain and discomfort subscale score was affected by gingival recession (Table 6).

Table 1. Sociodemographic characteristics and periodontal status of elderly.

Variable	
Age (years)	72.13±4.33
Gender [n (%)]	
Men	54 (49.1)
Women	56 (50.9)
Marital status [n (%)]	
Married	88 (80.0)
Widowed	22 (20.0)
Education Level [n (%)]	
Primary school	100 (90.9)
Secondary school	- (-)
High school	4 (3.6)
University	6 (5.5)
Periodontal status [n (%)]	
Gingivitis	31 (28.2)
Mild periodontitis	40 (36.4)
Severe periodontitis	39 (35.5)

**Table 2.** Distribution of GOHAI individual item response.

	Never (1)	Seldom (2)	Sometimes (3)	Often (4)	Always (5)	Mean scores
Physical function						
1. Limit the kinds of food	47 (42.7)	30 (27.3)	19 (17.3)	9 (8.2)	5 (4.5)	2.05
2. Trouble biting / chewing	30 (27.3)	24 (21.8)	34 (30.9)	12 (10.9)	10 (9.1)	2.53
3. Uncomfortable to swallow	54 (49.1)	31 (28.2)	15 (13.6)	4 (3.6)	6 (5.5)	1.88
4. Prevented from speaking	58 (52.7)	31 (28.2)	8 (7.3)	8 (7.3)	5 (4.5)	1.83
Psychosocial impacts						
6. Limit contacts with people	75 (68.2)	16 (14.5)	11 (10)	2 (1.8)	6 (5.5)	1.62
7. Unhappy with appearance of gums and teeth	57 (51.8)	19 (17.3)	22 (20)	7 (6.4)	5 (4.5)	1.94
9. Worried about teeth or gums	51 (46.4)	32 (29.1)	22 (20)	3 (2.7)	2 (1.8)	1.84
10. Nervous / Self-conscious of teeth or gums	55 (50)	24 (21.8)	24 (21.8)	2 (1.8)	5 (4.5)	1.89
11. Uncomfortable eating in front of others	63 (57.3)	19 (17.3)	13 (11.8)	2 (1.8)	13 (11.8)	1.94
Pain and discomfort						
5. Discomfort when eating	44 (40)	11 (10)	26 (23.6)	14 (12.7)	15 (13.6)	2.5
8. Use medication to relieve pain	54 (49.1)	22 (20)	23 (20.9)	6 (5.5)	5 (4.5)	1.96
12. Gums, teeth sensitive to hot/cold	48 (43.6)	22 (20)	23 (20.9)	1 (0.9)	16 (14.5)	2.23

Values are given as n (%)

Table 3. Individual subscales, internal consistency and the mean scores for GOHAI.

	Mean scores	Internal consistency
GOHAI	23.24±6.86	0.778
Physical function	8.29±2.9	0.736
Psychosocial impacts	9.23±3.98	0.734
Pain and Discomfort	6.69±3.22	0.714

Table 4. GOHAI and subscales scores of elders with mild / severe periodontitis and gingivitis and periodontal clinical measurements.

	Gingivitis (n=31)	Mild periodontitis (n=40)	Severe periodontitis (n=39)	p
GOHAI	21.35±7.01 ^a	22.30± 6.23 ^{ab}	25.69±6.80 ^b	< 0.005
Physical function	7.19±2.36 ^a	8.53±3.29 ^{ab}	8.92±2.69 ^b	< 0.005
Psychosocial impacts	6.52±3.46	6.03±2.52	7.51±3.55	0.114
Pain and Discomfort	9.23±4.67	8.88±4.06	9.59±3.33	0.731
CAL(mm)	-	3.94±1.15	6.15±1.64	< 0.005
PPD(mm)	2.07±0.26 ^a	3.08±1.03 ^b	4.96±1.25 ^b	< 0.005
GI	2.14±0.53	2.25±0.65	2.36±0.47	0.070
BOP (%)	69.42±19.45 ^a	78.48±18.23 ^{ab}	81.66±17.84 ^b	< 0.005
PI	1.77±0.58	2.05±0.63	2.33±0.57	0.195

ab The different letters in the row indicate statistical significance.

Table 5. Quality of life and self-reported periodontal symptoms of the elders.

	n (%)	GOHAI scores (mean±sd)	p
Swollen gums			
Yes	52 (47.3)	23.1±6.33	0.931
No	58 (52.7)	22.98±7.21	
Sore gums			
Yes	57 (51.8)	23.44±7.21	0.521
No	53 (48.2)	22.6±6.31	
Gingival recession			
Yes	59 (53.6)	24.1±7.2	< 0.005
No	51 (46.4)	21.8±6.08	
Mobile teeth			
Yes	62 (56.4)	24.13±6.62	< 0.005
No	48 (43.6)	22.19±6.82	
Loose teeth			
Yes	53 (48.2)	23.74±7.01	0.631
No	57 (51.8)	22.28±6.5	
Oral malodor			
Yes	50 (45.5)	24.13±7.52	< 0.005
No	60 (54.5)	21.72±5.55	

**Table 6.** The correlations between GOHAI scores and periodontal clinical measures.

	GOHAI scores	Physical function	Psychosocial impacts	Pain and discomfort
PI	.131	.078	.165	.029
GI	.017	.017	.034	-.020
PPD<3mm (Gingivitis)	-.071	.049	-.122	-.030
PPD 3-5mm (Moderate periodontitis)	-.125	-.330*	.101	-.140
PPD>5mm (Severe periodontitis)	.293	.349	-.239	.159
REC	.125	-.069	.140	.205*

Statistical analysis was performed by a Pearson correlation coefficient test.

* $p < 0.05$, ** $p < 0.01$

DISCUSSION

Recently, periodontal treatment and patient satisfaction, in other words, patient-focused outcomes have been explored with a broader concept (6,9). With the increasing interest in QoL, the number of articles on this subject is also increasing (1,4). Although studies reporting QoL as a patient-focused measurement strategy have been published in areas such as orthodontics and oral surgery, little information has been reported on OHRQoL associated with periodontal disease or health (1). Additionally, OHRQoL associated with periodontal disease is a less investigated issue than OHRQoL associated with other oral problems such as tooth loss and dental caries (19). Moreover, periodontal disease is a widespread problem among the elderly worldwide and is the leading cause of oral health problems in this population (3). However, little is known about the impact of oral health on QoL of the elderly population with periodontal disease.

In the study by Needleman et al., the effect of oral health on QoL was assessed using oral health related quality of life – United Kingdom (OHRQoL-UK) in a periodontal patients' group, and periodontal status was demonstrated to have a marked effect on QoL (8). Subsequently, in a study by Ng and Leung, the differences in QoL were investigated

using the Oral Health Impact Profile-14 (OHIP-14) in various periodontal conditions, and a significant correlation was found between periodontal disease and OHRQoL. The OHRQoL score was significantly different among patients with different periodontal status (1). The present study showed a significant difference between the GOHAI scores of elderly patients with different periodontal status. No such study has yet been conducted involving elderly patients with different periodontal status, but our study results corroborate with a study by Irani et al. that showed significantly different OHRQoL scores in non-diabetic patients with different periodontal status (20).

Similarly, in the present study, elderly patients with severe periodontitis had significantly higher GOHAI and physical function subscale scores than those with gingivitis regarding the impact of oral health on their QoL. Therefore, while elderly patients might perceive their physical functions to be significantly affected by their oral status, they would not be significantly affected in terms of pain, discomfort, and psychosocial effects at the same time. Patients usually continue to live with fewer symptoms such as tooth mobility without any sense of pain, swelling, and bleeding, or no symptoms at all. Therefore, periodontal diseases are commonly regarded as "silent diseases" (4). Moreover, social

anxiety may not be as important among the elderly as it is among young people (21). Consistent with this, the most important factor for elderly patients is the ability to chew well (10). The present study findings show that the greatest effects of periodontal disease on QoL of elderly patients are related to trouble biting/chewing, discomfort when eating, and gums or teeth being sensitive to hot/cold, whereas limited contact with people, being prevented from speaking, and worries about teeth or gums have a lesser impact.

Ozçelik et al. evaluated the postoperative effects of different treatments on health-related QoL in patients with periodontitis. The preoperative GOHAI scores of the three test groups ranged from 24.5 to 26 (9). In this study, the GOHAI scores of elderly patients with chronic periodontitis were similar to those reported by Ozçelik et al (9). Guzeldemir et al. conducted a study on Turkish population and investigated the periodontal status of patients undergoing hemodialysis; they reported that the GOHAI score was 15.72 ± 8.68 , which is lower than the GOHAI scores in the present study (22). The elderly population and the generally poorer periodontal status in the present study group may explain the differences. The mean GOHAI scores in studies investigating periodontal status and OHRQoL reported in literature range between 12.2 and 44.1 (23, 24), which indicates the effect of factors such as a variety of conceptual models, social and cultural differences, individual history, treatment of oral problems, and access to dental care (4).

In this study, the impact of oral health was found to have significant importance on QoL of elderly patients with periodontal disease. The findings emphasize the importance of the impact periodontal disease can have on a person's daily life and overall QoL. Socially and economically disadvantaged elderly patients may be at a greater risk for periodontal disease. As people age, their physical and mental capacities may diminish. This also affects their ability to maintain oral health (25). Therefore, the elderly are more

susceptible to periodontal disease (2). Moreover, periodontal disease is a major cause of tooth loss (1). The number of teeth present in oral cavity is an important indicator of oral function and oral health. It has been reported that the number of remaining teeth in the elderly is related to the ability to chew, intake of nutrients, and QoL (10). This may reflect the importance of the impact of periodontal disease in elderly patients.

Changes in OHRQoL were evident due to the symptoms of periodontal disease reported by the patients themselves. Presence of "gingival recession," "mobile teeth," and "oral malodor" were associated with a poor QoL. An important feature of patient-centered measures is their discriminative ability. Elderly patients with severe periodontal destruction are reported to have poorer OHRQoL. This supports the idea that the measurement of OHRQoL is susceptible to self-reported and clinically observed periodontal status (1,8,23).

Cronbach's alpha of OHIP-14S and subscale scores were high; the reliability of the scale is accepted as good. The lowest Cronbach's alpha (0.71) values were associated with pain and discomfort subscale. These values indicate that the scale as a whole and its sub-dimensions are self-consistent and the items have reasonably satisfactory validity when applied in the present sample of subjects.

This study has some limitations. Ultimately, the examined elderly patients were selected from a population sample that was referred to the dental faculty. In this respect, the generalizability of existing findings cannot be considered satisfactory. However, the study by Ng and Leung showed that periodontal destruction can directly affect QoL (1). Participants in this study were elderly patients diagnosed with periodontal disease by a specialist periodontologist. At this point, it is important to understand that periodontal problems in elderly patients affect their daily lives and the resulting difference in oral health is understandable.



In conclusion, the assessment of OHRQoL may play an important role in clinical practice in terms of identifying patients' oral health condition and treatment needs as well as improving communication with them. From a periodontal point of view, this is important in terms of understanding perceptions and concerns about the consequences of periodontal disease, their impact on the lives of elderly patients, planning periodontal care, meeting the needs of elderly patients, eliminating their concerns, and emphasizing the importance of periodontal care in society.

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Conflict of interest

The authors declare that they have no competing interests.

ACKNOWLEDGEMENT

The authors received no financial support for the research, authorship and/or publication of this article. We would like to thank the Osman Demir from Gaziosmanpasa University for their statistical contributions in these study.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344046
2018;21(3):323-332

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Received: 05/02/2018
Accepted: 21/05/2018

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RESEARCH

NON-TRADITIONAL MORTALITY PREDICTORS FOR GERIATRIC INTENSIVE CARE UNIT PATIENTS

ABSTRACT

Introduction: There is an increased number of elderly patients in intensive care units. Decreased physiological reserve and frailty makes them more vulnerable to illnesses.

Materials and Method: Geriatric intensive care unit patients (n=1093), who had no history of malignancy and chemotherapy with hospitalised more than 3 days were examined retrospectively. Clinical and laboratory values on admission and at the final, discharge or dead, were recorded. Non traditional mortality predictors neutrophil-to-lymphocyte count (NLR) and mean platelet volume (MPV), and timely changes of these parameters were examined.

Results: Readily measurable and effective markers foreseeing outcome are vital importance. In this retrospective cohort, we showed that neutrophil-to-lymphocyte count (NLR) and mean platelet volume (MPV) are independent mortality predictors in geriatric patients. In addition timely changed NLR and MPV were also independent mortality predictors [0.41 (95% CI 0.30-0.55) p<0.001 and 0.43 (95% CI 0.31-0.59) p<0.001, respectively].

Conclusions: These easily measurable and cheap parameters can be good patient follow-up parameters in geriatrics patients who have increased mortality due to cardiovascular and sepsis related diseases.

Keywords: Geriatrics, Cardiovascular disease, Inflammation, Mortality

ARAŞTIRMA

GERİATRİK YOĞUN BAKIM HASTALARINDA MORTALİTE ÖNGÖRÜCÜLERİ

Öz

Giriş: Yoğun bakımlarda izlenen geriatric hasta sayısı giderek artmaktadır. Fizyolojik rezervlerin azalması ve kırılabilirlik, bu hastaları, daha savunmasız hale getirmektedir. Prognozu öngörmeye, kolay ölçülebilen ve etkili göstergeler hayati önem taşımaktadır.

Gereç ve Yöntem: Bu çalışmada, yoğun bakım ünitesinde 3 günden fazla yatarak izlenen, herhangi bir malignite ve kemoterapi öyküsü olmayan geriatric hastaların (n=1093) verileri retrospektif olarak incelenmiştir. Hastaların laboratuvar ve klinik verileri, kliniğe giriş ve sonlanım olmak üzere kaydedildi. Geleneksel olmayan mortalite öngörücüleri; nötrofil-lenfosit oranı (NLO) ve ortalama trombosit hacmi (MPV) ve bu parametrelerin zamansal değişimi incelenmiştir. Retrospektif kohort çalışmamızda, geriatric hastalarda nötrofil-lenfosit oranı (NLO) ve ortalama trombosit hacminin (MPV) bağımsız mortalite prediktörleri olduğunu saptadık. Aynı zamanda, NLO ve MPV'nin zamanla değişiminin de mortalite göstergesi olduğunu saptadık [sırasıyla 0.41 (% 95CI 0.30-0.55) p<0.001 ve 0.43 (% 95CI 0.31-0.59) p<0.001].

Sonuç: Bu kolay ölçülebilen ve ucuz elde edilebilen göstergeler, kardiyovasküler ve sepsisle ilişkili hastalıklara bağlı mortalite oranı artmış geriatric hastalarında, iyi birer hasta başı takip parametresi olabilirler.

Anahtar sözcükler: Geriatric, Kardiyovasküler hastalık, İnflamasyon, Mortalite

INTRODUCTION

There is an increased number of critically ill geriatric patients in hospitals who require intensive care unit (ICU) services. During ageing, diseases that involve multiple organ-systems and anatomical and physiological deteriorations occur in combination. Decrease in physiological reserve renders geriatric patients more vulnerable to illnesses and adverse events. In this population, preventive measures can be life-saving (1,2). The ratio of neutrophil-to-lymphocyte counts (NLR) and mean platelet volume (MPV) are easily measurable and novel inflammatory markers that can be used as indicators of systemic inflammation (3-5). In this retrospective study, we sought to investigate non-traditional mortality predictors for geriatric patients with generalised inflammation and cardiovascular complications.

MATERIALS AND METHOD

This retrospective report focussed on ICU patients treated between January 2010 and January 2017. We excluded patients younger than 65 years old and those older than 65 years old who had histories of malignancy, chemotherapy or death during the first 3 days of hospitalisation. We examined patients' laboratory and medical histories, including observational records, demographic characteristics and medications through Patient Database System.

Data of interest included demographics, such as age and sex. In addition, we examined patients' reasons for admission and comorbid clinical illnesses as specified in their medical histories. We recorded non-traditional inflammation markers, MPV, NLR and routine biochemical blood analyses with complete blood count (CBC). Records at baseline (baseline) and at discharge (final) were included in the statistical analyses. Changes in NLR and MPV during the hospital stay were summarised as Δ NLR, final NLR-baseline NLR, Δ MPV and final MPV-baseline MPV.

Posterior-anterior chest radiographs were obtained to regularly measure the cardiothoracic

ratio (CTR) especially in hypertensive subjects, patients with histories of congestive heart failure (CHF) and those suffering from hypervolemic states. Analysis was done by the same operation team with the same computer software to ensure measurement accuracy. The CTR was calculated by dividing the maximal horizontal width of the heart by the horizontal diameter of inner borders of the rib cage (6).

Between two groups, alive and deceased patients, numerical variables are compared by Two-Independent Samples Student-t test. Categorical variables are compared by Pearson Chi-Square test. To determine the mortality predictors, univariate logistic regression and multiple logistic regression, by Forward stepwise likelihood ratio method, analysis were performed. Overall significance level is % 5. IBM SPSS ver 23.0 (SPSS Inc., Chicago, IL, USA.) is used for analyses.

RESULTS

We initially identified 3883 ICU patients. After application of exclusion criteria, 1093 geriatric patients were included in the final analyses. The mean age of the 1093 patients was 77.2 ± 7.1 with a mean hospital stay of 7.7 ± 6.0 days. Within our cohort, 40.5% were diabetic, 50.7% were female, 32.3% had congestive heart failure (CHF) and 72.9% had histories of cardiovascular disease (CVD). During the ICU stay, 24% died ($n=262$) due to various reasons including sepsis-related complications ($n=132$), cardiovascular complications ($n=103$), respiratory failure ($n=2$) and gastrointestinal bleeding ($n=2$).

The univariate analysis of clinical and laboratory characteristics of the study patients, whose alive or dead, are shown in Table 1a and 1b. Mortality predictors of study population in univariate and multivariate logistic regression analysis are shown in table 3a. When we compared living and deceased subjects, age and gender did not reach a level of statistical significance. However, hemodialysis dependence was significant mortality



predictor (1.64, 95% CI 1.23–2.19 $p < 0.001$) in whole population. CTR also did not reached statistical significance (1.01, 95% CI 0.979–1.024, $p = 0.907$) in whole population. However, N-terminal pro-B-type natriuretic peptide (NTproBNP) emerged as mortality predictor (1.002, 95% CI 1.001–1.004, $p = 0.006$). Patients' NLR and MPV changes, while in the ICU, are represented in Figure 1.

We also performed univariate analysis in a subgroup (>80 years old) of study population

(Table 2a and 2b). Mortality predictors that emerged from this analysis are represented in Table 3b. This subgroup included 372 patients, with a mean age of 85.2 ± 3.4 and a mean hospital stay duration of 8.0 ± 7.2 days. During the hospital stay, 26.3% of these patients died ($n = 98$) from various reasons including sepsis-related complications ($n = 26$), cardiovascular complications ($n = 64$), and respiratory failure ($n = 8$). Subgroup NLR and MPV changes, while in the ICU, are shown in Figure 2.

Table 1a. Univariate analysis of mortality predictors of ≥ 65 years old (Independent Samples t-Test).

		Mean	(\pm)sd	p
Age	A	77.03	7.00	0.281
	M	77.57	7.25	
CTR(%)	A	57.53	8.412	0.907
	M	57.64	10.21	
Urea (mg/dL)	A	121.99	80.35	0.007
	M	137.23	76.02	
Creatinine (mg/dL)	A	3.27	2.27	0.421
	M	3.41	2.21	
Albumin	A	3.36	0.66	<0.001
	M	2.91	0.63	
CRP (mg/dL)	A	9.85	9.53	<0.001
	M	14.55	10.69	
NTproBNP ($\times 10^3$ pg/mL)	A	14.20	17.06	0.015
	M	22.78	22.04	
PMNL ($\times 10^3/\mu\text{L}$)	A	10.28	7.15	0.006
	M	11.96	8.87	
L ($\times 10^3/\mu\text{L}$)	A	1.50	3.36	0.474
	M	1.31	4.16	
NLR	A	11.37	11.71	<0.001
	M	16.78	17.60	
MPV (fL)	A	10.60	1.36	0.005
	M	10.90	1.53	

A; Alive patients, M; Deceased patients, CRP; C-Reactive protein, PMNL; Polymorphous nucleated leucocytes, L; Lymphocyte, NLR; Neutrophil-to-lymphocyte count, MPV; Mean platelet volume.

Table 1b. Univariate analysis of mortality predictors of ≥65 years old (Chi-Square Tests).

			A	M	p
Gender	Male	Count	375	128	0.321
		% within mortality	45.1%	48.9%	
	Female	Count	456	134	
		% within mortality	54.9%	51.1%	
CHF	A	Count	572	164	0.095
		% within mortality	68.9%	63.3%	
	M	Count	258	95	
		% within mortality	31.1%	36.7%	
HD	A	Count	585	154	0.001
		% within mortality	70.5%	59.2%	
	M	Count	245	106	
		% within mortality	29.5%	40.8%	

A; Alive patients, M; Deceased patients, CHF; History of congestive heart failure, CTR; Cardiothoracic ratio, HD; Haemodialysis,

Table 2a. Univariate analysis of mortality predictors of >80 years old patients (Independent Samples t-Test).

		Mean	sd (±)	p
Age	A	85.12	3.47	0.633
	M	85.31	3.39	
Urea (mg/dL)	A	133.51	86.07	0.449
	M	140.62	76.83	
Creatinine (mg/dL)	A	3.26	2.75	0,999
	M	3.26	2.24	
Albumin	A	3.34	0.61	<0.001
	M	2.91	0.64	
CRP (mg/dL)	A	9.59	8.67	<0.001
	M	13.95	10.72	
NLR	A	12.39	12.58	0.020
	M	17.12	18.50	
MPV (fL)	A	10.52	1.45	0.040
	M	10.86	1.31	

A; Alive patients, M; Deceased patients, CRP; C-Reactive protein, NLR; Neutrophil-to-lymphocyte count, MPV; Mean platelet volume.

**Table 2b.** Univariate analysis of mortality predictors of >80 years old patients (Chi-Square Tests).

			A	M	p
Gender	Male	Count % within mortality	124 45.3%	46 46.9%	0.774
	Female	Count % within mortality	150 54.7%	52 53.1%	
CHF	A	Count % within mortality	184 67.2%	60 61.2%	0.289
	M	Count % within mortality	90 32.8%	38 38.8%	
HD	A	Count % within mortality	205 75.1%	65 66.3%	0.094
	M	Count % within mortality	68 24.9%	33 33.7%	

A; Alive patients, M; Deceased patients, CHF; History of congestive heart failure, CTR; Cardiothoracic ratio, HD; Haemodialysis,

Table 3a. Logistic regression analysis of the mortality predictors (≥ 65 years old).

	Univariate Logistic Regression			Multiple Logistic Regression		
	OR	95%CI	p	OR	95% CI	p
Age	1.01	0.99-1.03	0.283			
Gender (M)	1.16	0.88-1.54	0.283			
CHF	1.29	0.96-1.73	0.089			
CTR (%)	1.01	0.979-1.024	0.907			
HD	1.64	1.23-2.19	<0.001	2.17	1.39-3.39	<0.001
Urea mg/dL	1.002	1.001-1.004	0.008			
Creatinine mg/dL	1.31	0.09-1.12	0.876			
Albumin g/dL	0.34	0.27-0.44	<0.001	0.33	0.24-0.45	<0.001
CRP mg/dL	1.04	1.03-1.05	<0.001	1.02	1.00-1.04	0.035
NTproBNP pg/mL	1.002	1.001-1.004	0.006			
PMNL $10^3/\mu\text{L}$	1.03	1.01-1.04	0.003	1.02	1.08-1.56	0.034
L $10^3/\mu\text{L}$	0.78	0.64-0.93	0.491			
NLR	1.03	1.02-1.04	<0.001	1.02	1.01-1.03	<0.001
MPV fL	1.17	1.05-1.30	0.005			

CHF; History of congestive heart failure, CTR; Cardiothoracic ratio, HD; Haemodialysis, CRP; C-Reactive protein, PMNL; Polymorphous nucleated leucocytes, L; Lymphocyte, NLR; Neutrophil-to-lymphocyte count, MPV; Mean platelet volume. Significant mortality predictors ($p \leq 0.10$) in univariate logistic regression were entered into multiple logistic regression analysis by forward stepwise likelihood ratio method.

Table 3b. Logistic regression analysis of the mortality predictors (>80 years old).

	Univariate Logistic Regression			Multiple Logistic Regression		
	OR	95% CI	p	OR	95% CI	p
Gender (M)	0.93	0.58-1.48	0.774			
CHF	1.29	0.83-2.08	0.290			
HD	1.53	0.92-2.52	0.09	2.07	1.15-3.72	0.014
Urea mg/dL	1.001	0.998-1.004	0.473			
Creatinine mg/dL	1.000	0.915-1.092	0.993			
Albumin g/dL	0.33	0.21-0.50	<0.001	0.34	0.20-0.56	<0.001
CRP mg/dL	1.048	1.02-1.07	<0.001			
NTproBNP pg/mL	1.000	1.000-1.000	0.080			
PMNL 10 ³ /μL	1.000	1.000-1.000	0.159			
NLR	1.02	1.00-1.03	0.009			
MPV fL	1.19	0.99-1.42	0.050			

CHF; History of congestive heart failure, CTR; Cardiothoracic ratio, HD; Haemodialysis, CRP; C-Reactive protein, PMNL; Polymorphous nucleated leucocytes, L; Lymphocyte, NLR; Neutrophil-to-lymphocyte count, MPV; Mean platelet volume. Significant mortality predictors ($p \leq 0.10$) in univariate logistic regression analysis were entered into multiple logistic regression analysis by forward stepwise likelihood ratio method.

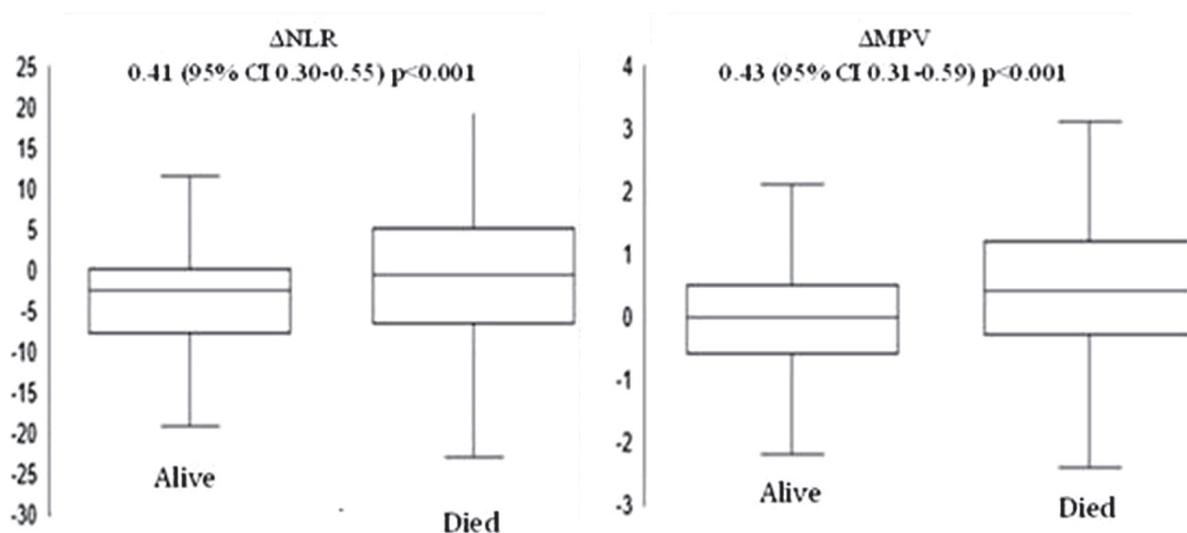


Figure 1. Odds ratios represent the effect of NLR and MPV change during the intensive care unit course in multiple logistic regression analysis. As compared to increments in Δ NLR and Δ MPV, same or decreased values are independent life saving parameters.

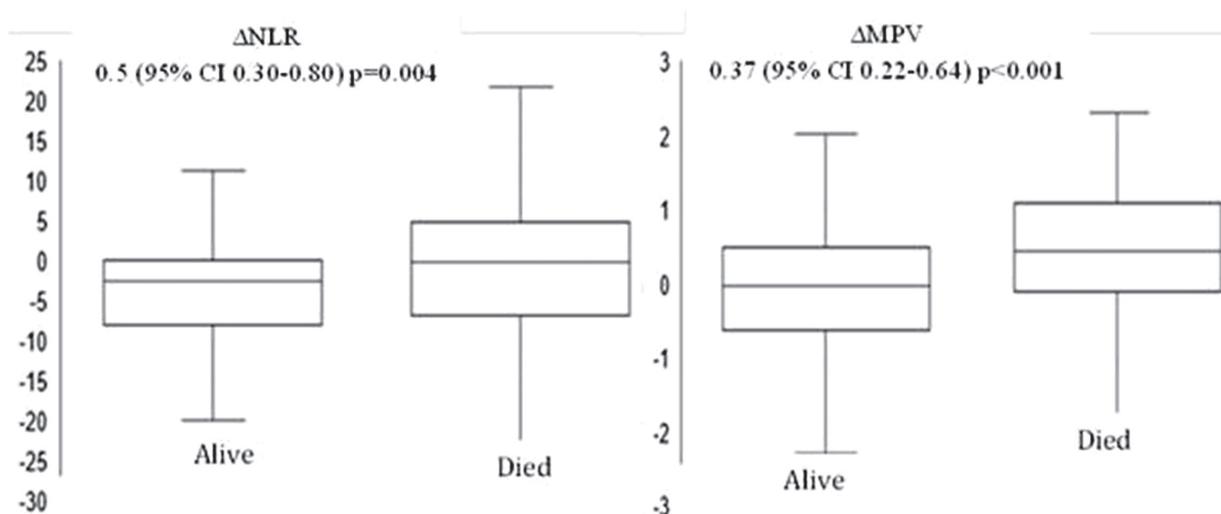


Figure 2. Odds ratios represent the effect of NLR and MPV change during the intensive care unit course in multiple logistic regression analysis in subgroup population (>80 years old). As compared to increments in Δ NLR and Δ MPV, same or decreased values are independent life saving parameters.

DISCUSSION

According to results of logistic regression, to need hemodialysis, serum urea, albumin, CRP, NTproBNP, NLR and MPV values with PMNL count were detected as mortality predictors in whole geriatric population. In the >80 years old population, to need hemodialysis, serum albumin, CRP and NLR values were independent mortality predictors in univariate logistic regression analysis. To avoid multicollinearity, we applied multiple logistic regression analysis by forward stepwise likelihood ratio method. In multiple logistic regression model, to need hemodialysis, serum albumin, CRP and NLR values with PMNL count were detected as independent mortality predictors in whole population while serum albumin level and to need hemodialysis were detected as independent mortality predictors in >80 years old population. In this retrospective study, we determined that change in NLR and MPV during the ICU stay are reliable predictors of mortality in geriatric patients.

As shown in literature, low serum albumin levels, increased CRP, to need haemodialysis and increased

serum Urea/Creatinine levels were also associated with higher mortality rates (7-11). Age was the leading cause of mortality in hospitalised patients, especially in ICUs. However, we did not observe a statistically significant correlation between age and mortality in our study. Besides increases in age-related mortality, the frailty frequently seen in geriatric patients, and its accompanying comorbidities, may play a larger role (12,13).

Our study patients demonstrated high rates of cardiovascular disease. CTR and NTpBNP were also examined. CTR is a cheap and readily obtainable parameter in patients suffering from cardiovascular complications. In addition, CTR is strongly associated with patient mortality (14,15). There is an increased data pertaining to NTpBNP levels and the relationship of these levels to cardiovascular and all-cause mortality in geriatric patients (16,17). In addition, generalised inflammation associated with various clinical conditions is strongly associated with higher NTpBNP levels. We did not confirm any relation like previously reported in literature between CTR values and mortality in our study. This

may have resulted from the small sample size of our cohort with posterior-anterior chest radiography reports. We found the NTpBNP level to be a significant mortality predictor in geriatric patients (1.002, 95%CI 1.001–1.004, $p=0.006$, $n=222$). Because of the small sample size we did not subject our findings to multiple logistic regression analysis. We believe that in a larger cohort, NTproBNP will emerge as a non-traditional mortality predictor in geriatric patients.

Acute kidney injury and dependence on haemodialysis are independent mortality predictors in ICU patients. In patients with acute kidney injury, especially those in ICUs, serum BUN levels and creatinine weakly correlate with the need for haemodialysis. In the geriatric population there is also an increased risk of sarcopenia associated with poor enteral feeding. This may mask elevated renal function tests. Generalised inflammation and cardiovascular insufficiency are the leading causes of acute kidney injury and the need for haemodialysis (18,19). In our study cohort, sepsis-related complications and cardiovascular complications are major causes of mortality. For that reason, the high mortality rates due to haemodialysis and acute kidney injury were no surprise. Haemodialysis was a significant independent predictor of mortality, both in univariate and multiple logistic regression analyses, whereas serum creatinine and BUN levels were not.

Unfortunately, there is little data concerning the most elderly patients who require ICU services. In our study due to the small number of patients ≥ 85 years old, we evaluated the mortality predictors in patients who were ≥ 80 years old instead. Low albumin levels, increased CRP and NLR values were independent mortality predictors. We also found that baseline NLR and MPV change during the ICU stay were independent mortality predictors among the most elderly patients. These were non-traditional risk factors for mortality in this population.

NLR and MPV are recognised non-traditional risk parameters for microvascular complications, generalised inflammation, and patient mortality and morbidity. There is a strong correlation between these non-traditional risk factors and patient

mortality not only within the geriatric population but also in asymptomatic individuals (20–22). We found that baseline NLR and NLR changes during the hospital stay were independent mortality predictors in the population of geriatric ICU patients who have higher mortality rates due to sepsis, septic shock, and cardiovascular complications. NLR is a cheap and readily-available test for use in a high-risk population. MPV is another non-traditional risk factor for predicting mortality due to cardiovascular complications and generalised inflammation (23–25). Timely change in MPV may reflect mortality risk in geriatric patients. This was the first study to evaluate the relationship between MPV change and mortality in the most elderly patients.

There are some limitations to our study. First, it was performed in a retrospective fashion. Second, we did not complete comprehensive geriatric assessments on our patients during their hospital stays. Combining these non-traditional risk factors with comprehensive geriatric assessments in a prospectively-designed study will likely yield useful information. We also excluded patients who required ventilator support due to the small number of these patients, and their higher associated mortality rates. This may have affected the statistical results. However, our results contain a wide range of data to explain the complex pathophysiology of geriatric illnesses.

This pilot study sought to link demographic, clinical, and laboratory values with mortality outcomes in a cohort of elderly ICU patients. NLR and MPV have advantages for predicting the outcomes of geriatric patients in ICUs. Geriatric patients are more vulnerable to adverse events during hospital stays due to physiological changes inherent in this population. Early identification of critically ill geriatric patients will increase survival in this high-risk and frail population.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research and/or publication of this article.



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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344048
2018;21(3):333-345

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Received: 29/01/2017
Accepted: 11/07/2018

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RESEARCH

STATUS OF NON-COMMUNICABLE DISEASES AND SOME OTHER MAJOR HEALTH PROBLEMS AND ASSOCIATED RISK FACTORS AMONG PATIENTS AGED 65 YEARS AND OVER PRESENTING TO A FAMILY HEALTH CARE CENTER IN KYRENIA

ABSTRACT

Status of non-communicable diseases and some other major health problems and associated risk factors among patients aged 65 years and over presenting to a family health care center in Kyrenia

Introduction: The objective of this study was to determine the status of non-communicable (chronic) diseases and some other major health problems and associated risk factors of people aged ≥ 65 years presenting to a family health care center in a county of the Turkish Republic of Northern Cyprus and to contribute to the activities of healthy aging.

Materials and Method: The study was a descriptive record survey, conducted in the primary health care center of Near East University. The data were collected in December 2016 from data collection forms of patients and the NEU Medical Faculty Hospital information database system. The data were evaluated using the SPSS 18.0 statistical program, with a significance level of $p < 0.05$.

Results: The study was conducted on 396 patients aged 65–96 years, of whom 51% were males and 49% were females. The participants were British 95.5% and Turkish Cypriots 1.5%. The most frequent diagnoses were accidents and injuries, ischemic heart disease, hypertension, lower respiratory infections, and cancer. The results of this study were similar to findings of other country older population groups.

Conclusion: Adoption of preventive measures with the aim of decreasing the risk factors of most frequent health-related problems might reduce their prevalence, with specific environmental precautions to prevent accidents and injuries. Prospective community-based studies could provide new data for the proper evaluation of the aging population and yield evidence-based information for designing future intervention studies.

Keywords: Aged; Aging; Chronic disease; Risk factors

ARAŞTIRMA

GİRNE'DE BİR AİLE SAĞLIĞI MERKEZİNE BAŞVURAN 65 YAŞ VE ÜZERİ HASTALARDA BULAŞICI OLMAYAN HASTALIKLARIN VE DİĞER BAZI ÖNEMLİ SAĞLIK SORUNLARININ VE İLİŞKİLİ RİSK ETMENLERİNİN DURUMU

Öz

Giriş: Bu araştırmanın amacı, Kuzey Kıbrıs Türkiye Cumhuriyeti'nin bir ilçesinde bir aile sağlığı birimine başvuran 65 yaş ve üstü nüfusta bulaşıcı olmayan (kronik) hastalıkların ve sağlığı etkileyen kimi önemli sağlık sorunlarının durumunu ve ilişkili risk etmenlerini belirlemek ve Kuzey Kıbrıs'ta sağlıklı yaşlanma kavramı kapsamındaki çalışmalara katkıda bulunmaktır.

Gereç ve Yöntem: Araştırma tanımlayıcı bir kayıt araştırmasıdır. Araştırmanın verileri, Yakın Doğu Üniversitesi birinci basamak birimi olarak görev yapan bir aile hekimliği merkezine ait dosyalardaki veri toplama formlarından ve Yakın Doğu Üniversitesi Tıp Fakültesi Hastanesi tıbbi bilgi depolama sisteminden Aralık 2016'da toplanmıştır. Veriler SPSS 18,0 istatistik paket program ile değerlendirilmiştir. $P < 0.05$ olan değerler istatistiksel olarak önemli kabul edilmiştir.

Bulgular: Katılımcı sayısı 396, yaş aralığı 65-96 arasındadır. Erkekler %51, kadınlar %49 düzeyindedir. Katılımcıların %95,5'i İngiliz, %1,5'i Kıbrıslı Türk'tür. Sağlık merkezine başvuruların en sık nedeni kaza ve yaralanmalar, iskemik kalp hastalıkları, hipertansiyon, alt solunum yolu enfeksiyonları ve kanser olmuştur. Bu sonuçlar, diğer ülkelerin aynı yaş grup araştırma sonuçlarıyla benzer bulunmuştur.

Sonuç: Sık görülen sağlık sorunlarının risk etmenlerini düşürmeye yönelik koruyucu önlemler, bu hastalıkların sıklığını azaltacak bir ilk adım olarak önerilebilir. Özellikle en sık görülen kaza ve yaralanmaları önleyici özel çevresel önlemler alınması önemlidir. Konuya ilişkin ileriye dönük toplumsal araştırmaların yapılması, ülkedeki yaşlı nüfusun sağlık açısından daha doğru değerlendirmesi için veri oluşturacak ve gelecekte müdahale çalışmalarının yapılması için kanıtı dayalı bilgi sağlayacaktır.

Anahtar sözcükler: Yaşlı; Yaşlanma; Kronik hastalık; Risk etmenleri

INTRODUCTION

Biologically, aging denotes the gradual accumulation of a variety of molecular and cellular damage, resulting in a decline in physiological reserves and an increased risk of many non-communicable or chronic disease (NCDs) which account for morbidity and mortality (1,2).

The modern global strategy on aging and health defines the concept of active aging as "the process of optimizing opportunities for health, participation and security to enhance quality of life as people age" (2). Therefore, the World Health Organization (WHO) adopted the Global Strategy and Action Plan on Ageing and Health 2016–2020 (3-5).

A significant upsurge in the aging population during the last century has introduced the concept of an aging population (6). The 2015 data of the Turkish Statistical Institute states the total population of people aged ≥ 65 years as 6,475,239 (8.2%). The life expectancy at birth is 75.3 years for males and 80.7 for females, with 78 years on an average (7).

In 2015, the global population of the elderly was 8.5% of the overall population. According to the United Nations' 2015 report, the elderly population is estimated to increase from 901 million in 2015 to 2.1 billion by 2050 (6-8) with people > 80 , numbering 434 million (8). The projections in Turkey reveal that the aging population will rise to 10.2% in 2023, and 27.7% in 2075 (9).

NCDs have a substantial prevalence among people aged ≥ 65 years and are most commonly attributed to socioeconomic conditions and lifestyle behaviors, such as poor nutrition, smoking, excess alcohol intake, and insufficient physical exercise. Degenerative, genetic, and hereditary factors also have considerable influence as the primary causes of NCDs at advanced ages (10).

Older adults exhibit common characteristics regarding health issues. Relevant research for

health planning on preventive and promotive measures for them is mandatory for the well-being of the whole society.

In the Turkish Republic of Northern Cyprus (TRNC), as per the 2011 census, the population of people aged ≥ 65 years was 23,258, constituting 8.1% of the overall population and the number of people aged ≥ 65 in Kyrenia was 5653. There is a lack of knowledge about the population health situation in general and specifically on the senior people aged 65 years of age and over in TRNC. Since non-communicable (chronic) diseases (NCDs) comprise one of the major health problems and causes of death of the aging population, there appears to be a need for data on this group of diseases regarding the relevant population group. Thus, our intension was to investigate the data of a family health center in the county of Kyrenia associated with a university hospital, where the records were kept sufficiently by the health center and the medical school. Our main aim was to evaluate the information on NCDs and associated factors but other health problems which were important risk factors for the well-being of this age group were also noted and reported in the study.

The objective of this study was to determine primarily the status of NCDs, some other major health problems and associated risk factors among the older individuals visiting a family health center in a county of TRNC. The long-term objective was contributing to the activities in TRNC for enhancing their health as recommended by WHO.

MATERIALS AND METHOD

The survey was conducted in December 2016 in a family health care center in Kyrenia, serving since 2013 and becoming the primary health unit of the Near East University Medical Faculty (NEUMF) in 2015. The public health system in TRNC does not have a widespread primary health care



organization. The unit of first presentation for the patient may be private offices of doctors, public hospitals or one of the few public health centers, none of which are population based. Kyrenia health center is unique in this respect, serving as a health center of a medical school. Most of the patients in the study were followed for at least five years in this center by a practitioner doctor. However, the health center does not have a registered population either.

The study design was descriptive, based on health and disease records of the described center. The survey was conducted on records of 396 older patients visiting the center from 2013 to 2016, where data were recorded using data collection forms. The older population was defined as people aged ≥ 65 years.

Variables of the study included the age; sex; nationality; marital status; occupation; status of having hepatitis A, B, and C and tuberculosis tests; hepatitis A and B vaccinations; lung X-ray; smoking, alcohol, tea and coffee consumption, performing physical exercises as independent variables. The status of being diagnosed with an NCD; being hospitalized; having undergone a surgery; and drug therapy etc. were dependent variables.

The data were obtained using data collection forms of the center and the medical information database system of NEUMF, which provided information on frequency and reason of visits, diagnoses and therapies.

Grouping of diseases

All of the diseases in the patient records were listed and grouped according to systems and disease causes in some cases. The groups of diseases recorded and drugs prescribed are as follows:

Cardiovascular diseases: Hypertensive heart disease, heart failure, atherosclerotic cardiovascular disease, aortic aneurysm, aortic

valve stenosis, angina pectoris, atrial fibrillation and flutter, heart murmur, arrhythmia, tachycardia, bradycardia, claudication, syncope

Muscle-skeleton system diseases:

Fibromyalgia, chronic fatigue syndrome, carpal tunnel syndrome, rotator cuff syndrome, cervical disc disease, intervertebral disc disorders, Dupuytren's contracture, fractures, meniscal tears, synovitis, arthritis, gonarthrosis, polyarthritus, hallux rigidus, osteophytes, chondromalacia

Respiratory system diseases:

Pulmonary embolism, pneumothorax, pneumonia, asthma, COPD, bronchitis, interstitial lung disease, emphysema

Neurological diseases:

Parkinson's disease, Alzheimer's disease, multiple sclerosis, dementia, cerebrovascular disease, cerebral aneurysm, subarachnoid hemorrhage, middle cerebral artery syndrome, radiculopathy, polyneuropathy, sciatalgia, tremor

Ear, nose, throat diseases:

Vertigo, sensorineural hearing loss, otitis media, cerumen impaction, septal deviation, rhinitis, acute sinusitis, acute pharyngitis, sialadenitis, lymphadenitis

Dermatological diseases:

Psoriasis, dermatitis, urticaria, actinic keratosis, viral warts, tinea corporis, xerosis cutis, cellulitis, subcutaneous follicular lesions, nevus

Gastrointestinal system diseases:

Gastrointestinal hemorrhage, gastroesophageal reflux disease, peptic ulcer disease, diverticulitis, ulcerative colitis, colonic polyps, gastroenteritis, constipation, diarrhea, acute pancreatitis, cholelithiasis

Urogenital system diseases:

Urinary system infections, chronic renal failure, hydronephrosis, cystocele, prostatitis, benign prostate hypertrophy, impotence, dysmenorrhea, postmenopausal atrophic vaginitis

Oncological diseases: Adenocarcinoma; malignant neoplasms of the skin, brain, bladder; and breast, colon, rectum, prostate, lung cancers

Endocrine diseases: Hypothyroiditis, diabetes (types 1 and 2), adrenal gland dysfunction, dyslipidemia, gout, vitamin D insufficiency

Eye diseases: Glaucoma, hypermetropia, refraction disorders, conjunctivitis, blepharochalasis, keratoconus

Hematological diseases: Iron deficiency anemia, other anemias, Von Willebrand disease

Neurological diseases: Dementia, Alzheimer's disease, Parkinson's disease

Autoimmune diseases: Thyroiditis, arthritis, Sjogren's syndrome

Psychiatric diseases: Depression, schizophrenia, panic attack

Infectious diseases: Tuberculosis, pneumonia, poliomyelitis, bacteremia, septic shock

Traumas: War and road accident injuries, head traumas, falls from height, insect bites

Grouping of drugs

Antihypertensive drugs: Diuretics, selective/nonselective β -blockers, angiotensin-converting enzyme (ACE)inhibitors, calcium channel blockers, angiotensin II antagonists

Anticoagulants: Vitamin K antagonists, heparin, other platelet aggregation inhibitors

Gastrointestinal system diseases: Antacids, H_2 -receptor antagonists, proton-pump inhibitors, synthetic anticholinergics, serotonin antagonists

Antihyperlipidemics: HMG CoA reductase inhibitors, fibrates

Vitamin supplementation: Vitamins and/or minerals (vitamins B1,B2,B6,B12,C, potassium, calcium, iron), bisphosphonates

Anti-inflammatories: Acetic acid derivatives, propionic acid derivatives, steroids

Drugs for COPD and asthma: Corticosteroids, inhaler adrenergics (α,β ,selective, nonselective anticholinergics)

Insulin and oral hypoglycemics: Short, intermediate, or long-acting injectable insulin and analogues; biguanides; sulfonylureas

Hormonal medications: Systemic hormonal contraceptives, thyroid hormones, thiouracils

Antidepressants and sedatives: SSRIs, nonselective monoamine reuptake inhibitors, benzodiazepines

Antiarrhythmics: Class III antiarrhythmics

Gout therapy medications: Uric acid synthesis inhibitors, colchicine

Antiepileptics and Alzheimer's disease therapy: Barbiturate and derivatives, hydantoin derivatives, anticholinesterase

Antihistaminics: Aminoalkyl ethers, substituted alkylamines

Urogenital system drugs: Medications treating erectile dysfunction, α -adrenoceptor antagonists, testosterone-5 α -reductase inhibitors

Antibiotics: Tetracyclines, sulfonamides, third-generation cephalosporins, fluoroquinolones, macrolides

Chemotherapeutics: Folic acid analogues, nitrogen mustard agents

Antivirals: Nucleosides other than the reverse transcriptase inhibitors (acyclovir, ganciclovir)

(The drugs in this list have been named according to ATC of WHO.)

The data were evaluated using the SPSS 18.0 statistical program. Descriptive statistics (frequency distribution, mean, standard deviations)



were calculated; marginal and cross tables were created. The differences were evaluated using χ^2 test; $p < 0.05$ was considered statistically significant.

The survey was approved by the Deanery of NEUMF and the NEU Ethics Committee.

RESULTS

In this study, the patient records of 396 people aged ≥ 65 years who visited the family health care center in Kyrenia from 2013 to 2016 were accessed. The reason of presentation and the related health problems were evaluated for each case.

Table 1 shows some socio-demographic features and habits of patients. Of the patients, 95.5% were from the UK, 1.5% from TRNC and the remaining 3% from Ireland, Sweden, Spain, Denmark, USA, and Canada. Of all patients, 16.7% were smokers, 85.4% and 98.1% consumed alcohol and coffee, respectively, and 76.2% performed physical exercises.

Of 381 patients, 85.6% were hospitalized at least once. The number of hospitalization occasions was an average of 2.89 ± 2.27 , ranging from 1 to 14. In addition, 68.2% had undergone at least one surgery, with a mean of 2.67 ± 1.88 .

Table 2 shows the presentation features, diagnoses, and medications of patients. The average number of visits is 9.09 ± 9.34 , with a maximum of 61. A friend's recommendation was the most common reason for choosing the health care center. According to the patient forms of the first presentation, the leading diseases diagnosed were hypertension (55.4%); high cholesterol (39.8%); heart disease, angina-heart murmur (25%); arthritis (19.6%); reflux (19.4%), lung disease (14.0%); cancer (12.9%), thyroid diseases (12.1%).

Of 231 participants using medications, 61% were receiving antihypertensive treatment, followed by antilipidemic agents at 42.4% and anticoagulants at 29%.

Table 3 reveals the most prevalent five diseases diagnosed and their distribution to sex, age group, and physical exercise practice. Accidents and injuries, ischemic heart disease, and hypertension were the three most common diseases followed by lower respiratory tract infections and cancer.

The frequency of the five top diseases according to sex revealed accidents and injuries to be significantly higher in females than in males ($p = 0.05$). The differences between genders regarding the other four most frequent diseases were not significant.

Table 4 alternatively, shows the findings related to the patient history upon presentations to the health center. These findings revealed a considerably higher frequency of hypertension in males with 117 patients (62.2%) as compared to females with 89 women (48.4%; $p = 0.007$). Notably, 11.4% of female patients and 5.3% of male patients presented with asthma ($p = 0.033$). Of female patients, 27.2% indicated arthritis as their disease, compared to 12.2% of males ($p < 0.001$). The frequency of thyroid disorders was 20.7% for female patients and 3.7% for males ($p < 0.001$), according to self-history. The sex differences were found to be significant for asthma, arthritis, and thyroid diseases, with higher frequencies in females. In contrast, hypertension cases were significantly more in males.

The comparison of patients according to the distribution of their diseases to some habits, such as tobacco and alcohol consumption and exercise, revealed no significant correlations.

No significant results were obtained regarding the five most frequent diseases among the age groups ($p > 0.05$). Accidents and injuries were more commonly reported among patients not performing exercises (11.2%) than those performing exercises (6.3%); however, the difference was not statistically significant ($p = 0.12$).

Table 1. Socio-demographic features and habits of patients aged ≥ 65 years presenting to a family health care unit in Kyrenia (December, 2016).

Sociodemographic features	n	%
Age group (years) (n=396)		
65–74	298	75.3
75–84	87	22.0
≥ 85	11	2.8
Mean \pm sd=71.62 \pm 5.45, Median=70, Mode=68, Minimum=65, Maximum=96		
Sex (n=396)		
Men	202	51.0
Women	194	49.0
Marital status (n=385)*		
Married	336	87.3
Single	49	12.7
Habits		
Smoking	63	16.7
Number of cigarette consumed a day (n=62)		
Mean \pm sd=18.56 \pm 9.35, Mode=20, Median=20, Minimum=2, Maximum=60		
Alcohol consumption (n=377)*	322	85.4
Amount of alcohol consumed (glasses/week) (n=304)		
Mean \pm sd=5.19 \pm 2.76, Mode=4, Median=5, Minimum=1, Maximum=16		
Coffee/tea consumption (n=378)*	371	98.1
Amount of coffee/tea (glasses/day) (n=355)		
Mean \pm sd=4.30 \pm 1.97, Median=4, Mode=4, Minimum=1, Maximum=17		
Exercise performance (n=374)*	285	76.2

* n<396, because information is missing from some records



Table 2. Presentation features, diagnoses, and medications of patients aged ≥ 65 years applying to a family health care unit in Kyrenia (December, 2016).

Number of visits (n=277)

Mean \pm sd=9.09 \pm 9.34, Median=6, Mode=2, Minimum=1, Maximum=61

References to the health unit (n=237)*	n	%**
Friend recommendation	175	73.8
Reference from doctor	34	14.3
Internet information	19	8.0
For referral to another institution	9	3.8
Diseases diagnosed during presentations (n=372)*		
Hypertension	206	55.4
High cholesterol	148	39.8
Heart disease/angina/murmur	93	25.0
Arthritis	73	19.6
Reflux	72	19.4
Lung diseases/cough	52	14.0
Cancer	48	12.9
Thyroid diseases	45	12.1
Renal and bladder diseases	45	12.1
Dyspnea	43	11.6
Ear diseases	41	11.6
Eye diseases/glaucoma	41	11.0
Seasonal allergies	38	10.2
Diabetes	36	9.7
Tonsillitis	35	9.4
Psychiatric disorders	34	9.1
Asthma	31	8.3
Neurological problems	27	7.3
Swelling of ankle	26	7.0

Sinus problems	26	7.0
Head ache/migraine	24	6.5
Ulcer/colitis	22	5.9
Cerebrovascular disease	20	5.4
Hypotension	13	3.5
Anemia and/or hematological problems	12	3.2
Epilepsy	7	1.9
Medications (n=231)*		
Antihypertensives	141	61.0
Anti-hyperlipidemics	98	42.4
Anticoagulants	66	29.0
Gastrointestinal system drugs	57	24.7
Vitamin supplements	38	16.5
Anti-inflammatory drugs	35	15.2
COPD*** and asthma drugs	31	13.4
Insulin and oral hypoglycemic drugs	24	10.4
Hormone drugs	24	10.4
Antidepressants and sedatives	21	9.1
Anti-arrhythmic drugs	15	6.5
Gout therapy drugs	14	6.1
Antiepileptics, Alzheimer treatment	12	5.2
Antihistaminics	8	3.5
Urogenital system agents	8	3.5
Antibiotics	6	2.6
Chemotherapeutics	5	2.2
Antiviral agents	2	0.9

*n<396, because information is missing from some records

**Row percentages

***COPD:Chronic obstructive pulmonary disease



Table 3. The most prevalent five diseases and their distribution based on sex, age group, and physical exercise among patients aged ≥65 years applying to a family health care unit in Kyrenia (December, 2016).

Most prevalent five diseases(n=396)	n	%*
Accidents and injuries	32	8.1
Ischemic heart disease	29	7.3
Hypertension	27	6.8
Lower respiratory infection	21	5.3
Cancer	16	4.0

Disease (n=396)	Sex				Chi square	p
	Men		Women			
	n	%	n	%		
Accidents and injuries	11	5.4	21	10.8	3.86	0.05
Ischemic heart disease	15	7.4	14	7.2	0.01	0.94
Hypertension	10	5.0	17	8.8	2.26	0.13
Lower respiratory infections	10	5.0	11	5.7	0.10	0.75
Cancer	9	4.5	7	3.6	0.18	0.70

Disease (n=396)	Age group						Chi square	p**
	65-74		75-84		≥85			
	n	%	n	%	n	%		
Accidents and injuries	23	7.7	8	9.2	1	9.1	0.21	0.64
Ischemic heart disease	19	6.4	9	10.3	1	9.1	1.59	0.21
Hypertension	21	7.0	5	5.7	1	9.1	0.10	0.75
Lower respiratory infections	17	5.7	2	2.3	2	18.2	0.39	0.53
Cancer	13	4.4	3	3.4	-	-	0.32	0.57

Disease (n=396)	Exercise				Chi square	p
	Performer		Not performer			
	n	%	n	%		
Accidents and injuries	18	6.3	10	11.2	2.37	0.12
Ischemic heart disease	18	6.3	9	10.1	1.46	0.23
Hypertension	20	7.0	6	6.7	0.01	0.93
Lower respiratory infections	13	4.6	8	9.0		0.11***
Cancer	14	4.9	2	2.2		0.28***

*Row percentages

**75-84 and ≥85 age groups combined

***Fisher's Exact Test used

Table 4. The distribution of diseases according to case history of patients aged ≥ 65 years applying to a family health care unit in Kyrenia (December, 2016).

Disease (n=372)	Gender				Chi square	p
	Male		Female			
	n	%	n	%		
High cholesterol	79	42.0	69	37.5	0.79	0.373
Hypertension	117	62.2	89	48.4	7.23	0.007
Anemia/hematologic problems	3	1.6	9	4.9	3.24	0.072
Asthma	10	5.3	21	11.4	4.52	0.033
Tonsillitis	11	5.9	24	13.0	5.64	0.018
Head ache	9	4.8	15	8.2	1.75	0.187
Diabetes	23	12.2	13	7.1	2.84	0.092
Arthritis	23	12.2	50	27.2	13.16	<0.001
Cancer	23	12.2	25	13.6	0.15	0.697
Thyroid diseases	7	3.7	38	20.7	25.1	<0.001

DISCUSSION

This study was conducted on people aged 65–96 years, of whom 95.5% were British. The findings of the study on NCDs, other major health problems of the older people and related factors were compared to the available international data on these issues (7,9,11-20).

According to the patient forms of the first presentation, the leading diseases were hypertension, high cholesterol, heart disease, arthritis, reflux, lung disease, cancer and thyroid diseases. These findings are similar to the data on NCDs in other countries and WHO data (11-13).

The WHO data holds NCDs responsible for 67.9% of all deaths. Among these diseases, the leading causes of death in the elderly population are ischemic heart disease(13.2%); cerebrovascular disease(11.9%); chronic obstructive pulmonary disease(COPD; 5.6%); lower respiratory disease(5.5%); trachea, bronchus, and lung cancers(2.9%) (12).

The most common NCDs affecting the elderly in Turkey, in order of their frequencies, are hypertension (68.7%), diabetes (28.3%), dyslipidemia (25.1%), coronary heart disease (14.5%), chronic obstructive lung disease (COPD;14.3%), and asthma (7.8%) (9,11). Based on 2014 death statistics of Turkey, cardiovascular diseases accounted for the highest mortality in the older population at 46.7%, followed by benign and malignant neoplasms at 16.9%, and respiratory diseases at 12.8% (7).

In the United Kingdom, the most frequent causes of mortality for people aged 65–79 years were ischemic heart disease; trachea, bronchus, and lung cancers; and chronic lower respiratory disease in 2012 (13).

Hypertension was recorded significantly more in males than in females in our study, which is in accordance with a review of 2013 (20).

The most significant risk factors for NCDs such as tobacco and alcohol consumption, unhealthy nutrition, and insufficient physical activity are



preventable (14,15). Among the participants of our study, 16.7% were current smokers. In Turkey, as of 2011, 14.9% of people aged 65–74 years and 7% of people aged ≥ 75 years were smokers (11). The 2014 UK tobacco statistics indicate tobacco addiction in 11% of people aged ≥ 60 years, declining to 10.6 in 2016 (18).

The high frequency of smoking in our study might be attributed to the insufficiency of tobacco control activities and the low prices of cigarettes in TRNC.

The participants of this study revealed a high percentage of alcohol consumption (85.4%). In Turkey, alcohol consumption was observed in 7.5% of people aged 65–74 years and in 2.8% of people aged ≥ 75 years (11). The alcohol use among the elderly is also lower in the USA (6.5%) and the UK (5%) among people aged ≥ 65 years (16). The high consumption of tobacco and alcohol might have contributed to the high frequency of hospital visits of some patients.

Of the patients in the current study, 76.2% of patients performed regular exercises. In Turkey, the proportion of people doing physical activities was 12.7% for those aged ≥ 65 (11). However, a UK study, reflecting people of the same culture revealed high results similar to those of our study: 58% of men and 52% of women aged 65–74 years and 36% of men and 18% of women aged ≥ 75 years were performing physical activity in 2012 (17).

Regarding medication use, antihypertensive agents were the most commonly used drugs, in compliance with the high frequency of hypertension, followed by antihyperlipidemic and anticoagulant drugs. A study in the UK also revealed high consumption of antihyperlipidemic medications, succeeded by antihypertensives and analgesic/nonsteroidal anti-inflammatory drugs (21).

Asthma and thyroid diseases were found to be significantly higher among females in our study. A study of 2015 showed that asthma is more prevalent

among females at advanced ages (22). Similarly, thyroid diseases are more prevalent in females, as reported in 2005 (23).

The female participants of this study experienced accidents and injuries twice as much as male patients. A similar finding was observed in a US-based study, where females experienced fall-related accidents 2.2 times more than males (24).

Cancer is diagnosed in one of two elderly people in the UK. More than half (53%) of cancer-related deaths in the UK were in people aged ≥ 75 years in 2012–2014 (25). Cancer was one of the most frequent diagnoses in our study, ranking fifth among the most prevalent diseases similar to the British population.

Preventive measures, such as hepatitis markers and vaccinations, tuberculin tests, and chest X-rays, were quantitatively insufficient. However, the frequency of using the Pap test and mammography screening were undergone by the majority of female patients. Some of the necessary tests and immunization programs recommended for people aged ≥ 65 years were missing from the records (5).

Similar to other countries, the level of hospitalization was high among patients in our study. A study in the UK revealed that 41% of inpatients were composed of people aged ≥ 65 years (19).

In conclusion, the most common reasons of presentations of people aged ≥ 65 years to health care center are similar to international data as accidents and injuries, ischemic heart disease, hypertension, lower respiratory infections, and cancer. Adoption of preventive measures to decrease the risk factors of these problems is a crucial step to reduce their prevalence, with specific environmental precautions to prevent accidents and injuries.

The results of this study demonstrate a deficiency of preventive medicine, especially immunizations among the studied population. There was a lack of information on the records about pneumococcal,

influenza, herpes zoster, tetanus, diphtheria, and pertussis vaccination status. Hence, encouraging educational activities on immunization for the elderly is of utmost importance. Prospective community studies could provide new data for the proper evaluation of the aging population and yield evidence-based information for designing future intervention studies and preventive measures.

Limitations of the study

Since the study is a descriptive study, the results do not represent the TRNC or Kyrenia's older population.

Because the study was based on patient records, the time periods in between the visits could not be evaluated.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344049
2018;21(3):346-353

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Received: 07/04/2018
Accepted: 21/07/2018

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RESEARCH

BRUCELLOSIS IN GERIATRIC PATIENTS: IS THE DISEASE COURSE MORE SERIOUS?

ABSTRACT

Introduction: Resistance to infectious diseases is impaired in the geriatric population. Delayed diagnosis and poor prognosis are common problems in this population because complaints are often considered natural consequences of old age. Thus, we evaluated the clinical and laboratory features of brucellosis in geriatric patients that we treated and followed up. We did not find any similar studies in the literature.

Materials and Method: Patients aged ≥ 65 years who were diagnosed with brucellosis and hospitalised between January 2012 and October 2017 were retrospectively evaluated for demographic characteristics and clinical, epidemiological and laboratory parameters.

Results: The study included 71 geriatric patients [29 male (40.8%) and 42 female (59.2%)]. The mean age was 70.64 ± 6.5 years. Twenty-four patients had acute, thirty had sub-acute and nine had chronic brucellosis, whereas eight had relapsed disease. Most common symptoms were fatigue and back pain. Most common clinical signs were organomegaly and fever. Wright and Coombs test results and blood cultures were positive in 76%, 22.5%, and 19.7% of patients, respectively. Focal involvement was detected in 36 (50.7%) patients. The most commonly preferred treatment combination was rifampicin/doxycycline.

Conclusion: Brucellosis can present with non-specific clinical signs in the geriatric population compared with those in the general population. This difference should be considered when treating geriatric patients, particularly in areas endemic for brucellosis.

Keywords: Geriatrics; Brucellosis; Complications; Prognosis

ARAŞTIRMA

GERİATRİK HASTALARDA BRUSELLOZ: DAHA CİDDİ Mİ SEYREDER?

Öz

Giriş: Geriatrik popülasyonda enfeksiyon hastalıklarına karşı direnç azalmaktadır. Gecikmiş tanı ve kötü prognoz şikayetlerin genellikle yaşlılığın doğal sonuçları olarak kabul edildiğinden bu popülasyonda sık görülen sorunlardır. Bu nedenle tedavi ve takibi yapılan geriatri yaş grubundaki hastalarında brusellozun klinik ve laboratuvar özellikleri değerlendirildi. Literatürde benzer herhangi bir çalışmaya rastlanmadı.

Gereç ve Yöntem: Ocak 2012 ve Ekim 2017 tarihleri arasında, bruselloz tanısı konan ve hastaneye yatırılan 65 yaş üstü hastalar demografik özellikleri, klinik, epidemiyolojik ve laboratuvar parametreleri açısından retrospektif olarak değerlendirildi.

Bulgular: Çalışmaya 71 geriatrik hasta dahil edildi [29 erkek (%40.8) ve 42 kadın (%59.2)]. Yaş ortalaması 70.64 ± 6.5 idi. Yirmi dört hasta akut, otuz hasta subakut ve dokuz hasta kronik bruselloz, sekiz hasta ise relapstı. En sık görülen semptomlar yorgunluk ve sırt ağrısıydı. En sık görülen klinik belirtiler organomegali ve ateşti. Wright ve Coombs test sonuçları ve kan kültürleri sırasıyla hastaların %76'sında, %22.5'inde ve %19.7'sinde pozitif idi. Fokal tutulum 36 (%50.7) hastada saptandı. En çok tercih edilen tedavi kombinasyonu, rifampisin/doksisisiklin idi.

Sonuç: Bruselloz genel popülasyondakilere göre geriatrik popülasyonda spesifik olmayan klinik bulgularla ortaya çıkabilir. Bu fark, özellikle bruselloz için endemik olan bölgelerde geriatrik hastaları tedavi ederken dikkate alınmalıdır.

Anahtar sözcükler: Geriatri; Bruselloz; Komplikasyonlar; Prognoz



INTRODUCTION

Brucellosis is endemic in Turkey, with most cases occurring in the central, eastern and southeastern Anatolian provinces. Although the number of patients has gradually decreased, the disease currently is not exactly under control (1). Brucellosis is the most common zoonosis worldwide; this systemic disease can be transmitted by contact with body fluids, urine and placenta of infected animals and/or ingestion of raw milk, dairy products and meat of these animals (2).

Brucellosis manifests in a wide range of cases from asymptomatic ones to those with serious disease (3). The disease is classified according to the duration of symptoms as acute (<8 weeks), sub-acute (8-52 weeks) or chronic (>1 year). In case of organ involvement, the disease is said to have focal involvement or complication (4). Relapse is described as the recurrence of brucellosis signs and symptoms within 1 year after completion of treatment course, elevated IgG antibody titres, newly emerging pathological and radiographical findings or growth detection in recent body samples (4,5). Although the disease can occur in all age groups, young adults and middle-aged individuals are most commonly affected. Its incidence in children and the elderly is relatively low (5). Old age (≥ 65 years) is primarily characterised by reduced biological capacity reserves (6). Infectious diseases present with atypical clinical course in elderly patients due to the impact of environmental factors in addition to their genetic constitution and acquired chronic changes (7). Delayed diagnosis and poor prognosis are common problems in this patient group because complaints are often considered a natural consequence of old age (8). Careful evaluation of clinical symptoms and signs in the elderly is the best approach for brucellosis. Therefore, we aimed to evaluate the clinical and laboratory features of brucellosis in geriatric patients and to compare the clinical course of the disease in this population in previous studies. We did not find any similar studies reported in the literature.

MATERIALS AND METHOD

We performed a retrospective analysis of 71 patients with brucellosis aged ≥ 65 years who were admitted to the Firat University Medical School Hospital Department of Infectious Diseases between 1 January 2012 and 10 January 2017. Brucellosis was diagnosed based on the growth of *Brucella* in blood cultures or positive titres on Wright and/or Coombs tests in cases without culture growth. Clinical, epidemiological and laboratory variables at diagnosis and before treatment onset and demographic characteristics were obtained. The study was approved by the Firat University Ethics Committee for Non-interventional Studies on 22 March 2018.

The data were analysed using the SPSS version 22 software. Visual and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk's test) were used to evaluate the normality of distributions. Normally distributed variables were expressed as the mean \pm standard deviation and non-normally distributed variables as the median (minimum–maximum). Categorical variables were presented as frequency and percentage values. Continuous variables were compared using either the Mann–Whitney *U* test or Student's *t*-test based on the normality of data distribution. Multiple comparisons were performed using the one-way ANOVA or Kruskal–Wallis tests. Categorical variables were compared using the Pearson's χ^2 and Fisher's exact tests. The level of statistical significance was $p < 0.05$.

RESULTS

Demographic results

Among the 71 patients with brucellosis [29 (40.8%) male, 42 (59.2%) female; overall mean age, 70.64 \pm 6.5 years (range, 65–92 years); median age, 68 years], 24 (33.8%) had acute, 30 (42.3%) had sub-acute and nine (12.7%) had chronic brucellosis, whereas eight (11.3%) had relapsed disease. Among patients with sub-acute disease, the rate of osteoarticular complications was 50%, which was significantly higher than

that in patients with acute disease ($p < 0.05$). Specific risk factors were found in 20 (28.1%) patients with brucellosis; 13 patients (65%) had a history of stock farming, 15 (75%) had ingested raw milk and fresh cheese, four (20%) had a family history of brucellosis and 55 (77.4%) lived in the rural area.

Symptoms and physical examination findings

The most common symptoms were fatigue (87.3%), back pain (59.1%), fever (52.1%), night sweats (52.1%) and myalgia (47.8%). The most common clinical signs were organomegaly (28.1%) and fever (25.3%; Table 1).

Table 1. Symptoms and clinical signs.

Symptom/sign	n(%)
Fatigue	62(87.3%)
Back pain	42(59.1%)
Fever	37(52.1%)
Night sweats	37(52.1%)
Myalgia	34(47.8%)
Arthralgia	14(19.7%)
Weight loss	7(9.8%)
Headache	6(8.1%)
Neck pain	5(7.1%)
Nausea-vomiting	5(7.1%)
Scrotal pain	1(1.4%)
Skin rash	1(1.4%)
Signs	
Organomegaly	20(28.1%)
Hepatomegaly	9(12.6%)
Splenomegaly	5(7.0%)
Hepatosplenomegaly	6(8.4%)
Fever	18(25.3%)
Cardiac murmur	6(8.4%)
Meningeal irritation	3(4.2%)
Skin rash	1(1.4%)
Swelling of scrotum	1(1.4%)

Laboratory results

C-reactive protein (CRP) levels were high in 55 (77.5%) patients (mean, 32.5 ± 43.8 ; median, 13;

range, 3–286). Erythrocyte sedimentation rate (ESR) was high in 51 (71.8%) patients (mean, 39.4 ± 22.9 median, 34; range, 5–100).



Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels were elevated above reference values in 19 (26.8%; median, 26; range, 9–241) and 23 (32.4%; median, 41; range, 11–189) patients, respectively.

Median CRP values were 40 (range, 3.1–286) and 12.4 (range, 3–182) in patients with positive and negative blood cultures, respectively ($p < 0.05$). No significant relationship was found between other variables ($p > 0.05$). Laboratory results are presented in Table 2.

Microbiological results

Of the 71 patients, 54 (76%) had positive standard tube agglutination (STA) test results, 16 (22.5%) had negative STA and positive Coombs test results and one had negative STA and negative Coombs test results but positive *B. melitensis* blood culture results. Overall, *Brucella* species were isolated in blood cultures of 14 (19.7%) patients, 78.6% of whom presented with complications. The complication rate was 43.9% in patients with negative blood cultures ($p < 0.05$). No significant difference was found for other variables ($p > 0.05$).

Complications

Focal involvement was present in 50.7% of the patients. The most common complication was osteoarticular involvement (69.4%), most often with spondylodiscitis (52.7%; Table 3).

Treatment

The preferred treatment combination was rifampicin/doxycycline in 69% of the patients, followed by rifampicin/doxycycline/aminoglycoside (amikacin/streptomycin) in 26.7%. Additionally, combination treatments, including tetracycline, ciprofloxacin, trimethoprim/sulfamethoxazole and ceftriaxone were also prescribed based on side effects caused by current drugs or presence of local infection. The mean duration of treatment for patients was 134 (38–369) days. Adverse antibacterial drug reactions were observed in 51 (71.8%) patients, with nausea and vomiting being the most common (76.4%), followed by hepatotoxicity (33.3%), nephrotoxicity (23%) and balance disorder and dizziness (11.7%). Treatment was changed in 12 (16.9%) patients due to adverse effects. No patients died of brucellosis during the treatment or follow-up.

Table 2. Laboratory results.

Result	n(%)
Anaemia (male-Hb<14mg/dL and female Hb<12mg/dL)	12 (16.9%)
Thrombocytopenia (platelet count<150,000/mm ³)	8 (11.3%)
Leukopenia (WBC count<4000/mm ³)	4 (5.6%)
Leukocytosis (WBC count>10,000/mm ³)	4 (5.6%)
Lymphocytosis (>45%)	6 (8.5%)
Pancytopenia	1 (1.4%)
Bicytopenia	2 (2.8%)
ALT (>40IU/L)*	19 (26.8%)
AST (>40IU/L)*	23 (32.4%)
ESR (>20mm/h)*	51 (71.8%)
CRP (>5mg/L)*	55 (77.5%)

*ALT: alanine aminotransferase, *AST: aspartate aminotransferase, *ESR: erythrocyte sedimentation rate, *CRP: C-reactive protein

Table 3. Distribution of complications.

Complication	n (%)
Osteoarticular complications	25(69.4%)
Spondylodiscitis	19(52.7%)
Paravertebral abscess	8(22.2%)
Sacroileitis	5(13.8%)
Osteitis	2(5.5%)
Neurobrucellosis	3(8.3%)
Hepatitis	2(5.5%)
Epididymo-orchitis	1(2.7%)
Endocarditis	1(2.7%)
Haematological complications	3(8.3%)
Skin involvement	1(2.7%)
Focal involvement	36(50.7%)

DISCUSSION

The proportion of geriatric population has been increasing worldwide, including Turkey, due to improved standard of living (9). As a result of immune dysfunction caused by ageing, resistance to infections is decreased (10). These adverse outcomes in the elderly can mask signs and symptoms of diseases, leading to delayed diagnosis and treatment. Delayed diagnosis and treatment in brucellosis affects all body systems, and patients present with various symptoms. As a consequence, serious complications which cause morbidity and mortality can occur (5).

Previous studies have compared epidemiological, clinical and laboratory findings and treatment outcomes in children and adults with brucellosis. However, such studies involving geriatric patients were not found in the literature. Therefore, we evaluated the course of brucellosis in geriatric subjects.

Although the incidence of brucellosis in children and the elderly is low (5), it can affect individuals of any age and sex (11). In a study evaluating 1028 patients aged 3–81 years (mean age, 33.7 ± 16.34 years), the disease incidence was commonly observed in patients aged 13–24 years (29%), while those aged ≥ 67 years accounted for only 2% of the study population (12). The mean age of our patients was 70.64 ± 6.5 years, with more female (59.2%) than male (40.8%) patients, which was similar to that in some other studies (12,13).

In endemic countries, brucellosis is mainly transmitted by the ingestion of unpasteurised milk products, whereas in developed countries, the transmission usually occurs as a result of occupational exposure (14). In a study conducted in Turkey, exposure history included ingestion of unpasteurised fresh cheese and raw milk in 79% of patients, agriculture and stock raising in 35%, and family history of brucellosis in 16% (15). In our study, the most



common routes of transmission were ingestion of raw milk and fresh cheese (75%) and stock raising (65%). Family history of brucellosis was identified in 20% of our patients. In the study by Roushan et al. (16), 73.8% of patients lived in rural areas compared with 77.4% in our study.

Brucellosis can present in different clinical forms (17). Buzgan et al. (12) reported acute, sub-acute and chronic brucellosis rates of 61.6%, 21.6% and 13.6%, respectively; another study reported these rates as 77%, 12.5% and 10.5%, respectively (18). In our study, these rates were found to be 33.8%, 42.3% and 12.7%, respectively. The prevalence of sub-acute brucellosis was considerably higher in our study than in other studies. These results can be explained by the fact that brucellosis symptoms are misjudged as consequences of ageing. Our patients did not get a different diagnosis before brucellosis.

Increased body temperature, which is the most common symptom of brucellosis, was reported in 72.2%–90.5% of patients in many studies (19,20). In our study, 52.1% of high fever was detected. These results indicated that typical brucellosis symptoms may not be very common in the elderly and that patients may present with a non-specific clinical manifestation.

Brucellosis can present with various signs and symptoms because it affects many organs and systems. Many studies have reported fever and organomegaly as the most common symptoms (19,20). Gonen et al. (21) found fever in 60.6%, hepatomegaly in 16.4% and splenomegaly in 15.9% of cases. In our geriatric patients, hepatomegaly, splenomegaly, hepatosplenomegaly and fever were found in 12.6%, 7.0%, 8.4% and 28.1% of patients, respectively. Our data indicated that fever, which is a typical symptom of brucellosis, was detected less frequently in the geriatric population compared with other studies.

Similar to previous studies, our most common laboratory findings were moderate anaemia, leuco-

penia, thrombocytopenia and increased liver enzymes, ESR and CRP levels (4,17). Haematological and biochemical tests are of poor diagnostic value in brucellosis (22). While increased CRP levels was the most prominent laboratory finding in acute and sub-acute cases in many studies (4,17), no significant association between CRP levels and different clinical forms of brucellosis was found in our study population ($p > 0.05$). However, a positive correlation was observed between increased CRP levels and positive blood culture results ($p < 0.05$). This result indicated the importance of performing blood cultures in patients with increased CRP levels.

Isolation of the pathogen from blood cultures varies between 15% and 90% of brucellosis cases (4,17). Isolation from cultures can be achieved in 40%–90% of acute brucellosis cases, although this rate decreases to 5%–20% in chronic brucellosis, focal infection, or complicated cases (23). In our study, the causative pathogen was isolated from blood cultures of 19.7% of the cases, while no significance difference was found in the bacterial growth in blood cultures from different disease stages. Additionally, complications were present in 78.6% and 43.9% of patients with positive and negative blood cultures, respectively ($p < 0.05$). The current data suggested that the rate of complications was higher in patients with positive blood cultures than in those with negative blood cultures for *Brucella*. Serological tests are an alternative method for the diagnosis of brucellosis when bacterial isolation is not possible (4,17). In several studies, STA was detected in 87%–95% of cases (4,12,17). Coombs STA test is an alternative for diagnosing brucellosis when STA results are negative. Previous studies have reported 4.8% of patients with positive Coombs STA results and 1.1% with negative results (12). In our study, the proportion of STA-positive patients (76%) was below the estimated rates and that of Coombs STA-positive patients (22.5%) was considerably above the estimated rates; the proportion of seronegative patients was 1.4%. Our results suggested that Coombs STA test should be used in routine practice for di-

agnostic purposes, particularly for geriatric patients with brucellosis with a sub-clinical disease course.

The rate of complications was 20%–40% in several studies (3,12). The complication rate of 50.7% in our study was higher than those in other studies (4,12,17). This result may be explained by delayed diagnosis and treatment in geriatric patients who do not present with typical clinical manifestations for brucellosis. Similar to other studies, the most common complication in our study group was osteoarticular involvement (69.4%), with spondylodiscitis most commonly observed (4,12,17). Osteoarticular complications were present in 50% of patients diagnosed with sub-acute brucellosis, and this rate was significantly higher than that reported for patients with acute brucellosis ($p < 0.05$). Kazak et al. (24) reported similar results.

The World Health Organisation has recommended a combination treatment with doxycycline/rifampicin or streptomycin/doxycycline for brucellosis (4). In our study, the most commonly used combination treatment was doxycycline/rifampicin; rifampicin/doxycycline/aminoglycoside combination was particularly preferred in patients with osteoarticular involvement. Hashemi et al. (25) found adverse re-

actions in 16.8% of patients. In our study, adverse antibacterial drug reactions were observed in 71.8% of patients, and treatment was changed in 16.9% of these patients. Combination treatments including tetracycline, ciprofloxacin, trimethoprim/sulfamethoxazole and ceftriaxone were also prescribed based on the side effects caused by current drugs or presence of local infections. The objectives of brucellosis treatment include prevention of complications and relapse. In a previous study, the relapse rate was reported as 6.4% (21), whereas it was high at 11.3% in our study. These data underlined the importance of post-treatment follow-up for geriatric patients with brucellosis to prevent relapse.

In conclusion, signs and symptoms of brucellosis can present differently than expected in geriatric patients. Atypical clinical presentation can delay diagnosis and treatment, causing serious clinical disease progression with increased complications. These findings indicate that a more comprehensive and prudent investigation course for brucellosis should be followed in geriatric patients. Taken together, we believe that our study would contribute to optimal assessment of geriatric patients with brucellosis.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344050
2018;21(3):354-364

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Received: 20/03/2018
Accepted: 15/06/2018

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Presented at the 9th Asian Conference
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RESEARCH

COMBINATION OF LACTATE WITH MODIFIED EARLY WARNING SCORE AND RAPID EMERGENCY MEDICINE SCORE IN GERIATRIC PATIENTS ADMITTED TO EMERGENCY DEPARTMENT TO PREDICT 28-DAY MORTALITY

ABSTRACT

Introduction: Aim was to compare the efficacy of Rapid Emergency Medicine Score, Rapid Emergency Medicine Score-Lactate, Modified Early Warning Score and Modified Early Warning Score-Lactate scores in predicting 28-day mortality after emergency department visit and hospitalization from emergency department for patients with age ≥ 65 years.

Materials and Method: The prospective observational study that carried out between February 29 to April 30, 2016 included patients with age ≥ 65 years who were referred to emergency department and did not have any trauma history.

Results: The mean age of 1106 patients included was 77.23 ± 7.41 years and 52.3% (n=578) were female. In the prediction of hospital admission, AUC for Rapid Emergency Medicine Score, Rapid Emergency Medicine Score-Lactate, Modified Early Warning Score and Modified Early Warning Score-Lactate were 0.837, 0.918, 0.817, 0.927 (p=0.001, p<0.001, p=0.002, p<0.001) respectively. In the prediction of 28-day mortality AUC for Rapid Emergency Medicine Score, Rapid Emergency Medicine Score-Lactate, Modified Early Warning Score and Modified Early Warning Score-Lactate were 0.659, 0.695, 0.647, 0.681 (p<0.001, p<0.001, p<0.001, p<0.001) respectively.

Conclusion: Rapid Emergency Medicine Score and Modified Early Warning Score were powerful in predicting hospital admission from emergency department and had moderate force in predicting 28-day mortality. Rapid Emergency Medicine Score-Lactate and Modified Early Warning Score-Lactate scoring systems are more powerful than isolated Rapid Emergency Medicine Score and Modified Early Warning Score in predicting both for hospitalization and 28-day mortality.

Keywords: Aged; Geriatrics; Hospitalization; Lactic acid; Mortality

ARAŞTIRMA

ACİL SERVİSE BAŞVURAN GERİATRİK HASTALARDA 28 GÜNLÜK MORTALİTE TAHMİNİNDE “MODIFIED EARLY WARNING SCORE” VE “RAPID EMERGENCY MEDICINE SCORE” UN LAKTAT İLE KOMBİNASYONUNUN KARŞILAŞTIRILMASI

Öz

Giriş: Acil servise başvuran 65 yaş üstü hastalarda mortalite tahmininde kullanılan Rapid Emergency Medicine Score, Rapid Emergency Medicine Score-Laktat, Modified Early Warning Score ve Modified Early Warning Score-Laktat skorlarının 28 günlük mortalite tahmini ve hastane yatışı tahmini açısından güvenilirliği ve kullanılabilirliğini araştırmak ve etkinliğini karşılaştırmaktır.

Gereç ve Yöntem: Bu çalışma 29 Şubat-30 Nisan 2016 tarihleri arasında hastanemiz acil servisine başvuran 65 yaş ve üstü olan 1106 hasta dahil edildi.

Bulgular: Çalışmaya alınan hastaların yaş ortalaması 77.23 ± 7.41 yıl ve %52.3'ü (n=578) kadındı. Hastane yatışı tahmininde ROC eğrisinin altında kalan alan Rapid Emergency Medicine Score, Rapid Emergency Medicine Score-Laktat, Modified Early Warning Score ve Modified Early Warning Score-Laktat için sırası ile 0.837, 0.918, 0.817, 0.927 (sırası ile p=0.001, p<0.001, p=0.002, p<0.001); 28 günlük mortalite açısından ROC eğrisinin altında kalan alan Rapid Emergency Medicine Score, Rapid Emergency Medicine Score-Laktat, Modified Early Warning Score ve Modified Early Warning Score-Laktat için sırası ile 0.659, 0.695, 0.647, 0.681 olarak hesaplandı (sırası ile p<0.001, p<0.001, p<0.001, p<0.001).

Sonuç: Çalışmamıza göre Rapid Emergency Medicine Score ve Modified Early Warning Score skorlama sistemleri geriatric hastaların acil servisten hastane yatışı tahmini açısından güçlü; 28 günlük mortalite tahmininde orta kuvvette puanlama skorlarıdır. Rapid Emergency Medicine Score-Laktat ve Modified Early Warning Score-Laktat skorlarını skorlama sistemleri ise geriatric hastaların hem acil servisten hastane yatışı hem 28 günlük mortalite tahmini açısından izole Rapid Emergency Medicine Score ve Modified Early Warning Score'dan daha güçlüdür.

Anahtar sözcükler: Geriatri; Hospitalizasyon; Laktat; Mortalite; Yaşlı



INTRODUCTION

Emergency departments are facilities where rapid triage and stabilisation of patients are performed simultaneously and where people from different age groups present with medical and trauma associated complaints as well as different provisional diagnosis. The rate of elderly patients presenting to emergency departments (EDs) is increasing both in Turkey and abroad (1-4). Therefore, EDs have an important role and responsibility with respect to the initial assessment and treatment of this patient group.

Elderly patients might become clinically unstable in a short time and this could result in increased mortality. ED physicians should be more attentive and vigilant with respect to this patient group. There is no globally acknowledged and common scoring system for elderly patients presenting to EDs. Therefore, it is crucial to investigate the extent to which early warning systems are effective in assessing mortality and morbidity in elderly patients who presented to EDs (5).

Modified Early Warning Score (MEWS) comprises five physiological parameters: systolic blood pressure (SBP), heart rate (HR), respiratory rate (RR), temperature and mental status (6). Rapid Emergency Medicine Score (REMS) comprises six physiological parameters: mean arterial pressure (MAP), HR, RR, mental status, oxygen saturation and age (7).

An increase in lactate levels was demonstrated to be associated with shock, perfusion and poor prognosis. Studies on EDs found that a lactate level of >4 mmol/L was associated with the severity of critical illness (8).

The aim was to investigate the prognostic value of REMS, MEWS and the combination of REMS and MEWS with lactate levels on hospitalisation and estimation of 28-day mortality in elderly patients.

MATERIALS AND METHOD

Research population

This prospective, monocentric study was conducted in the Ankara Yıldırım Beyazıt University Atatürk Training and Research Hospital ED between 29.02.2016 and 30.04.2016. We obtained ethical approval from the Ethics Committee of Clinical Studies (Date 17.02.2016; No. 46).

Patient inclusion criteria

1. Patients aged ≥ 65 years
2. Patients tagged with yellow or red colour codes during a triage
3. Voluntary participation in the study

Patient exclusion criteria

1. Presentation to ED because of trauma
2. Patients who underwent cardiopulmonary resuscitation before admission to ED
3. Inability to reach the patient or patient's relative by phone

Research method

In our ED, patients were classified as green (less acute), yellow (urgent) and red (emergency) during admission at triage site by the emergency resident physician in charge and referred to relevant fields in ED. The patients were then assessed by the emergency resident and specialist physician. Patient admission date, age, sex, HR, SBP, diastolic blood pressure, body temperature, RR, oxygen saturation, mental status, comorbidities, complaints, diagnosis and outcomes in the emergency department were recorded. We recorded findings obtained by the clinician on the study form to calculate REMS and MEWS values. We never interfered with the decision process about patients. When arterial blood gas sampling was obtained, lactate levels were also recorded to measure the REMS-Lactate (REMS-L) and MEWS-Lactate (MEWS-L) values.

'REMS-L=REMS + lactate levels (mmol/L)'

'MEWS-L=MEWS + lactate levels (mmol/L)'

Patients' demographic data and contact details were obtained. The 28-day mortality status of all was recorded.

Statistical analysis

The analyses of the study were conducted using Statistical Package for the Social Sciences (SPSS) software (version 19.0, SPSS Inc., Chicago, IL) package programme. Descriptive measures of variables were calculated. Categorical variables were presented as frequency and percentage, whereas ratio scale variables were presented as mean±SD in tables. The normal distribution of continuous variables was analysed via Kolmogorov–Smirnov test. It was found that the variables were not normally distributed. Therefore, during comparison of independent groups, Mann–Whitney U Test was used for data with two groups and Kruskal–Wallis Test was used for data with multiple groups. In statistically significant multiple comparisons, paired comparisons were implemented. Groups that had significant differences were shown as exponential letters in tables. Results of mortality in ED and 28-day mortality estimation were visualised via figures. Throughout the study, the type-1 error was set at 5%, and a p-value of <0.05 was considered to be statistically significant.

RESULTS

In total, 21685 patients presented to ED between the study period. Of these patients, 3079 patients were aged ≥65 years and 1106 patients who fulfilled the inclusion and exclusion criteria were included in the study.

The mean age was 77.23±7.41 years, and the median was 77 years. The number of female patients was 52% (n=578). The most frequent complaints of the patients who admitted to the ED

were dyspnea (18.4%; n=204), abdominal pain (7.2%; n=80) and fever (6%; n=66), whereas the most frequent comorbidities were hypertension (58.1%; n=643), diabetes mellitus (32.8%; n=363) and atherosclerotic cardiovascular disease (32.5%; n=360) (Table 1).

In total, 56.2% (n=622) of the elderly patients who presented to the ED were discharged. Twenty-five percent of the cases (n=276) were referred to wards, whereas 15.2% (n=168) were referred to the intensive care unit (ICU); 2.9% (n=32) of the patients were discharged on their own accord and 1% (n=8) were exitus patients. At the end of 28 days, 15.6% (n=173) of the cases resulted in exitus (Table 1).

Elderly patients who presented to ED were divided into three groups with respect to age: 65–74, 75–84 and ≥85 years. Among the age groups, there was a statistically significant difference with respect to gender distribution, Glasgow Coma Scale (GCS) and mean saturation levels (p=0.017, p=0.012 and p<0.001, respectively). There was no statistically significant difference between the age groups with respect to mortality in ED; however, there was a statistically significant difference between the age groups with respect to 28-day mortality (p=0.066 and p=0.001, respectively) (Table 1).

A statistically significant difference between the age groups existed only with respect to REMS and REMS-L values (p<0.001 and p<0.001, respectively). The mean REMS in the 65–75 age group was significantly lower than that in the other groups. In addition, REMS-L values increased with age. The mean MEWS and MEWS-L increased with age; however, the difference was not statistically significant (Table 1).

Elderly patients who presented to ED were divided into survival and non-survival groups with



respect to their 28-day mortality scores. There was a statistically significant difference between the groups with respect to age, SBP, diastolic blood pressure (DBP), MAP, RR, GCS, lactate levels, MEWS, REMS, MEWS-L and REMS-L ($p=0.003$, $p<0.001$, $p<0.001$, $p<0.001$, $p=0.001$, $p<0.001$, $p<0.001$, $p<0.001$, $p<0.001$, $p<0.001$ and $p<0.001$, respectively) (Table 2). There was also a statistically significant difference between the mortality in ED categories with respect to 28-day mortality scores ($p=0.001$). The exitus rate was very high in patients who were referred to the ICU, whereas the survival rate was statistically higher in those who were discharged from ED (Table 2).

Excluding 'those who were discharged on their own wish', the results were reassessed with respect to mortality in ED via a sub-analysis. The patients were divided into four groups: group I (admitted to a hospital ward bed), group II (admitted to an ICU bed), group III (discharged from ED) and group IV (exitus at ED). There was a statistically significant difference between the groups with respect to SBP, MAP, RR, GCS and lactate levels ($p=0.004$, $p=0.021$, $p<0.001$, $p<0.001$ and $p<0.001$, respectively). In addition, there was a statistically significant difference between the groups with respect to scoring systems: MEWS, REMS, MEWS-L and REMS-L ($p<0.001$, $p<0.001$, $p<0.001$ and $p<0.001$, respectively). All scores were significantly higher in group IV, whereas group III had the lowest scores (Table 3).

Analysis of ROC was conducted to assess the efficiency of scoring systems in estimating the mortality in ED and 28-day mortality. Among the four scoring systems, MEWS-L yielded the highest score for estimating hospitalisation (AUC=0.921; $p<0.001$), whereas REMS-L yielded the highest score for estimating the 28-day mortality (AUC=0.695; $p<0.001$; Table 4).

It was demonstrated that as MEWS increased from 2 to 3, the mortality rate increased from 9.6%

to 22.3% and as it increased from 6 to 7, the mortality rate increased from 22.7% to 58.8%. Based on these results, the patients can be divided into the following risk groups: MEWS<3, MEWS between 3 and 6 and MEWS>6. There were 681 patients (61.6%) in the MEWS<3 group, 402 patients (36.4%) in the MEWS between 3 and 6 group and 23 patients (2%) in the MEWS>6 group (Figure 1).

It was found that as REMS increased from 8 to 9, the mortality rate increased from 15.4% to 20.2% and as it increased from 11 to 12, the mortality rate increased 17.1% to 38.1%. According to these results, the patients can be divided into the following risk groups: REMS<9, REMS between 9 and 11 and REMS>11. There were 820 (74.2%) patients in the REMS<9 group, 229 (20.7%) patients in the REMS between 9 and 11 group and 57 (5.1%) patients in the REMS>11 group (Figure 1).

It was demonstrated that as MEWS-L increased from 2 to 3, the mortality rate increased from 8.4% to 17.9% and as it increased from 6 to 7, the mortality rate increased from 30% to 60%. According to these results, the patients can be divided into the following risk groups: MEWS-L<3, MEWS-L between 3 and 6 and MEWS-L>6. There were 388 (49.5%) patients in the MEWS-L<3 group, 378 (48.3%) patients in the MEWS-L between 3 and 6 group and 17 (2.2%) patients in the MEWS-L>6 group (Figure 1).

It was found that as REMS-L increased from 7 to 9, the mortality rate increased from 9.4% to 18.4% and as it increased from 13 to 15, the mortality rate increased from 31.5% to 54.2%. Based on these results, the patients can be divided into the following risk groups: REMS-L<9, REMS-L between 9 and 13 and REMS-L>13. There were 340 (43.5%) patients in the REMS-L<9 group, 386 (49.5%) patients in the REMS-L between 9 and 13 group and 55 (7%) patients in the REMS>13 group (Figure 1).

Table 1. The distribution of demographic, vital signs, lactate level, ED visiting results and 28-day mortality in all and according to age groups..

		All patients	65-74 years	Age groups 75-84 years	+85 years	
		n (%) or mean±sd				p
Age	years	77.23±7.41	69.59±2.95	79.52±2.84	88.28±2.71	<0.001*
Sex	male	528 (47.7)	217 (51.3) ^a	234 (48.1)	76 (39.0) ^b	0.017*
	female	578 (52.3)	206 (48.7) ^a	252 (51.9)	119 (61.0) ^b	
Comorbidities	yes	1023(92.5)	385 (91.0)	454 (93.4)	182 (93.3)	0.347
	no	83 (7.5)	38 (9.0)	32 (6.6)	13 (6.7)	
Systolic blood pressure	mmHg	138.27±30.81	138.26±31.88	138,25±29.74	138.32±31.22	0.998
Diastolic blood pressure	mmHg	77.80±28.63	77.88±18.56	78.43±37.77	76.05±18.45	0.576
Mean arterial pressure	mmHg	97.42±20.29	97.64±21.17	97.48±19.21	96.81±21.05	0.927
Pulse	per/min	89.25±22.20	90.05±21.42	88.90±22.96	88.40±22.02	0.406
Breathing rate	per/min	22.43±6.39	22.23±6.14	22.27±5.874	23.24±7.93	0.323
Body temperature	°C	36.54±0.81	36.52±0.71	36.55±0.91	36.58±0.75	0.069
GCS	score	14.55±1.36	14.69±1.10 ^a	14.49±1.52	14.42±1.4 ^b	0.012*
Peripheral oxygen saturation	%	92.34±26.96	92.26±6.82 ^a	92.86±40.05 ^a	91.20±5.45 ^b	<0.001*
Lactate	mmol/L	2.20±1.75	2.15±1.67	2.20±1.76	2.29±1.87	0.894
REMS		8.14±2.37	7.41±2.25 ^a	8.52±2.42 ^b	8.78±2.07 ^c	<0.001*
REMS-L		10.51±3.27	9.63±3.11 ^a	10.94±3.33 ^b	11.14±3.06 ^c	<0.001*
MEWS		2.47±1.62	2.44±1.59	2.41±1.61	2.66±1.71	0.190
MEWS-L		4.75±2.70	4.73±2.63	4.70±2.62	4.91±3.02	0.957
ED visiting results	Ward admission	276 (25.0)	114 (27.0)	120 (24.7)	42 (21.5)	0.066
	ICU admission	168 (15.2)	72 (17.0)	67 (13.8)	29 (14.9)	
	Discharged from ED	622 (56.2)	224 (52.5)	281 (57.8)	117 (60.0)	
	Left yourself	32 (2.9)	13 (3.1)	14 (2.9)	5 (2.6)	
	Exitus	8 (0.7)	2 (0.5)	4 (0.8)	2 (1.0)	
28-day mortality	Survivor	933	372 (87.5) ^a	412 (84.8)	149 (76.4) ^b	0.001*
	Non-survivor	173	53 (12.5) ^a	74 (15.2)	46 (23.6) ^b	

* Different exponential letters indicate the categories where the results of the paired comparisons are different.
ED: Emergency Department; GCS: Glasgow Coma Scale; ICU: Intensive Care Unit



Table 2. The distribution of demographic, vital signs, lactate level, scoring systems and ED visiting results according to 28-day mortality.

		Survival (n=933)	Non-survival (n=173)	
		n (%) or mean±sd		p
Sex	female	495 (53.1)	83 (48)	0.219
	male	438 (46.9)	90 (52)	
Age	years	76.93±7.31	78.87±7.71	0.003*
Systolic blood pressure	mmHg	140.11±30.34	128.18±31.66	<0.001*
Diastolic blood pressure	mmHg	78.84±30.08	72.14±17.88	<0.001*
Mean arterial pressure	mmHg	98.62±19.98	90.95±20.78	<0.001*
Breathing rate	per/min	22.10±6.21	24.12±7.05	0.001*
GCS	score	14.68±1.13	13.88±2.09	<0.001*
Lactate	mmol/L	2.02±1.37	3.08±2.82	<0.001*
MEWS	score	2.35±1.55	3.11±1.86	<0.001*
REMS	score	7.98±2.27	9.03±2.65	<0.001*
MEWS-L	score	4.42±2.27	6,37±3.81	<0.001*
REMS-L	score	10.08±2.89	12.58±4.08	<0.001*
ED visiting results	Ward admission	244 (26.2)	32 (18.5)	0.001*
	ICU admission	88 (9.4) ^a	80 (46.2) ^b	
	Discharged from ED	574 (61.3) ^a	50 (28.9) ^b	
	Left yourself	27 (2.9)	5 (2.9)	

* Different exponential letters indicate categories where the results of the paired comparisons are different. ED: Emergency Department; GCS: Glasgow Coma Scale; MEWS: Modified Early Warning Score; REMS: Rapid Emergency Medicine Score; L: Lactate

Table 3. The distribution of demographic, vital signs, lactate level, scoring systems and according to ED visiting results.

		Group I (N=276)	Group II (N=168)	Group III (N=622)	Group IV (N=8)	
		n (%) or mean±sd				p
Sex (N %)	Female	140 (50.7)	89 (53.0)	328 (52.7)	6 (75.0)	0.546
	Male	136 (49.3)	79 (47.0)	294 (47.3)	2 (25.0)	
Age	years	76.54±7.13	76.70±7.39	77.70±7.46	79.75±8.61	0.157
Systolic blood pressure	mmHg	139.38±29.23 ^b	131.80±33.15 ^a	139.68±30.58 ^b	111.13±42.04 ^c	0.004*
Diastolic blood pressure	mmHg	77.12±16.69	75.80±20.26	78.77±34.64	60.87±21.31	0.118
Mean arterial pressure	mmHg	97.63±18.99	94.36±22.15	98.26±20.19	77.60±27.07 ^a	0.021*
Breathing rate	per/min	22.44±5.67	25.16±6.65	21.55±6.30	31.00±9.98 ^a	<0.001*
GCS	score	14.67±1.03	13.43±2.37	14.82±0.79	12.00±3.29 ^a	<0.001*
Lactate	mmol/L	2.05±1.36	3.21±3.03	1.91±0.94	6.37±4.96 ^a	<0.001*
MEWS	score	2.46±1.63	3.46±1.77	2.18±1.46	4.75±1.83 ^a	<0.001*
REMS	score	7.93±2.24	9.56±2.58	7.82±2.20	11.38±2.06 ^a	<0.001*
MEWS-L	score	4.53±2.46	6.85±3.82	4.15±1.80	11.12±5.27 ^a	<0.001*
REMS-L	score	10.05±2.97	13.13±4.12	9.87±2.50	17.75±4.52 ^a	<0.001*

* Different exponential letters indicate the categories where the results of the paired comparisons are different.

ED: Emergency Department; GCS: Glasgow Coma Scale; MEWS: Modified Early Warning Score; REMS: Rapid Emergency Medicine Score; L: Lactate



Table 4. The results of scoring systems according to end points of study.

	MEWS	REMS	MEWS-L	REMS-L
Hospitalization				
AUC (p)	0.817 (p=0.002)	0.837 (p=0.001)	0.921 (p<0.001)	0.918 (p<0.001)
Optimal Cut-off	4.50	8.50	7.35	15.85
Sensitivity (%)	19.14	43.46	17.90	11.14
Spesifisity (%)	91.80	67.04	94.47	97.45
LR+ (%)	233.48	131.88	323.71	437.71
LR- (%)	88.07	84.32	86.90	91.17
28-day mortality				
AUC (p)	0.647 (p<0.001)	0.659 (p<0.001)	0.681 (p<0.001)	0.695 (p<0.001)
Optimal Cut-off	2.50	9.50	5.25	10.05
Sensitivite (%)	58.38	40.46	58.08	70.37
Spesifisite (%)	65.27	76.84	74.35	57.64
LR+ (%)	168.11	174.77	226.47	166.14
LR- (%)	63.77	77.47	56.37	51.39

AUC: Area Under curve; LR: Likelihood Ratio; MEWS: Modified Early Warning Score; REMS: Rapid Emergency Medicine Score; L: Lactate

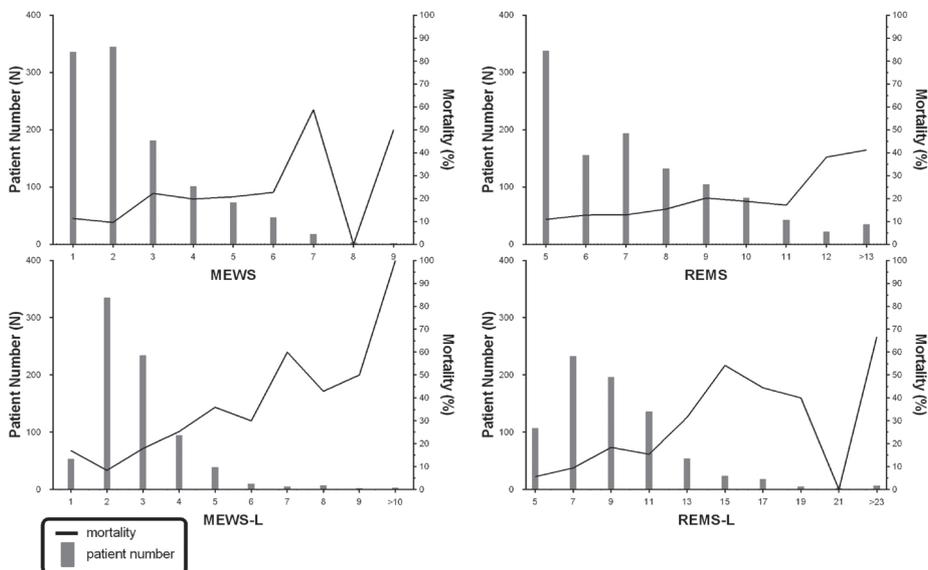


Figure 1. The distribution of patients and rate of mortality according to scores.

DISCUSSION

In the study in which MEWS was first defined, it was reported that AUC for admission to the ICU was 0.62 and that it had an intermediate predictive strength (6). Dundar et al. (4) found that AUC of MEWS for hospitalisation of elderly patients from ED was 0.727 and that it had an intermediate predictive strength. In our study, the predictive strength of MEWS was stronger for estimating the hospitalisation of elderly patients.

Another study calculated AUC of MEWS for estimating the 30-day mortality as 0.754 (9). Çıldır et al. (10) found that the optimal threshold value of MEWS for estimating the 28-day mortality was 6 and determined the sensitivity, specificity and AUC to be 43.24%, 75% and 0.608, respectively. Köksal et al. (11) reported the optimal value of MEWS for estimating the 28-day mortality was 3, sensitivity was 77.97%, specificity was 79.9% and AUC was 0.846. In our study, we obtained lower scores with respect to sensitivity and specificity of MEWS and it yielded an intermediate predictive strength.

Bulut et al. (12) found REMS to be 6 for estimating hospitalisation after ED visit and AUC was calculated as 0.642. Dundar et al. (13) reported AUC of REMS as 0.698. In our study, contrary to the findings of previous studies, REMS had higher AUC values in the prediction of discharge from ED and of hospitalisation in elderly patients.

A study by Cattarmole et al. (9) designated AUC of REMS to be 0.771 for the estimation of 30-day mortality. Hilderink et al. (14) found AUC of REMS to be 0.74 for the estimation of 28-day mortality. In our study, in line with the results of previous studies, we determined similar AUC values of REMS.

Yoo et al. (15) demonstrated that AUC of MEWS was 0.816, whereas that of MEWS-L was 0.898 for the prediction of hospitalisation after ED visit. In our study, in line with the results of the previous study, AUC of MEWS-L was determined to be high for the estimation of discharge after emergency and hospitalisation. In addition, it was found that AUC

and specificity of MEWS-L was higher than those of MEWS.

In our study, AUC and specificity of MEWS-L was significantly higher for the prediction of 28-day mortality than those of MEWS. In line with the findings of our study, Yoo et al. (15) reported that MEWS-L was a stronger predictor of 28-day mortality than MEWS.

In our study, AUC and specificity of REMS-L was higher than that of REMS for predicting discharge after emergency and hospitalisation; however, the sensitivity of REMS-L was found to be lower. In addition, AUC and sensitivity of REMS-L was determined to be higher than that of REMS for estimating the 28-day mortality. We found no study in the literature to compare our findings on REMS-L.

In our study, we found that MEWS of 6 corresponded to a mortality rate of 22.7%, whereas MEWS of 7 corresponded to a mortality rate of 58%. Similarly, Dundar et al. (4) stated that MEWS of 6 corresponded to a mortality rate of 38% and as MEWS increased to 7, the mortality rate increased to 77%. However, Burch et al. (16) determined a mortality rate of 16% for MEWS<5 and a mortality rate of 26% for MEWS ≥5. We determined that REMS of 11 corresponded to a mortality rate of 17.1% and when it increased to 12, the mortality rate increased to 38.1%. A study by Ha et al. (17) designated a mortality rate of 16% for REMS of 10–11 and as REMS increased to 12–13, the mortality rate increased to 39%. However, Dundar et al. (13) found a mortality rate of 3.6% for REMS of 8 and as REMS increased to 9, the mortality rate increased to 14.1%. According to these results, there is a difference among the risk groups with respect to the prediction of mortality.

The main limitations of our study were that it was monocentric, ignored the possible seasonal variations and excluded trauma patients. It is known that in patients aged ≥ 65 years, comorbidity and medications affect the prognosis. These factors were also ignored. Similarly, no detailed evaluations were performed with respect to the cause of death



of patients who died during the study and their final diagnosis.

We approached elderly patients as a whole in our study, and their complaints at admission and final diagnosis were evaluated with respect to their organ systems. However, prognostic values of scoring systems between different sub-groups of patients with different diagnosis were not analysed.

In addition, the study did not evaluate how primary lifesaving interventions and medications provided by the emergency medical system affected MEWS and REMS was not taken into consideration.

In conclusion, the present study supports that MEWS and REMS are effective, reliable and convenient scoring systems for predicting hospitalisation

and 28-day mortality in elderly patients who presented to EDs. We found that REMS was a more effective system for predicting hospitalisation and mortality of the patient than MEWS.

We also determined that a combination of REMS and MEWS with lactate levels had a stronger estimation value for predicting hospitalisation and 28-day mortality than REMS and MEWS alone. We believe that future studies on MEWS-L and REMS-L in elderly patients who presented to EDs will yield a better understanding on their roles in the definition of critical elderly patients.

Conflicts of interest

There are no conflicts of interest.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344051
2018;21(3):365-373

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Received: 30/01/2018
Accepted: 27/08/2018

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RESEARCH

EVALUATION OF SUNBATHING AND PROTECTION AWARENESS ACCORDING TO THE SOCIODEMOGRAPHIC CHARACTERISTICS OF INDIVIDUALS AGED ABOVE 65 YEARS

ABSTRACT

Introduction: Because excessive exposure to solar radiation contributes to the aging of skin and the risk of skin cancer, protection from sunlight has become an important public health problem. This study aims to assess the knowledge level of individuals aged >65 years regarding sun exposure and their current use of sunscreen products.

Materials and Method: A questionnaire consisting of 22 questions was prepared to measure sun protection awareness and use of sunscreen products by individuals aged >65 years. Between July and August 2017, the questionnaire was administered to 603 patients who presented to outpatient clinics. The data were analyzed using SPSS 22 software; a p-value of <0.05 was considered significant.

Results: The average age of the 603 participants was 67.8 years; 202 (33.5%) of them stated that they generally remained in the sun for 4–6 h, and 518 (86.3%) indicated that they had not received any information about sun protection.

Conclusion: We found that individuals aged ≥65 years had insufficient knowledge of the dangers of excessive sun exposure and were not protected from it. In order to reduce the risk of skin cancer in Turkey, education regarding lifestyle modification, sun protection, and use of sunscreen should be provided and relevant health policies should be formulated for these trainings to become a part of lifestyle there.

Keywords: Aged; Sun; Awareness

ARAŞTIRMA

65 YAŞ ÜZERİ BİREYLERDE GÜNEŞLENME VE KORUNMA BİLİNCİNİN SOSYODEMOGRAFİK ÖZELLİKLERE GÖRE DEĞERLENDİRİLMESİ

Öz

Giriş: Deri kanseri ve deri yaşlanmasında güneş ışınlarının rolünün net olarak anlaşılmasıyla birlikte güneşten korunmak önemli bir toplum sağlığı sorunu haline gelmiştir. Çalışmayla 65 yaş üstü bireylerin güneşin zararlı etkileri konusundaki bilgi düzeylerini ve güneş koruyucu ürün kullanım durumları değerlendirilmeye çalışılmıştır.

Gereç ve Yöntem: Çalışmaya 65 yaş üstü bireylerin güneşlenme bilincini ve güneş koruyucu ürün kullanım durumlarını ölçen 22 sorudan oluşan bir anket hazırlandı. Temmuz-Ağustos 2017 tarihi arasında ayaktan hasta polikliniklerine müracaat eden hastalar uygulandı. Veriler SPSS 22 prog ile değerlendirildi ve anlamlılık değeri p<0.05 olarak alındı.

Bulgular: Çalışmamıza katılan 603 kişinin yaş ortalaması 67.8 yıl olarak hesaplandı. Katılımcılardan 202'si (%33.5) 4-6 saat güneşte kaldığı ve 518'i (%86.3) güneşten korunma konusunda hiç bilgi almadığını belirtti.

Sonuç: Altmış beş yaş üstü bireylerin güneşten korunma konusunda yeterli bilgilerinin olmadığı ve güneşten korunmadıkları bulunmuştur. Yılın dört mevsimi güneş gören ülkemizde yaşla birlikte arttığı bilinen cilt kanserleri sıklığını azaltmak için; yaşam tarzı değişikliği, güneşten korunma ve güneş koruyucu kullanımı hakkında eğitimler düzenlenmeli ve bu eğitimlerin yaşam stili olarak kabul edilmesi için sağlık politikaları oluşturulması gerekmektedir.

Anahtar sözcükler: Yaşlı; Güneş; Farkındalık

INTRODUCTION

In the 20th century, it was reported that the world population included more than 500,000 people aged >65 years; it was estimated that this number would reach 2 billion by 2050 (1). According to 2016 data from the Turkey Statistical Institute, 6.6 million people are now aged >65 years (2). This increase in life expectancy has raised the question of how to improve people's quality of life as their lives become longer.

In literature it has been noted that even short durations of exposure to sunlight, although necessary for vitamin D synthesis, may still cause DNA damage. With our current clear understanding of the role of UV light in promoting skin cancer and the premature aging of the skin, protection from sunlight has become an important public health issue. It is known that the prevalence of sun exposure and incidence of skin cancer increase with age; however, awareness of the importance of protection against sun exposure is barely spread among older people (3). According to the WHO, 132,000 people were diagnosed with melanoma, the deadliest form of skin cancer, and 2–3 million were diagnosed with non-melanoma skin cancer. In addition, the incidence of skin cancer increases by 3% annually (4). Despite variety of treatment options, it is known that, annually, Approximately 55,000 people die due to melanoma (5). The most common etiological cause of skin cancer is exposure to sunlight. For this reason, nations have been organizing various campaigns to raise awareness of people about sun protection and being out in the sunlight at proper times (6, 7).

Despite all awareness-raising efforts and improvements in health care, exposure to sunlight is still high and increased incidence of skin cancer suggests that behavioral changes could not be produced in individuals in this regard. The aim of our study is to increase the awareness of individuals aged >65 years by determining their level of knowledge regarding the harmful effects of UV light and the use of both sunscreen and sun protection products.

MATERIALS AND METHOD

Two dermatologists prepared a questionnaire consisting of 22 questions designed to measure the respondents' awareness of the risks of sun exposure and the use of sunscreen products; all respondents were aged >65 years. The survey questions were created on the basis of literature review. The initial questionnaire was tested with 45 individuals. Then the unclear questions were revised, and a Turkish language expert checked them for clarity. The final questionnaire included 21 questions: 7 questions were designed to obtain demographic information, 10 tested for attitudes, and 4 questioned knowledge level. After a power analysis, when the questionnaire reached an accuracy of 96%, at least 528 individuals were included in the study, with $n = 0.96$, a deviation of 0.03, type 1 error of 0.05, and type 2 error of 0.10.

From July to August 2017, the questionnaire was administered on a voluntary basis via face-to-face interviews with patients aged ≥ 65 years who were illiterate, had no neurologic or psychiatric problems, and who had applied to the outpatient clinics of the Inonu University Scientific Research and Publication Committee.

For data analysis, the SPSS 22 software program was utilized. When descriptive statistics were reported, frequency distributions of qualitative data were presented; for quantitative data, arithmetic mean and standard deviation values were presented. Nonparametric tests and chi-square tests were used in the analysis of qualitative data; parametric tests were used in the analysis of quantitative data, and nonparametric tests were used in the analysis of quantitative data that did not have a normal distribution. The Mann–Whitney U test, Kruskal–Wallis test and Binary Logistic Regression test were used in analyzing the data. A p-value of <0.05 was considered significant.

RESULTS

The study included 603 participants and average age was 70.73 ± 5.42 . The majority of participants are males. Details of the sociodemographic characteristics are given in Table 1.



Participants' daily duration of exposure to sun and status of sunburn and sun protection are given in Table 2.

We found that 33% of participants have been sunburn once in their previous life. Regarding the awareness of sun protection, we found that 86.3% of patients had no information from healthcare personnel. Regarding sun protection, 82.7% of the participants stated that they stay in the shade to protect from the sun, 46.5% used hats, and 17.4% used sun cream. Only 15.6% of the participants using sun-cream stated that they had received help from a dermatologist. The first factor considered in choosing sunscreen (21.3%) was found to be the price of the product, while 16.5% considered height the sun protective factor. The factors affecting the participants' behavior of using the sunscreen are given in Table 3.

When sociodemographic factors affecting the use of sunscreen were taken into consideration, income and occupation were found to be most effective factors ($p < 0.001$). It was found that people with high income and qualified professions use sunscreens more often. We found that gender, age and social security did not affect the use of sunscreen creams.

The analysis of the answers to the questions asked to evaluate the potential benefits and harms of the sun rays is given in Table 4.

We found that the number of the correct answers given the participants who worked for higher salaries, who occupied in qualified professions, and those between the ages of 71-80 were statistically significantly higher

According to the results of the logistic regression analysis, which we included questions regarding the time spent outside (divided for three hours or more), use of sunscreen, hair color (light and dark colors), eye color (blue, green and other dark colors), being received information about necessity of sun protection, and whether any of these has an effect on sunburn, we observed that model fit of was good (omnibus test $p < 0.001$). The overall correct estimate of the model is 67.8%. The results of the

regression analysis for development of sunburn are given in Table 5.

We found that staying out more than 3 hours increased the risk of sunburn 1.6 times, while not using sunscreen cream increased this risk by about 3 times. while the out-of-worker his of developing sunburn by a factor of 1.6 over 3 hours. It has been found that hair color, eye color, and being received information in this regard are not important for the risk of developing sunburn.

Table 1. Sociodemographic characteristics of the participants.

Variable	n	%
Gender		
Male	327	54.2
Female	276	45.8
Age group (in years)		
65-70	372	61.7
71-80	179	29.7
≥81	52	8.6
Monthly income (in TL)		
<1000	207	34.7
1001-2000	263	44.1
2001-3000	96	16.1
≥3001	31	5.2
Occupation		
Retired Civil Servant	132	21.9
Retired worker	91	15.1
Self-Employed	149	24.7
Housewife	231	38.3
Social security		
Yes	513	85.2
No	90	14.8
Total	603	100.0

Table 2. Participants' daily duration of exposure to sun, sunburn and, sun protection.

Variable	n	%
Daily duration of exposure to sun		
Less than 1 hour	188	31.2
1-3 hours	108	17.9
4-6 hours	202	33.5
6-8 hours	66	10.9
More than 8 hours	39	6.5
Sunburn		
Yes	199	33.0
No	404	67.0

Table 3. Participants' behaviors of using sunscreen.

Variable	n	%
Do you use sunscreen?		
Yes	104	17.4
No	493	82.6
Whom do you get help while you buy sunscreen?		
Dermatologist	94	15.6
Advertisements	19	3.2
Pharmacist	83	13.8
Internet	7	1.2
Friends	23	3.8
No help	86	14.3
How do you choose the sunscreen?		
According to the brand	98	16.3
By price	128	21.3
According to the protective factor height	99	16.5
According to the perfume it contains	15	2.5
According to being free of perfume	20	3.3
When do you use sun protector?		
1 hour before sunbath	125	20.8
15 minutes before sunbath	46	7.6
While sunbathing	22	3.7
After sunbathe	5	0.8
It does not matter	16	2.7
Where do you apply sunscreen?		
Face	218	36.2
Back of the hands	117	19.4
Back	46	7.6
Arms and legs	114	18.9
Body	41	6.8



Table 4. Answers to questions according to sociodemographic factors.

Variable	Number of correct answers	
	A.O.±sd	p
Gender		
Male	2.73±1.17	0.241
Female	2.85±1.13	
Age		
60-70	2.82±1.11	≤0.001
71-80	2.93±1.15	
>80	2.00±1.13	
Income (TL)		
<1000	2.60±1.13	≤0.001
1001-200	2.69±1.14	
2001-3000	3.22±1.09	
>3000	3.40±1.06	
Occupation		
Retired officer	3.33±0.95	≤0.001
Retired worker	2.70±1.20	
Self employment	2.37±1.15	
Housewife	2.76±1.12	

Table 5. Results of logistic regression analysis.

Variable	Development of sunburn				
	B	p	Exp (B)	Lower limit	Upper limit
Time spent out	0.474	0.009	1.606	1.127	2.289
Not to use sunscreen	1.114	<0.001	3.046	1.861	4.985
Hair color	0.187	0.324	1.196	0.831	1.750
Eye color	0.087	0.669	0.462	0.731	1.629
Being informed before	0.172	0.549	1.185	0.677	2.083

DISCUSSION

It is known that the number of melanocytes gradually decreases as people age and that the incidence of skin damage and skin cancer increases (8). A significant increase in the incidence of melanoma has been identified in the United States and Europe because of an increase in the proportion of people aged >65 years, and this is considered a public health problem (9). It has recently been reported that this is also a serious problem in Turkey (10). Therefore, it will be appropriate to perform skin cancer screening within the scope of cancer screenings, within the basic principles of geriatric preventive medicine.

The mean age of the patients in epidemiological studies investigating skin cancers and etiological factors in older groups was reported to be 64–69 years (10,11). The average age of those in the present study was 67.8 years, which is consistent with the findings of other studies in the literature.

The ideal way to protect oneself from the sun is to wear long, less open clothing as well as hats and wide-framed sunglasses that protect the face; one should also remain in the shade as much as possible, especially when the sun is directly overhead (12). When the literature is examined in this regard, in studies conducted in Canada, about half of the participants stated that they stay in the shadow to protect from the sun (13,14). Seit et al. in their multicenter study including 23 countries found that most of the participants used sunscreen and sunglasses to protect against sunlight (15). In our study, 85% of the participants stated that they stay in the shadow to protect from the sun. It is known that resistant sun exposure is generally associated with basal cell carcinoma and melanoma, and chronic sun exposure is associated with squamous cell carcinoma (16). In the light of this information, just sitting in the shadow without taking sun protection precautions is not considered to be adequate protection method, in areas such as our city which is sunny for most of the year.

Hall et al. found that those who stayed in the sun for more than 4 h a day were more likely to be young males with higher incomes (17). Although the participants in the present study were aged >65 years, they mostly (33.5%) stayed under the sun for 4–6 h a day. This result may be explained by the fact that our city is located in the eastern part of Turkey, where many people are farmers and are therefore obliged to work in the sunlight.

It is known that UV light plays an important role in all skin cancers and that UV light is an accepted part of the environment. To prevent excessive exposure to UV, sun protectors, products that increase the production of collagen, and antioxidants can be used (18). A study in Australia found that the use of sunscreens reduced the frequency of squamous cell carcinoma by 9.3% and melanoma by 14% (19). Only 17.3% of the participants in our study indicated that they used sunscreens, which suggests that they are vulnerable to skin damage or cancer in the future. This indicates that community awareness needs to be created. In the study of Pinault and Fioletov, it has been reported that 45% of those who said they used sunscreen, applied it on the face, while in the study of Seit et al. the participants said that they applied sunscreen mostly on their legs and arms. (13,15). In our study, 36.2% of those who used sunscreen stated that they most frequently applied it on their faces. It is known that sunscreen protectors should be applied 15–20 min before sun exposure and repeated every 2 h if the individuals remain in the sun (20). In our study, we found that the participants over the age of 65 applied sunscreen 1 hour before going out and not repeated and using it in this way was not enough to protect the skin of people over 65 years from sunlight. We suggest that giving information about skin cancer and prevention methods is necessary, when advising elderly people in our country, and campaigns should be organized and even media should be employed. In this context, Haluza et al. found that participants had deficiencies in knowledge about sun protection and the rate of sun protection increased, after the



media, TV, and even doctors informed individuals about sun protection (21).

The studies in which sun protection techniques were examined on the basis of gender indicate that females mostly prefer to stay in the shade and use sunscreen products, whereas males prefer to wear hats and long pants (13,17,22). In our study, we found that both females and males preferred to sit in the shade but females used sun protection more than males.

Purdue et al. reported that the use of sunscreen and wearing thick clothes reduced the frequency of sunburn and that the use or inadequate application of sunscreen increased sun exposure (14). In the study by Pinault and Fioletov, 33% of participants were found to have experienced sunburn during the previous year and most of these were males, unemployed, and with low levels of income (13,15). There are also studies indicating that sunburn is more common among males and in high-income groups (14,23), which helps explain why malignant melanoma is seen more often in those with higher incomes (24). Our study included male participants who stayed under the sun for 4–6 h daily and did not use sunscreen; among them, the rate of sunburn during the preceding year was reported as 33%. It has been reported that male skin is thicker, colloiddally richer, and with less subcutaneous fat; thus, it is able to repair UV damage more readily; this accounts for the fact that males are less likely to experience erythema and sunburn (25,26). We found that as people's monthly income increases, their use of sunscreen also increases. In addition, we found that retired civil servants and workers, who had higher level of education, used more sunscreen products. In addition, the participants' response of "according to price" for the question "How do you select your sunscreen?" led us to conclude that the frequency of sunscreen use is directly related to the level of income.

When our participants were asked, "Is sun protection necessary?", 63.2% replied that it was

not. As to the question of how long one should expose oneself to the sun daily, the response was generally "more than an hour." In response to the question "Have you ever received information on how to protect yourself from the sun?", 86.3% of the participants answered that they had not received such information. Liu-Smith et al. emphasized that informative training should be organized to reduce the risk of skin cancer in people as they age (22). Seit et al also found a positive association between level of knowledge of sun protection, age and socioeconomic status and sun exposure. The primary prevention methods for skin cancer and self-skin examination should be taught and an awareness should be raised (15). It is stated in the literature that among all cancers, skin cancer is the most costly type (27,28). Although there is no official skin cancer screening program in Australia, skin cancer screening programs are being implemented by family physicians (29). Economic analyses show that the early diagnosis of skin cancer reduces the cost of treating it (12). Early diagnosis is especially important for malignant melanoma; overall, education and awareness are the primary and most cost-effective preventive measures (30). Based on the results of our study, we believe that it would be appropriate to screen for skin cancer in individuals aged >65 years, with a nocost physical examination as the first step.

In their study, Pinault and Fioletov found the rate of awareness regarding sun protection to be only 35%. When the answers to the questions that measure sun protection awareness in our study were examined, it was found that those who had a higher monthly income and higher level of education (such as retired civil servants) and those in the age range of 65–80 years had a greater level of awareness (13,15).

A limitation of our study was that it did not include questions about winter sun exposure or chronic exposure, and the physical examinations did not include a search for precancerous skin lesions. However, our study remains significant because to

the best of our knowledge, no other similar study has been conducted in Turkey, and this is the first study conducted for the present purpose.

In conclusion; we investigated the socio-demographic characteristics of 65-year-olds and the level of knowledge about sun protection in this study. Our results showed that the participants did not have adequate information on sun protection and were not protected from the sun effectively. It is very important for individuals living in our region to be informed about the harmful effects of the sun because our region is mostly sunny and the farming is the main occupation group. In particular, healthcare professionals should conduct training

on self skin examination and primary prevention methods and health policies should be established to ensure that these trainings are considered as a lifestyle. In this regard even public spots should be created to ensure media support.

Ethical considerations

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication, double publication and/or submission, redundancy, etc.) have been completely checked by the authors.

Conflict of interest

The authors declare that they have no conflicts of interest.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344052
2018;21(3):374-382

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Received: 29/05/2018
Accepted: 06/09/2018

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Presented at the 38th TUSAD National Congress, 2016, Çeşme, İzmir.

RESEARCH

THE EFFECT OF COGNITIVE FUNCTIONS ON SPIROMETRIC EVALUATION IN ELDERLY PATIENTS

ABSTRACT

Introduction: Compliance with spirometry may be disturbed among elderly patients, leading to difficulties in diagnosis and treatment. Contradicting studies exist concerning the quality of spirometry measurements, particularly among patients with cognitive disorders. We studied the effect of cognitive functions on spirometry testing time and pulmonary function test (PFT) parameters among patients aged ≥ 65 years.

Materials and Method: The study was conducted in the Pulmonary Function Laboratory of our hospital between January and June 2015. A total of 336 subjects aged >45 years who never underwent PFT were included. Patients were categorized as those aged ≥ 65 years (Group 1) and those aged 45–65 years (Group 2). Mini-Mental State Examination (MMSE) scores of ≥ 24 were considered normal, whereas those of 18–23 indicated mild cognitive dysfunction.

Results: Groups 1 (132 subjects) and 2 (204 subjects) had similar male-to-female ratios. Six (1.8%) patients were excluded because their spirometry was not properly performed. Forced expiratory volume in 1st second (FEV1 % predicted), forced vital capacity (FVC % predicted), FEV1/FVC %, and MMSE results were significantly lower in Group 1 than in Group 2. No significant difference was noted between the groups regarding spirometry testing time and the number of maneuvers. MMSE negatively correlated with age and the number of spirometry maneuvers and positively with FEV1 % and FVC %. The prevalence of obstructive pulmonary disorders was higher in Group 1. Logistic regression analysis revealed age, body mass index, and smoking history as factors affecting obstruction.

Conclusion: Evaluation of cognitive function before performing spirometry testing in elderly patients is essential for accurate and reliable test results.

Keywords: Spirometry; Cognition; Aged; Mental Status and Dementia Tests

ARAŞTIRMA

YAŞLI HASTALARDA KOGNİTİF FONKSİYONLARIN SİPİROMETRİK DEĞERLENDİRMEYE ETKİSİ

Öz

Giriş: Yaşlı hastalarda spirometriye uyum zor olabilmekte bu da tanı ve tedavide yetersizliklere neden olmaktadır. Özellikle kognitif fonksiyonlardaki bozulmaya bağlı spirometri ölçümlerinin kalitesi ile ilgili çelişkili yayınlar mevcuttur. Çalışmada 65 yaş üzerindeki kişilerde kognitif fonksiyonların spirometri süresi ve solunum fonksiyon testi (SFT) parametreleri üzerine etkisinin araştırılması amaçlanmıştır.

Gereç ve Yöntem: Çalışmaya Ocak 2015 ile Haziran 2015 tarihleri arasında hastanemiz solunum fonksiyon laboratuvarına başvuran daha önce SFT yapılmamış olan 45 yaş üzeri toplam 336 olgu alındı. Olguların yaş, kilo, boy, eğitim düzeyi, geçmiş tıbbi öyküleri ve alışkanlıkları, SFT ve standardize mini mental test (MMSE) sonuçları kaydedildi. Olgular 65 yaş üstü (grup 1) ve 45-65 yaş arası (Grup 2) olacak şekilde sınıflandırıldı. MMSE' de 30 puan üzerinden yapılan değerlendirilmede 24 puan ve üzeri normal, 18-23 puan arası hafif kognitif bozukluk olarak kabul edildi.

Bulgular: Olguların 132'si Grup 1'de, 204'ü Grup 2'de idi, her iki grubun erkek ve kadın oranları benzerdi ($p=0.053$). Altı (%1.8) olgunun spirometreleri uygun şekilde yapılmadığından değerlendirmeye alınmadı. Grup 1'de postbronkodilatatör FEV1%, FVC %, FEV1/FVC % değerleri ile MMSE puanları kontrol grubuna kıyasla anlamlı olarak daha düşük bulundu ($p < 0.001$). Spirometri süresi ve manevra sayısı bakımından 2 grup arasında fark saptanmadı. MMSE'nin korelasyon analizinde yaş ve spirometri manevra sayısı ile negatif, FEV1 % ve FVC % değerleri ile pozitif korele olduğu bulundu. Grup 1'de obstrüktif solunum fonksiyon bozukluğu daha fazla idi. Lojistik regresyon analizinde obstrüksiyon için etkili faktörler; yaş, VKİ ve sigara içme öyküsü idi.

Sonuç: Verilerimiz yaşlı olgularda spirometri öncesi kognitif fonksiyonları değerlendirmenin hem spirometri kalitesine hem de spirometri süresine olumlu katkı sağlayacağına işaret etmektedir.

Anahtar sözcükler: Spirometri; Bilişsel durum; Yaşlanma ve Demans testleri



INTRODUCTION

The elderly population is increasing in Turkey as well as worldwide. According to the World Health Organization, the population aged ≥ 65 years is defined as "old" and that aged ≥ 85 years as "very old" (1). The percentage of the elderly population in Turkey was 7.5% in 2012, which increased to 8.3% in 2016. According to population projections, the elderly population is predicted to constitute 10.2% of the total population in 2023, 20.8% in 2050, and 27.7% in 2075 (2).

Various changes in pulmonary functions occur with increasing age, of which the two most important are increased residual volume and decreased vital capacity. Increased functional residual capacity and decreased elastic recoil occur together with aging. Forced expiratory volume in 1st second (FEV1) and forced vital capacity (FVC) show a plateau between ages 18–25 and then decreases by 30 mL/year. This reduction can reach 100 mL/year in smokers (3). In addition, aging may be associated with cognitive function disorders, ranging from mild-to-moderate disorders to dementia. Compared with the younger population, processing and reaction speeds of the elderly are slower during the time-based evaluation of cognitive function. However, this reduction is not so prominent as to affect daily living (4,5). Cognitive function can be assessed using screening tests, such as the Mini-Mental State Examination (MMSE), clock-drawing test, and three-item recall test. Among these, the MMSE is a comparatively short, simple, and global test that can be used in clinical practice and research. The MMSE test is scored over 30 points and measures tendency, attention, memory, motor abilities, and linguistic performance. If the test can be standardized according to age and the educational level, its sensitivity and specificity can reach 82% and 99%, respectively (6,7).

The increased incidence of pulmonary symptoms observed in elderly patients results in an increased requirement of pulmonary function tests (PFT) to distinguish obstructive diseases. In these patients, the presence of a cognitive function disorder can affect the quality of PFT results, thereby influencing the prognosis. Further, elderly patients have difficulties in comprehending spirometry maneuvers and in cooperating with the PFT technician. Thus, spirometry testing time is increased (8). In the present study we determined the effects of cognitive functions on spirometry parameters and testing time using MMSE.

MATERIALS AND METHOD

The study was conducted between January and June 2015 at the Pulmonary Function Laboratory of the Adnan Menderes University Hospital after obtaining ethical committee approval. Subjects were chosen among patients admitted to the laboratory who never underwent spirometry and, thus, were unfamiliar with the maneuvers. A total of 336 patients aged ≥ 45 years provided written consent to participate. Patients diagnosed with chronic obstructive pulmonary disease (COPD), respiratory failure, severe cardiovascular or neurologic disorders were excluded. Subjects were categorized as those aged ≥ 65 (Group 1) and 45–65 (Group 2, controls) years. For all patients, demographic data [age, sex, weight, height, body mass index (BMI), smoking history, socioeconomic and educational status, professional history, medical history], PFT, and standardized MMSE results were recorded.

Pulmonary Function Testing (PFT)

The test was conducted at our laboratory with the patient in a sitting position, according to the 2005 ATS/ERS criteria, using a Jaeger Master Scope spirometer. Subjects were tested eight

times or until they could not continue the test, and the three best results were recorded. All measurements were performed by the same Certified Pulmonary Function Technician. The bronchodilation test was conducted with an inhaler device. At 15 min after the inhalation of four puffs of salbutamol (400 µgr), FEV1 (%), FVC (%), and FEV1/FVC (%) values were recorded. Results that were not acceptable according to the ATS/ERS 2005 criteria or those not reproducible were excluded. According to these criteria, post-bronchodilator FEV1/FVC values of <70% indicated obstruction and FEV1 and FVC values of <80% with a normal FEV1/FVC ratio indicated restriction. The test testing time and number of maneuvers were recorded (9).

Mini-Mental State Examination (MMSE)

MMSE was developed in 1975 in English language. Its standardized form was translated to Turkish in 1997, and we used this version to evaluate cognitive functions (Figure 1), including attention, memory, motor skills, and linguistic abilities. MMSE was scored over 30 points, including 10 for time and space orientation, 6 for memory (3 for registration and 3 for recall), 5 for attention, 8 for linguistic abilities, and 1 for visual-spatial functions. Scores of ≥ 24 points indicated normal, those of 18–23 indicated mild, and those of ≤ 17 indicated severe cognitive impairment (10).

Statistical analysis

For the statistical analysis of the data, SPSS (Statistical Package for Social Sciences, for Windows Release 16.0 licensed to University of California Davis USA) software package was utilized. Descriptive statistics of categorical measures (gender, educational status, group, etc.) were expressed as frequency (percentage).

Kolmogorov–Smirnov test was used to assess the normality of numeric variables. Mann–Whit-

ney U test was used to compare the two groups for all non-normally distributed numeric variables, and descriptive statistics were presented as median (interquartile range). χ^2 test was used to analyze categorical data, and descriptive statistics were represented as frequency (%). Spearman's ρ correlation analysis was used to determine correlations between numeric variables. Logistic regression (LR) with a forward stepwise variable selection was used to determine factors affecting obstruction. $p < 0.05$ was considered statistically significant.

RESULTS

Of the 336 subjects [mean age, 62.14 ± 9.32 (range, 45–89) years; 174 (51.8%) males], 273 (81.3%) had received education for < 5 years [62 (18.5%) were illiterate and 211 (62.8%) were primary school graduates] and 23 (6.8%) were university graduates. Mean BMI was 29.28 ± 6.29 (17.51–61.73), and 161 (47.9%) subjects had no smoking history. Six (1.8%) subjects were eliminated because their spirometric tests did not match the 2005 ATS/ERS criteria (three each from groups 1 and 2; $p = 0.683$).

Among the remaining 330 patients, PFT results indicated obstruction in 145 (43.2%) and restriction in 56 (16.7%). The mean number of maneuvers was 3.60 ± 1.26 , and mean PFT testing time was 19.01 ± 5.00 min. Median MMSE was 21.50 (19–24) points. MMSE results indicated severe dementia in 18.8% of the subjects, mild dementia in 43.5%, and normal function in 37.8%.

Mean BMI was statistically significantly lower in Group 1 than Group 2 (26.80 versus 30.08, $p < 0.001$). Median MMSE scores were 19 (17–22) and 23 (20–25) in groups 1 and 2 and differences were statistically significant ($p < 0.001$). Educational level and medical and smoking histories are shown in Table 1.



The prevalence of mild and severe cognitive impairment was 42.4% and 37.9%, respectively, in Group 1 and 44.6% and 5.9%, respectively, in Group 2 ($p < 0.001$). Among subjects who scored < 24 points, 100 (75%) in Group 1 and 97 (47.5%) in Group 2 were either illiterate or primary education graduates. There were no significant differences in spirometry testing time and the number of maneuvers between the groups ($p=0.352$ and $p=0.603$). The level of postbronchodilator FEV1/FVC %, FEV1 % predicted and FVC % predicted were found significantly lower in group 1 ($p<0,001$). Obstructive pulmonary dysfunction was noted in 58.1% and 34.8% of patients in groups 1 and 2, respectively ($p<0.001$). However, the difference in the rate of restrictive pulmonary dysfunction between the groups was not significant ($p=0.166$; Table 2).

Groups 1 and 2 were divided into subgroups based on normal (≥ 24 points) and abnormal MMSE scores. FEV1 % predicted, FVC % predicted and FEV1/FVC % values were significantly lower in Group 1 ($p=0.01, 0.001, 0.003$, respectively), whereas there was no significant difference between PFT testing time and the number of maneuver.

MMSE negatively correlated with age and the number of spirometry maneuvers and positively with FEV1 % predicted and FVC % predicted values (Table 3, Graphs 1 and 2).

Logistic regression analysis, performed to determine factors contributing to obstructive disorders, revealed age, BMI, and smoking history as factors affecting obstruction (specificity, 77.3%; sensitivity, 60.0%; accuracy, 69.7%; Table 4).

Table 1. Demographic data of the case and control groups.

Variable	Group 1 (≥ 65 years) (n=132)	Group 2 (control) (n=204)	p
Sex (M/F) %	58.3/41.7	47.5/52.5	0.053
BMI (kg/m^2) (% percentile)	26.80 (23.53–31.23)	30.08(25.76–33.74)	<0.001
Education			
Illiterate + Primary Education (%)	114 (86.4)	159 (77.9)	0.074
Secondary + Post-Sec. (%)	18 (13.6)	45 (22.1)	
Medical history			
With comorbidities (%)	85 (64.4)	122 (59.8)	0.398
Without comorbidities (%)	47 (35.6)	82 (40.2)	
Smoking history (%)	72 (54.5)	103 (50.5)	0.467
Evaluable PFT (%)	129 (97.7)	201 (98.5)	0.683
MMSE score (% percentile)	19 (17–22)	23 (20–25)	<0.001

Abbreviations: BMI: body mass index, PFT: pulmonary function test

Table 2. Comparison of MMSE and PFT parameters of the case and control groups.

Variables	Group 1 (n=132)	Group 2 (n=204)	p
MMSE, ≥24 points (%)	26 (19.7)	101 (49.5)	
MMSE, 18–23 points (%)	56 (42.4)	91 (44.6)	<0.001
MMSE, ≤17 points (%)	50 (37.9)	12 (5.9)	
PFT testing time (min)	17.5 (16–21)	18 (16–21)	0.352
# PFT maneuvers	3 (3–4)	3 (3–4)	0.603
Obstruction (%)	75 (58.1)	70 (34.8)	<0.001
Restriction (%)	27 (20.9)	29 (14.4)	0.166
FEV1/FVC (%)	67.48 (58.39–75.24)	74.40 (66.51–79.58)	<0.001
FEV1 (% predicted)	67.80 (54.15–86.80)	86.50 (72.40–100.15)	<0.001
FVC (% predicted)	82.50 (71.65–94.85)	96.10 (83.75–109.85)	<0.001

Abbreviations: MMSE: Mini-Mental State Examination, PFT: pulmonary function test, FEV1: forced expiratory volume–1st s, FVC: forced vital capacity, # PFT maneuvers: number of PFT maneuvers.

Table 3. Relationship of MMSE with age and the number of spirometry maneuvers.

Variable	Mental Test	
	r	p
Age (years)	–0.421	<0.001
# spirometry maneuvers	–0.160	0.003

Abbreviations: # spirometry maneuvers: number of spirometry maneuvers

Table 4. Results of logistic regression analysis for factors affecting obstruction.

Risk factor	OR	95% Confidence Interval for OR		p
		Lower	Upper	
Age (years)	1.053	1.025	1.082	<0.001
BMI (kg/m ²)	0.928	0.887	0.970	0.001
Smokinghistory (packets/year)	3.251	1.956	5.401	<0.001

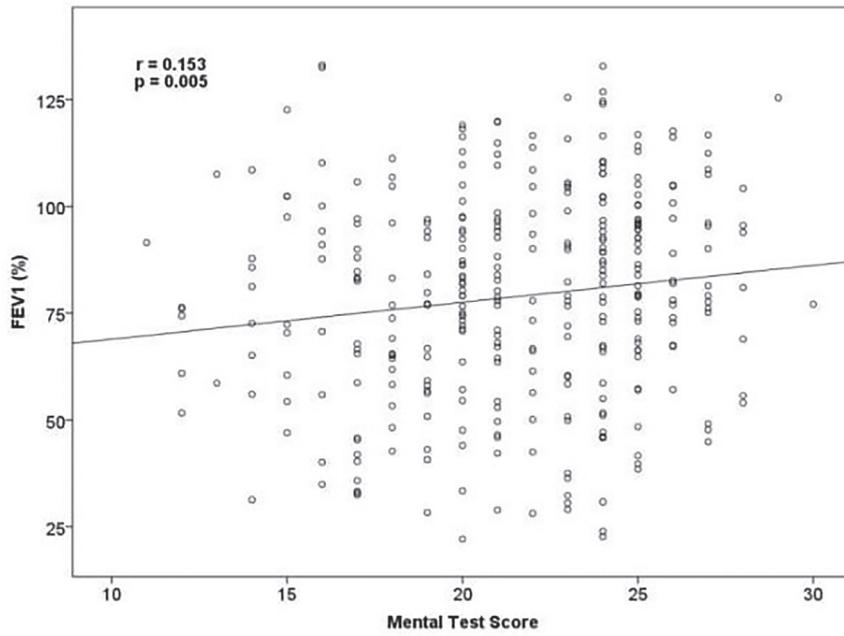


Figure 1. Relationship between MMSE Score and FEV1%.

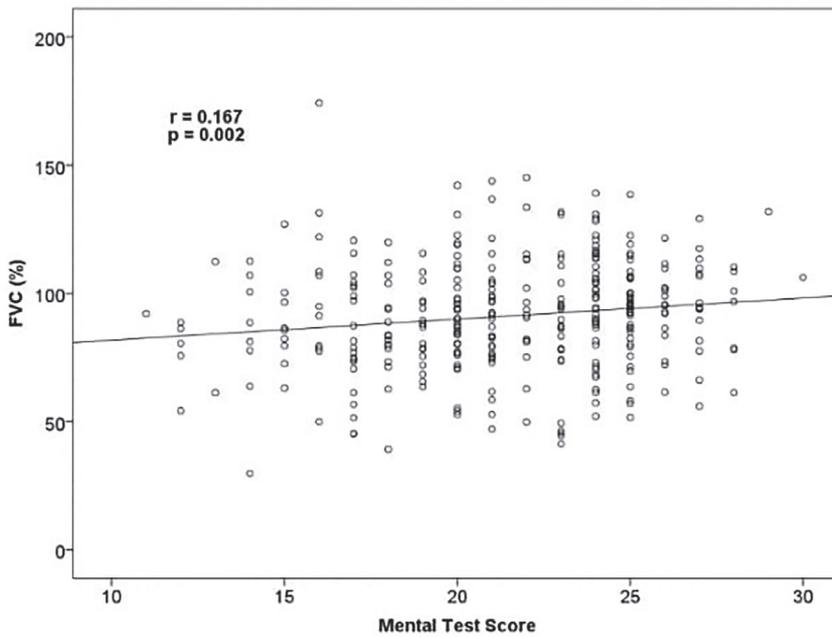


Figure 2. Relationship between MMSE Score and FVC%.

DISCUSSION

Our study indicated that cognitive functions declined with age and as they declined, FEV1 and FVC values decreased and the number of spirometry maneuvers increased. Age, BMI, and smoking history were determined to be factors affecting obstructive pulmonary dysfunction.

Six (1.8%) of our subjects were excluded because they did not comply with the 2005 ATS/ERS criteria. Similarly, in the spirometry study conducted by Czajkowska-Malinowska et al. (8), 29 (2.3%) of 1271 subjects aged 65–94 years were excluded. Bellia et al. (11) evaluated 1622 subjects aged ≥ 65 years and excluded spirometry results of 103 (6.4%). The reason why our study had a lower ratio of excluded subjects may be because of the younger subject group in our study compared with other studies.

Cognitive functions decline because of age-dependent reductions in cerebral blood flow and oxygen and glucose consumptions. Also, educational level, comorbidities, and/or age-related decrease in physical activity are influential factors (12). MMSE scores were found lower in the elderly than in the controls, although levels of education, comorbidity, and smoking history were found similar between the groups, suggesting that age affects cognitive functions regardless of the educational level or comorbidities.

Studies evaluating pulmonary and cognitive functions in the elderly, without any obstructive lung disease such as asthma or COPD, are limited in the medical literature. Carvalhaes-Neto et al. (6) studied 208 subjects aged >65 years measuring cognitive functions using MMSE and found that 60.5% had severe, 17.3% mild dementia, and 22.1% had normal function. In our study, 18.8% of subjects had severe and 43.5% had mild dementia and 37.8% had normal function. One of the factors affecting cognitive functions is the educational level and it should be taken into consideration. However, Carvalhaes-Neto et al. (6) did not mention educational levels of their subjects. In our study, 62 (18.5%) sub-

jects were illiterate and MMSE scores were lower among subjects with ≤ 5 years of education.

Feng et al. (13) studied 2450 patients aged >55 years and evaluated spirometry parameters together with cognitive functions using MMSE, taking educational level into consideration. Mean MMSE scores were 27.00 ± 3.45 , and 1167 (47.6%) subjects had ≥ 7 years of education. In our study, mean MMSE score for the entire sample was 21.36 ± 3.86 and 273 (81.3%) subjects were educated for <5 years [62 (18.5%) were illiterate]. This finding suggested that the difference in MMSE scores between the two studies was related to educational level. Illiterate subjects were evaluated using standardized MMSE for literate adults because no standardized MMSE for illiterate adults was available in Turkey at the time our study was conducted. We suggest further studies using standardized MMSE studies for illiterate individuals.

Bellia et al. (11) evaluated 638 patients with obstructive diseases and 984 control subjects, all with similar age, sex, and educational levels. MMSE scores were significantly lower in the case group. Similarly, in our study, although educational levels were not significantly different, the elderly group had lower MMSE scores, suggesting that age affects cognitive functions.

Pulmonary functions decline with age (3). Most elderly subjects (particularly subjects aged >75 years) have difficulty in performing forced spirometry maneuvers (FEV1 and FVC), which becomes even more difficult when cognitive function is affected (14–16). Haynes (15) evaluated spirometry and diffusion capacity (DLCO) performances in 150 subjects aged ≥ 80 years, together with 178 control subjects aged 40–50 years, and determined that FEV1/FVC lower limits of normal were similar in the elderly and control groups. However, DLCO (% predicted) was significantly lower (15). In our study, we found higher rates of obstructive PFT results in the elderly group compared to the controls, whereas the rates of restrictive PFT results were found similar in both



groups. There was no significant difference between the groups regarding spirometry testing time and the number of maneuvers. Factors associated with obstructive PFT results were smoking history [odds ratio (OR)=3.25], age (OR=1.05), and BMI (OR=0.92). Luoto et al. (17) studied 2025 subjects aged 65–100 years for the incidence of airway obstruction and found that age, active smoking (OR=1.75), smoking history (OR=1.36), and male sex (OR=0.95) were affecting factors and that ages 70–79 years were 1.90-fold effective and ages 80–89 and 90–100 years were 3.15- and 2.84-fold effective, respectively, for obstructive pulmonary dysfunction.

Although we found no difference between the groups regarding spirometry testing time and the number of maneuvers, correlation analysis revealed that older age is associated with impaired cognitive functions. Impaired cognitive function in individuals of advanced age can lead to more spirometry maneuvers, suggesting that the technician will have to spend more time for spirometric tests. Further, FEV1 and FVC values decreased with the deterioration of cognitive functions. The literature indicates that

DLCO, body plethysmography, helium dilution volumetry, and standard forced oscillation techniques can be used to evaluate pulmonary functions in cognitive-impaired elderly individuals when spirometry does not suffice. However, further studies are required regarding this subject (6,14).

In conclusion, cognitive functions deteriorate with age and physiological changes and functional cognitive disorders affect spirometry parameters and the number of maneuvers. Our data indicated that evaluating cognitive functions before undergoing spirometry can improve the quality and testing time of spirometry in the elderly. For the elderly with cognitive impairment, further studies investigating alternative methods to assess pulmonary functions are needed.

There are limitations for our study. Because no standardized MMSE for illiterate adults was available at the time of the study, these subjects were evaluated using standardized MMSE for literate adults in our study. Also, very elderly group could not be evaluated because of low number of participants.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344053
2018;21(3):383-393

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Received: 10/07/2018
Accepted: 13/08/2018

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RESEARCH

DEATH ANXIETY IN THE ELDERLY: RELATION TO PARTICIPATION IN DAILY LIFE

ABSTRACT

Introduction: Evaluating daily living activities and death anxiety, which is one of the psychological problems that elderly people experience, is important to provide the best quality of care for improving the psychological well-being and the quality of life of elderly people. The aim of this study was to analyse death anxiety and daily living activities of elderly people living in a nursing home.

Materials and Method: This descriptive study was performed in a nursing home in Izmir in western Turkey. The sample comprised 150 elderly people who met the research inclusion criteria. Data were gathered with the use of the Demographic Information Form, the Templer Death Anxiety Scale and the Daily Life Activities Form.

Results: The mean Templer Death Anxiety score of the participants was 5.44 ± 1.05 , and the mean Daily Life Activities Form score was 36.67 ± 9.04 . Among activities of daily living, using the toilet had the lowest score (7.48 ± 2.62). Death anxiety was significantly higher among men ($t=2.81, p<0.05$). There was no statistically significant relationship between death anxiety and performance of activities of daily living ($r=-0.02, p>0.05$).

Conclusion: Death anxiety was not associated with performance of activities of daily living.

Keywords: Activities of daily living; Anxiety; Aged; Death; Nursing homes; Nursing care

ARAŞTIRMA

YAŞLILARDA ÖLÜM ANKSİYETESİ: GÜNLÜK YAŞAMA KATILIMLARI İLE İLİŞKİSİ

Öz

Giriş: Günlük yaşam aktivitelerini ve yaşlıların yaşayabileceği psikolojik problemlerden biri olan ölüm kaygısının değerlendirilmesi, verilecek bakımın kalitesi, yaşlıların psikolojik iyilik hali ve yaşam kalitesindeki artış açısından oldukça önemlidir. Bu çalışmanın amacı, yaşlı bakım evinde yaşayan yaşlıların ölüm kaygısı ve günlük yaşam aktivitelerini değerlendirmektir.

Gereç ve Yöntem: Bu tanımlayıcı çalışma, Türkiye'nin batısında bulunan İzmir ilindeki bir yaşlı bakım evinde gerçekleştirildi. Örneklem, araştırmaya katılma kriterlerini taşıyan 150 yaşlı bireyden oluşmuştur. Veriler "Demografik Bilgi Formu", "Templer Ölüm Anksiyetesi Ölçeği" ve "Günlük Yaşam Aktiviteleri Formu" kullanılarak toplanmıştır.

Bulgular: Katılımcıların ortalama Templer Ölüm Anksiyetesi Ölçeği puanı 5.44 ± 1.05 , Günlük Yaşam Aktiviteleri Formu ortalaması 36.67 ± 9.04 ' tür. Günlük yaşam aktiviteleri arasında tuvaleti kullanma puanı en düşük olanıydı ($X=7.48 \pm 2.62$). Ölüm kaygısı erkekler arasında istatistiksel olarak anlamlı düzeyde yüksek bulundu ($t=2.81, p<0.05$). Yaşlıların ölüm kaygı düzeyleri ile günlük yaşam aktiviteleri arasında istatistiksel olarak anlamlı bir ilişki bulunmadı ($r=-0.02, p>0.05$).

Sonuç: Yaşlıların ölüm kaygı düzeyleri ile günlük yaşam aktiviteleri arasında anlamlı bir ilişki bulunmadı.

Anahtar sözcükler: Günlük yaşam aktiviteleri; Anksiyete; Yaşlı; Ölüm; Bakım evleri; Hemşirelik bakımı

INTRODUCTION

Thinking about death in an excessive and pathological way may have a negative effect upon human psychology. However, although the thought of death creates anxiety, it also provides a reason to hold on to life and brings a meaning to existence (1). Death anxiety is characterized by a fear of pain, feeling of threat, uneasiness, feeling of punishment, loneliness, loss of control, disturbance, fear of the event of death, fear of what happens after death. Death anxiety is believed to originate from numerous different situations, such as fear of annihilation, castration and separation anxiety, a view of death as bodily mutilation and conditioned response of existential origins (2). It starts at birth and continues throughout life, with the perception that at one point, the individual will not exist anymore, that he/she will lose the world and become nothing (3). According to Yalom (4), fear of death is the cause of the first anxiety and first psychopathology and is so severe that most of the energy of life is spent on trying to deny it.

As people grow older, they feel closer to death (2). A growing child usually perceives death as a "regression," whereas in old age, it is usually a highly accepted, inevitable and less fearsome situation. It has been reported that as one grows older, fear of life becomes predominant over fear of death because of the physical problems and social isolation of old age (3).

Death anxiety is a major concern for older adults. With aging, death is more likely and expected. In most cultures, dying is associated primarily with old age (2-4). As elders face the biopsychosocial challenges of aging, they inevitably think about their own death. As an existential issue, death anxiety stems from the conscious awareness of our own mortality. Individual thinks that does not exist her/his own existence, this thinking triggers negative feeling. (5). Anxiety about death can

reflect low levels of awareness to severe neurotic fears about losing self, loss of control, and loss of meaning. The quality of life of an individual is influenced by daily life activities, sense of well-being. Physical and psychological distresses are important in death anxieties (5,6).

In old age, physical and cognitive functions decline. Health, sexual life, independence, social life and support decrease or are lost. In addition, the awareness of having reached the end of life and gaining a different view of death results in changes in self-perception (5). The elderly may have difficulties in performing basic daily activities and become dependent on other people (6). Daily living activities include enhancing environmental security, communicating, eating, drinking, excreting, maintaining personal hygiene and keeping mobile. Decline in the ability to perform these activities in old age decreases the quality of life (6,7).

Anxiety regarding death is one of the crucial psychosocial problems of elderly people. It is important to assess the ideas and anxieties of the elderly associated with death during the admission process to the institution to improve their quality of care, psychological well-being and quality of life (8,9).

Limited studies of death anxiety among individuals living in nursing homes have been performed in Turkey. One study reported that they hoped to die as soon as possible and had low life satisfaction (9). Another study reported that the rate of psychiatric diseases, depression being the most common, was higher in elderly persons living in nursing homes than in those living in the community (5). However, the elderly living in nursing homes had less death anxiety than those living in the community.

The aim of this study was to analyse the death anxiety and daily living activities of elderly people



living in a nursing home. The following questions were posed:

What are the mean scores for death anxiety and daily living activities of elderly people living in a nursing home?

Are these scores related to socio-demographic factors?

Are the scores for death anxiety and daily living activities correlated?

MATERIALS AND METHOD

Setting and samples

This descriptive study was performed on 150 individuals above 60 years of age living in a nursing home in Izmir. A detailed psychiatric evaluation of the participants was performed. The inclusion criteria were being capable of giving written and oral response and not having any cognitive or hearing loss. Cognitive functioning was assessed using the Mini-Mental Status Test. Those with scores of 26 or below were excluded from the study (10). In line with the information received from home registration and staff; from 310 elderly people living in nursing home, who have terminal period cancer or kidney failure, who have difficulties in speech and meaning, illiterate aged and, after mental status assessment, whose cognitive abilities have been impaired and who refuse to participate in the study are excluded from the sample.

Measurements

Face-to-face interviews were conducted with the participants, and data were also collected with the use of three questionnaires: the Demographic Information Form, the Templer Death Anxiety Scale and the Daily Life Activities Form.

Demographic Information Form

Demographic variables included age, gender, having children, educational status, health

insurance, physical limitations, physical disease and psychiatric disease.

Templer Death Anxiety Scale (TDAS)

This scale developed by Templer (11) consists of 15 items. Possible scores range from 0 to 15, with higher scores indicating higher levels of death anxiety. Scores from 4.5 to 7 indicate normal levels of death anxiety. Cronbach's alpha value was calculated as 0.86 (12).

Daily Life Activities Form (DLAF)

This form is a questionnaire that was prepared by the researchers, guided by the results of prior studies, with the aim of measuring the daily living activities of elderly people (13,14). It consists of questions inquiring regarding their nutritional status, ability to pull themselves together, hygiene, toilet behaviour and mobility. The highest score that can be obtained from this form is 51. High scores were interpreted as independent behaviors. Cronbach's alpha value was calculated as 0.97 for this research.

Data analysis

Demographic variables were expressed as the distribution of numbers and percentages, means, and standard deviations. The Kruskal-Wallis test, Student's t-test, and the Mann-Whitney U Test were used to determine the relationships between dependent and independent variables. Correlation analysis was used to evaluate the relationship between death anxiety and daily living activities. For all statistical analyses, $p < 0.05$ was considered to indicate statistical significance.

Ethical considerations

The study was approved by the ethical committee of the EUNF (IRB approval number: 03-1420) and the nursing home branch manager of the IMM Culture and Social Affairs Department. The researchers informed each individual about the objectives of the study, and their permission to participate was obtained through interviews.

Informed written consent was also obtained from all participants. The consent form was in

RESULTS

The sociodemographic characteristics of the participants are summarized in Table 1. Half (50.0%) of the participants were male; 56.7% were widowed, divorced or living alone; 54.7% had children; 36.0% were primary school graduates; 66.0% stated that they experienced physical limitation; 42.7% had health insurance; 75.3% reported having a physical disease; and 16.7% reported having a psychiatric disease. The mean duration of stay in the nursing home was 5.30 ± 3.68 years.

The mean age of the participants was 66.12 ± 9.79 years. The mean TDAS score was 5.44 ± 1.05 , and the mean total DLAF score was 36.67 ± 9.04 . The mean TDAS score and the mean total DLAF score were evaluated according to demographic data.

Data on factors that affected death anxiety are shown in Table 2. Death anxiety was analyzed using the kruskal-wallis test, student's t-test, and the mann-whitney u test. Death anxiety was significantly higher among men than among women ($t=2.81$, $p<0.05$). Death anxiety was high among participants who were divorced or living alone ($W=0.77$, $p>0.05$), had no children ($t=-0.63$, $p>0.05$), had no health insurance ($t=-0.77$, $p>0.05$), had no physical limitations ($t=-0.58$, $p>0.05$) and had no physical diseases ($t=-0.40$, $p>0.05$) and low among those who graduated from high school ($W=4.49$, $p>0.05$); however, these differences were not statistically significant.

accordance with the ethical principles of the Universal Declaration of Human Rights.

Death anxiety was higher in those with psychiatric diseases, but the difference was not statistically significant ($Z=-0.90$, $p>0.05$). There was no significant correlation between age and TDAS score ($r=-0.04$, $p>0.05$).

Among daily living activities, the lowest performance was in using the toilet (7.48 ± 2.62), followed by dressing-pulling (8.52 ± 1.63), self-feeding (8.72 ± 1.27) and mobility (9.76 ± 3.60). The highest performance was in hygiene (10.71 ± 2.94). The distribution of DLAF mean scores according to some sociodemographic variables is shown in Table 3. In this study, daily living activities were analyzed using the kruskal-wallis test, student's t-test, and the mann-whitney u test. DLAF scores were higher in those who were male ($t=-0.64$, $p>0.05$), single ($W=0.28$, $p>0.05$), had no children ($t=-0.99$, $p>0.05$), were high school graduates ($W=5.41$, $p>0.05$), had health insurance ($t=1.81$, $p>0.05$) and had no psychiatric diseases ($Z=-0.90$, $p>0.05$), but the differences were not statistically significant. On the contrary, DLAF scores were significantly lower in those who had physical limitations ($t=-8.30$, $p<0.001$) and physical diseases ($t=-4.28$, $p<0.001$). Age and DLAF score were negatively correlated ($r=-0.20$, $p=0.01$).

Pearson correlation coefficients were applied to establish if there was a correlation between death anxiety and performance of daily living activities. There was no statistically significant correlation between death anxiety and performance of daily living activities ($r=-0.02$, $p>0.05$) (Table 4).

**Table 1.** Distribution of the elderly's sociodemographic variables.

Variable	n	%
Gender		
Female	75	50.0
Male	75	50.0
Marital status		
Single	49	32.7
Married	16	10.7
Divorced/widowed	85	56.7
Having children		
Yes	82	54.7
No	68	45.3
Education status		
Able to read and write	50	33.3
Primary school	54	36.0
Secondary school	34	22.7
High school	12	8.0
Health insurance		
Yes	64	42.7
No	86	57.3
Physical limitation state		
Yes	99	66.0
No	51	34.0
Physical disease state		
Yes	113	75.3
No	37	24.7
Psychiatric disease state		
Yes	25	16.7
No	125	83.3

Table 2. Distribution of the TDAS (Templer Death Anxiety Scale) mean score according to some sociodemographic variables.

Sociodemographic variables	TDAS Score			
	Mean	Std. Dev.	W/t/Z	p
Gender				
Female	5.67	0.93	2.81	0.005*
Male	5.20	1.11		
Marital status				
Single	5.42	1.06	0.77	0.678
Married	5.39	0.62		
Divorced/widowed	5.45	1.11		
Having children				
Yes	5.39	1.09	-0.63	0.530
No	5.49	0.99		
Education status				
Able to read and write	5.45	0.99	4.49	0.212
Primary school	5.53	1.15		
Secondary school	5.41	1.04		
High school	4.98	0.73		
Health insurance				
Yes	5.38	1.06	-0.77	0.438
No	5.51	1.05		
Physical limitation state				
Yes	5.37	0.93	-0.58	0.558
No	5.47	1.10		
Physical disease state				
Yes	5.42	1.03	-0.40	0.688
No	5.49	1.12		
Psychiatric disease state				
Yes	5.66	1.22	-0.96	0.443
No	5.39	1.02		

*p<0.01

**Table 3.** Distribution of the DLAF (Daily Life Activities Form) mean score according to some sociodemographic variables.

Variable	DLAF Score			
	Mean	Std. Dev.	W/t/Z	p
Gender				
Female	36.19	10.07	-0.64	0.518
Male	37.15	7.93		
Marital status				
Single	37.14	8.72	0.28	0.868
Married	36.63	7.61		
Divorced/widowed	36.40	9.55		
Having children				
Yes	36.00	9.51	-0.99	0.323
No	37.47	8.45		
Education status				
Able to read and write	34.48	10.28	5.41	0.144
Primary school	38.03	8.47		
Secondary school	36.65	8.58		
High school	39.66	9.04		
Health insurance				
Yes	37.81	7.81	1.81	0.072
No	35.13	10.35		
Physical limitation state				
Yes	28.47	10.35	-8.30	0.000*
No	40.89	4.23		
Physical disease state				
Yes	35.38	9.71	-4.28	0.000*
No	40.59	4.90		
Psychiatric disease state				
Yes	35.38	11.42	-0.90	0.365
No	37.10	8.48		

*p<0.001

Table 4. Correlation between the TDAS (Templer Death Anxiety Scale) mean score and daily life activities and the DLAF (Daily Life Activities Form) mean scores.

DLAF	TDAS	
	r	p
Self-eating	-0.06	0.410
Dressing-pulling	-0.03	0.684
Hygiene	-0.03	0.646
Toilet using	-0.00	0.973
Mobilisation	-0.00	0.979
DLAF	-0.02	0.775

DISCUSSION

Thoughts of death occur throughout life but may become more prominent in the elderly (15). The findings of this study revealed that the mean level of death anxiety among the elderly participants was normal. It has been suggested that the elderly can generally cope with this anxiety. Similar studies also have found moderate levels of death anxiety among the elderly (16).

The majority of the participants (72.0%) were independent in their activities of daily living with a mean score of DLAF. Other studies in Turkey produced similar results, showing that the rate of independence in activities of daily living among the elderly ranged from 65.9% to 82.8% (17).

The variable most expected to be associated with death anxiety is age. The expectation in general is that as one approaches the end of life, death anxiety should increase (12). However, one study reported that death anxiety decreased as age increased (18). It has been observed that elderly people have less death anxiety than young and middle-aged adults, and that after a certain age death anxiety shows a negative linear course. Our study found no statistically significant relationship between death anxiety and age or age group. The studies support that the death anxiety increase of

with age. Death anxiety may be related to higher ageism. According to the Terror Management Theory, as older age tends to be associated with greater susceptibility to deteriorating bodily functions and death (18,19). Although this result is contrary to that of numerous studies, there are studies that report no relationship between death anxiety and age (19). On the contrary, our population is Muslim. In Islam, Allah creates death and life. According to Islam, life in this world is temporary. After death, people go to paradise or hell. Belief in the existence of God and in the afterlife is related to decreased death anxiety (20).

We found that death anxiety was significantly related to gender. Several studies found that women had higher death anxiety than men (21). In cultures with a traditional structure, because of the expectation that men should be braver and stronger than women, death anxiety can be higher in women and is acted out more often by women. Women have been proven to be emotionally, cognitively different from men. It has been established that, while men approach death in a more cognitive way, women have a higher emotional burden and a higher awareness regarding this emotional structure (19,21). However, we observed that death anxiety in elderly men was higher than that reported in



other studies. In general, men receive substantial instrumental and health-enhancing support from their spouse. Therefore, older men may feel death anxiety due to anticipating lose instrumental support after the loss of a partner (19,21).

We also found that death anxiety was higher among participants who had no children than among those who had children, even though the difference was not statistically significant. This difference could be because of the awareness that their generation will continue thanks to their children or the social support they receive from their children (3). Children have a crucial role in making the elderly feel safe and able to cope with their problems. Elderly people who have children may be able to cope with their anxieties more easily.

Studies have shown that the presence of physical problems and/or severe health problems affects death anxiety. It has been established that death anxiety in the elderly is manifested as somatic complaints (19). Studies comparing death anxiety in patients with terminal cancer and people without a fatal disease reported that death anxiety was actually less among the cancer patients (22). Our study found no relationship between the presence of physical disease and death anxiety. Death anxiety, is related to the annihilation of one's existence which has been defined as a state of severe distress that is induced by the threat or actual loss of the intactness of person. Death anxiety is closely related to illnesses and their symptoms (6).

Death anxiety is intensely experienced starting from childhood (22) and is related to psychological stress experienced in youth. Higher levels of stress, especially from chronic stressors, may speed ageing. Ageing includes not only biological ageing, but also cognitive ageing associated with poorer processing speed and working memory (23). In individuals who experience intense anxiety, the fear of death can lead to loss of time control. Patients with depression, especially severe depression, may think that they

are already dead and experience intense death anxiety. Studies argue that death anxiety can also lead to depression, as both are related to existential concerns with the loss of meaning in life (22,23). Our study found higher death anxiety in participants with a psychiatric disease, although the result was not statistically significant. Accordingly, we think that our data verify the relationship of death anxiety with psychological disorders.

Limitations in daily activities affect the quality of life in elderly people. Reportedly, people aged 65 years or older are dependent in at least one kind of daily activity, that 10.0% of those aged 65 to 69 years need help, and that 47.0% of those aged 85 years or above are dependent in their daily activities (24). It was found that almost half of geriatric patients had scores below average in daily activities. Over 80.0% could perform activities such as eating, bathing and going to the toilet alone, but as the activities became complicated (shopping, cleaning, etc.), performance decreased (17).

Among the activities of daily living, the participants in our study had the lowest score for using the toilet and the highest score for hygiene. Except for physical limitations and physical disease affected activities of daily living. Performance of activities of daily living was statistically significantly lower in participants with physical limitations or disease. These elderly people were more dependent on others for the performance of the activities of daily living. It can be concluded that as the incidence of chronic diseases increases with age, the dependency level will increase due to the disability caused by chronic diseases.

Our study found no significant relationship between death anxiety and performance of activities of daily living. A study by Ustuner et al. (2010) also found no relationship between death anxiety and performance of activities of daily living (25). However, other studies have found that when people cannot perform daily activities, they become

dependent on other people or auxiliary devices, and this dependence increases both death anxiety and mortality (3,8,17).

The limitations of our study included the small sample size, comprising non-fatal patients and elderly participants, all chosen from a nursing home, and the absence of a control group comprising other patient groups. Another limitation of our study is that the scales were self-assessment scales, which can cause some negative results. Because these scales are based on participants' declarations, the answers may not always be correct, and the participants may misinterpret the questions according to their cultural characteristics or social environments.

Death anxiety affects human life and life quality at all ages, with the greatest effect upon the elderly. Ignoring death anxiety would result in disregarding one of the most important factors affecting mental health. The condition of elderly people living in

nursing homes should be analysed and individual and collective efforts regarding nursing should be increased to enhance their quality of life. Supporting the activities the elderly can perform independently by psychotherapeutic nursing interventions will enable them to embrace life and help them age in a healthy way, preventing gloomy thoughts of death and thus decreasing death anxiety.

In conclusion, our study showed that death anxiety levels of the elderly participants were not related to their daily living activity levels. Death anxiety levels were related only to gender among sociodemographic characteristics. It is believed that these results will guide professionals working in the field of elderly health and contribute to future studies of ageing and death anxiety.

Conflict of interest

The authors declare no conflict of interest related to this study.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344054
2018;21(3):394-401

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Received: 20/05/2018
Accepted: 21/07/2018

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RESEARCH

EFFECTIVENESS OF EXTRACORPOREAL SHOCK WAVE THERAPY TO TREAT PRIMARY MEDIAL KNEE OSTEOARTHRITIS WITH AND WITHOUT BONE MARROW EDEMA IN ELDERLY PATIENTS

ABSTRACT

Introduction: This study aimed to evaluate the clinical and radiographic effectiveness of extracorporeal shock wave therapy to treat primary medial knee osteoarthritis with and without bone marrow edema in elderly patients.

Materials and Method: Elderly patients with right knee osteoarthritis and bone marrow edema confirmed by magnetic resonance imaging were allocated to the first group (n=40), whereas patients without bone marrow edema were randomly allocated to either the second (n=40) or third (n=40) groups. The patients were treated twice weekly with a total of 10 sessions of extracorporeal shock wave therapy (Groups 1 and 2) or were left untreated with sham extracorporeal shock wave (Group 3).

Results: The comparison of the patients' Visual Analogue Scale, Western Ontario and McMaster Universities Osteoarthritis Index and Lequesne scores before treatment and at 6 months and 1 year after treatment revealed significant score reductions in the first and second groups (p<0.05). One year after treatment, the medial joint space was preserved in Groups 1 and 2 (p<0.05), whereas the medial joint width protection was more prominent in Group 1 (p<0.05) than in Groups 2 and 3.

Conclusion: In elderly patients with knee osteoarthritis, extracorporeal shock wave therapy led to functional and radiologic improvements and pain relief without substantial complications. The improvement remained at the 1 year follow-up and was higher in patients with bone marrow edema. Further studies are required to investigate its potential as a disease-modifying physical agent, particularly for treating elderly patients with knee osteoarthritis with bone marrow edema.

Keywords: Aged; Osteoarthritis, knee; Extracorporeal shock wave therapy

ARAŞTIRMA

YAŞLI HASTALARDA KEMİK İLİĞİ ÖDEMLİ VE ÖDEMSİZ MEDİAL DİZ OSTEOARTRİTİNİN TEDAVİSİNDE EKSTRAKORPOREAL ŞOK DALGA TEDAVİSİNİN ETKİNLİĞİ

Öz

Giriş: Bu çalışmada, yaşlı hastalarda, kemik iliği ödemi olan ve olmayan primer medial diz osteoartritini tedavi etmede ekstrakorporeal şok dalga tedavisinin klinik ve radyografik etkinliğinin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Sağ diz osteoartriti olan ve magnetik rezonans görüntüleme ile dizde kemik iliği ödemi teyit edilen yaşlı hastalar birinci gruba (n=40), kemik iliği ödemi olmayan hastalar ise randomize olarak ikinci gruba (n=40) veya üçüncü gruba (n=40) ayrıldı. Hastalar haftada iki kez toplam 10 seans ekstrakorporeal şok dalga tedavisi (Grup 1 ve 2) ile tedavi edildi ya da sham ekstrakorporeal şok dalga ile tedavi edilmedi (Grup 3).

Bulgular: Hastaların Vizuel Analog Skala, Western Ontario ve McMaster Üniversiteleri Osteoartrit İndeksi ve Lequesne skorlarının tedaviden önce ve tedaviden 6 ay ve 1 yıl sonra karşılaştırılması, birinci ve ikinci gruplarda bu skorlarda anlamlı derecede azalma olduğunu gösterdi (p<0.05). Tedaviden bir yıl sonra, medial eklem genişliği grup 1 ve 2'de (p<0.05) korunurken, medial eklem genişliğinin korunması Grup 1'de (p<0.05) Grup 2 ve 3'e göre daha belirgindi (p<0.05).

Sonuç: Diz osteoartriti yaşlı hastalarda, ekstrakorporeal şok dalga tedavisi önemli komplikasyonlar oluşturmaksızın fonksiyonel ve radyolojik iyileşmelere ve ağrı giderilmesine neden oldu. İyileşme, 1 yıllık izlemde devam etti ve kemik iliği ödemli diz osteoartriti hastalarında daha yüksekti. Özellikle kemik iliği ödemli yaşlı diz osteoartriti hastaların tedavisinde, ekstrakorporeal şok dalga tedavisinin bir hastalık modifiye edici fiziksel ajan olarak potansiyelini araştırmak için, daha fazla çalışmaya gereksinim vardır.

Anahtar sözcükler: Yaşlı; Diz osteoartriti; Ekstrakorporeal şok dalga tedavisi



INTRODUCTION

Knee osteoarthritis (OA) is a common and debilitating form of arthritis that affects the entire joint tissues, including bone, synovium and cartilage, leading to progressive joint degeneration in the elderly (1). Bone marrow edema (BME) consists of highly painful fluid accumulation in the extracellular bone marrow spaces, which usually spreads into the subchondral region of the joint (1). In knee OA, the cartilage pathology may be accompanied by alterations of the subchondral bone and marrow space (1). Previous MRI studies have indicated a relationship between BME and knee OA-related structural deterioration, particularly osteoarthritic cartilage degradation (2). Moreover, in knee OA, bone marrow lesions are predictive of worsening of the radiographic joint space narrowing (JSN) (2,3), and BME has been associated with clinical symptoms, such as pain and disease progression, assessed in terms of JSN (3,4).

Extracorporeal shock waves are acoustic waves generated by electromagnetic, electrohydraulic or piezoelectric methods (5), and extracorporeal shock wave therapy (ESWT) may promote reparative processes of the cartilage and bone via angiogenic (neovascularisation), anti-edema, anti-inflammatory and trophic effects (6-10). ESWT was previously shown to effectively treat pain and BME in patients with hip and knee OA (7,10) and is considered a powerful non-pharmacological tool to normalise the vascular and metabolic impairments of hip BME (6,7). Previous studies have also shown ESWT-induced functional improvement, pain reduction and normalisation of MRI features (resolving BME) in patients with knee OA (10).

Herein, we hypothesised that BME positively affects the clinical activity of ESWT in elderly patients with knee OA. To our knowledge, no previous clinical trials have compared the effectiveness of ESWT to improve radiographic JSN in patients with knee OA with and without BME. Therefore, the current study aimed to perform a prospective clinical trial to compare and evaluate the clinical and radiographic effectiveness of ESWT to treat primary knee OA with and without BME in elderly patients.

MATERIALS AND METHOD

This study enrolled elderly patients (aged 65–75 years) with primary medial tibiofemoral knee OA who presented at the Physical Medicine and Rehabilitation outpatient clinic of our University Medical Faculty Hospital and underwent MRI examination and weight-bearing fixed-flexion knee radiography between 11th November, 2014 and 3rd September, 2016. The study protocol was approved by the Medical Clinical Ethical Committee of our University.

The patient selection was based on the following inclusion criteria: a) radiological and clinical diagnosis of primary medial tibiofemoral knee OA, according to the ACR criteria; b) age range between 65 and 75 years; c) knee pain lasting a minimum of 6 months; d) bilateral stage 2 or 3 OA according to the KL radiological stage; and e) ability to independently continue follow-up and provide informed consent for the study.

Patient exclusion was based on the following criteria: a) secondary knee OA; b) use of oral or intramuscular corticosteroids or any intraarticular injections within the previous 6 months; c) knee arthritis due to inflammatory joint disease; d) undergoing physical therapy during the previous year; e) history of malignancy, knee surgery or knee trauma; f) presence of other diseases that cause pain in the lower extremities (neuropathy, herpes zoster, restless legs syndrome, fibromyalgia, hemiparesis, etc.); g) mental status disorder, neurological or vestibular diseases (Parkinson's, Alzheimer's, polyneuropathy, etc.) and poor overall health status (heart failure, chronic obstructive pulmonary disease, cancer, etc.).

Age, sex, complaints, physical examination findings and laboratory and radiological examination results [KL stage, medial joint space width (JSW) and BME presence in the MRI] of each patient were collected into a special form. The patients' history, including bone diseases, rheumatoid arthritis, trauma, seronegative spondyloarthropathies and other diseases that could lead to secondary gonarthrosis, was collected.

From the 189 patients with primary medial knee OA assessed at the outpatient clinic, 40 patients were allocated to each treatment group following the initial assessment. Patients with primary medial knee OA and MRI-confirmed BME [51 of 189 patients (26.98%) had MRI-proven BME] in the right knee joint were allocated to the first group (TENS + ESWT-treated group, n=40). TENS was applied to the patients' right knee before ESWT treatment to prevent treatment-related pain. TENS was applied for 30 min at a 80-Hz frequency prior to each ESWT session. The existing of BME was accepted as extending 5–40 mm diameter BME lesion into the subchondral area in the medial tibial and/or medial femoral plateau on MRI T2-weighted sequences.

Following application of the exclusion criteria, 11 patients were excluded from the first group. Patients with primary medial knee OA without MRI-proven BME [138 of 189 patients (73.02%)] in the right knee were randomly allocated to either the second (TENS + ESWT-treated, n=40) or third (only TENS + sham ESWT, n=40) group. Following application of the exclusion criteria, 58 of 138 patients were excluded from the second and third groups.

The treatment and evaluation were performed only for the patients' right knee. For patients in the first and second groups, ESWT was applied to the medial femur and tibia condyles while the knee was kept at a 90° flexion. An ESWT device from the Medical Italia brand (SN: EK1238092) was used, and the dose was set according to the generally accepted therapeutic dose for tendinopathy (11).

ESWT was applied with 2,500 pulses at a pressure of 3 bar and a frequency of 12 Hz. Two weekly sessions were performed [one session (Tuesday) for the medial femur condyle and one session (Thursday) for the medial tibial condyle] for 5 weeks, resulting in a total of 10 ESWT sessions within 5 weeks. Sham ESWT was applied to the third group, according to a similar schedule. To enhance the sham design, with every shock wave, the ESWT machine made a noise, and minimal energy pulses were generated.

The selected patients were interviewed and evaluated by a single investigator who was blinded

to the treatment group. Information about the outcome measures was written on specific follow-up forms. All evaluations were conducted prior to treatment (PT) and at 6 months and 1 year after the end of treatment (AT). The following outcome measures were evaluated:

JSN, the primary outcome measure, was assessed for structural progression using bilateral weight-bearing, standing, mild flexion (20°–30° flexed knees with 10° rotated feet), posterior–anterior radiographs of the knees. Medial JSW (mm) in the medial tibiofemoral compartment was electronically measured using the hospital's Picture Archiving Communication System (PACS). JSW was defined as the maximum height of the radiolucent area of the medial tibio–femoral articular surfaces between the radiopaque margins in the mid-portion of the medial compartment of the treated right knees. All measurements were made by the same investigator to avoid interobserver variation. JSN was calculated as JSW at 6 months and 1 year minus the pre-treatment JSW. Other primary outcome measures included the Western Ontario and McMaster Universities Index (WOMAC) and scores of pain (P), stiffness (S) and function (F) subscales. Validity and reliability analyses of the Turkish version of WOMAC were conducted. The variable names were pain (WomacP), stiffness (WomacS), function (WomacF) and total score (WomacTS). A standard 10-cm visual analogue scale (VAS) chart was used to assess pain severity during the night, at rest and during movement. The VAS score corresponded to the mean of those three scores. The Lequesne index assesses pain, discomfort, maximum walking distance and daily life activities, determines the functional status and is frequently used for OA. The total score was used for the present study. Moreover, the medial JSW was evaluated using PACS, as described above.

Statistical analysis

All statistical analyses were performed using the SPSS software, and $p < 0.05$ was considered statistically significant. Categorical variables were expressed as numbers, whereas continuous variables were expressed as mean±standard deviation. Between-group comparisons of sex and radiographic



stage were evaluated using the chi-square test. Within-group pre- and post-treatment comparisons were performed using paired t-tests. Bonferroni corrected ANOVA was performed to compare treatment effects between groups.

RESULTS

Three patients from the first group, two from the second group and five from the third group were

lost to follow-up and were thus excluded from the study. ESWT caused only minor bruising or transient soft tissue swelling. No clinically device-related systemic or neuromuscular adverse effects were observed; thus, no patient was excluded due to side effects. The three groups did not differ significantly in terms of age, sex, body mass index, symptom duration and KL knee OA stage (stage 2/3) (Table 1).

Table 1. Age, sex and knee OA KL stage distribution across treatment groups. Group 1, (primary medial knee OA with BME in the joint) ESWT treatment group; group 2, (primary medial knee OA without BME in the joint) ESWT treatment group; group 3, (primary knee OA without BME in the joint) sham ESWT group.

	Group 1 (with BME in the joint) (n=37) ESWT treatment (mean±sd)	Group 2 (without BME in the joint) (n=38) ESWT treatment (mean±sd)	Group 3 (without BME in the joint) (n=35) Sham ESWT (mean±sd)	p
Age (year)	69.74±3.91	70.48±4.18	69.65±4.49	>0.05
BMI (kg/m ²)	27.12±5.09	26.91±4.67	26.89±4.85	>0.05
Sex (F/M)	24/13	24/14	22/13	>0.05
Kellgren–Lawrence stage (stage 2/3)	16/21	18/20	16/19	>0.05
Symptom (knee pain) duration (months)	38.64±14.47	40.72±15.14	39.43±12.34	>0.05

VAS PT-VAS 6. Month AT: At both 6 months and 1 year after treatment, the VAS scores were significantly lower in the first and second groups compared with those before treatment; the decrease in the VAS scores was greater in the first group than in the second group ($p < 0.05$) (Table 2).

Pre- and post-treatment comparisons revealed that the WOMAC pain, stiffness and function subscales and total scores (WOMAC P, S, F and TS PT-WOMAC P, S, F and TS 6. Month AT) and the Lequesne scores underwent significant reductions in

the first and second groups ($p < 0.05$); the decrease in these scores was greater in the first group than in the second group ($p < 0.05$) (Table 2).

Changes in the medial joint width (JSN) before treatment and at 6 months and 1 year after treatment: The medial joint space was more preserved in groups 1 and 2 than in group 3 ($p < 0.05$). One year after treatment, the medial joint width protection was more prominent in group 1 ($p < 0.05$) (Table 3).

Table 2. Between-group comparisons for VAS, WOMAC (total [TS], pain [P], stiffness [S], function [F] subscales) and Lequesne scores and score changes prior to treatment (PT) and at 6 months (Significance P1) and 1 year after treatment (AT-Significance P2).

Outcome measures	Group1 (with BME in the joint) (n=37) ESWT treatment (Mean±sd)	Group2 (without BME in the joint) (n=38) ESWT treatment (Mean±sd)	Group3 (without BME in the joint) (n=35) Sham ESWT treatment (Mean±sd)	P1	P2
VAS PT	6.66±1.58	6.42±1.76	6.35±1.28		
VAS 6 th month AT	4.58±1.47	5.16±1.34	5.43±1.22		
VAS 1 year AT	4.87±1.78	5.27±1.53	5.98±1.91		
VAS Change- 6 th month AT	1.64±1.15	1.31±1.71	1.28±0.91	<0.05	
VAS Change-1 year AT	1.47±1.34	1.14±1.44	1.10±1.02		<0.05
LQ PT	10.31±2.77	10.58±2.51	10.49±2.58		
LQ 6. month AT	8.17±2.88	9.31±2.52	9.96±2.45		
LQ 1 year AT	8.33±2.67	9.43±2.27	10.02±2.14		
LQ Change – 6 th month AT	1.73±0.89	1.25±1.29	0.57±1.01	<0.05	
LQ Change -1 year AT	1.69±1.12	1.14±1.37	0.37±0.83		<0.05
WomacTS- PT	40.63±7.04	40.33±6.28	42.30±7.55		
Womac TS- 6 th month AT	37.61±5.36	37.08±7.04	40.33±7.51		
Womac TS- 1 year AT	38.12±4.87	38.43±7.65	40.54±6.97		
WOMAC TS Change- 6 th month AT	4.35±2.82	3.21±2.98	1.95±2.19	<0.05	
WOMAC TS Change-1 year AT	3.97±3.01	2.78±2.54	1.15±2.14		<0.05
WomacP- PT	12.38±2.34	12.01±2.72	12.19±3.03		
WomacP 6 th month AT	9.57±3.85	9.27±5.15	11.93±3.06		
WomacP 1 year AT	9.69±4.12	9.82±4.42	11.56±4.76		
WomacP Change-6 th month AT	2.59±1.78	2.32±1.66	0.38±1.05	<0.05	
WomacP Change- 1 year AT	2.23±1.52	1.98±1.77	0.68±1.43		<0.05
WomacS- PT	4.35±1.25	4.24±1.36	4.31±1.48		
WomacS 6 th month AT	3.71±0.88	3.90±0.95	4.27±1.42		
WomacS 1 year AT	3.93±1.14	4.02±1.22	4.25±1.18		
WomacS Change-6 th month AT	0.61±0.74	0.36±1.04	0.09±0.56	<0.05	
WomacS Change-1 year AT	0.54±0.81	0.32±0.92	0.14±0.48		<0.05
WomacF-PT	24.68±3.58	24.97±4.08	24.77±4.95		
WomacF 6. month AT	18.34±3.79	20.61±4.06	24.27±5.87		
WomacF 1 year AT	20.65±4.14	22.75±5.43	24.46±5.12		
WomacF Change-6 th month AT	5.32±2.05	3.43±3.11	0.50±3.33	<0.05	
WomacF Change- 1 year AT	5.32±2.05	3.43±3.11	0.50±3.33		<0.05



Table 3. Changes in the medial joint width (joint space narrowing) before treatment and at 6 months and 1 year after treatment. Different lower case refers to statistically difference between groups.

Evaluation time	Group1 (with BME in the joint) (n=37) ESWT treatment Joint Space Narrowing (mm) mean (95% confidence interval)	Group2 (without BME in the joint) (n=38) ESWT treatment Joint Space Narrowing (mm) mean (95% confidence interval)	Group3 (without BME in the joint) (n=35) only TENS treatment Joint Space Narrowing (mm) mean (95% confidence interval)	p
6 months after treatment	0.043 (-0.062 to 0.104) ^a	0.039 (-0.071 to 0.081) ^a	-0.053 (-0.142 to 0.017) ^b	<0.05
1 year after treatment	0.032 (-0.072 to 0.143) ^a	-0.011 (-0.057 to 0.044) ^b	-0.081 (-0.182 to -0.013) ^c	<0.05

DISCUSSION

The present study showed a positive effect of ESWT on the treatment of elderly patients with knee OA with and without BME during ten session treatment. The effect was maintained at a 1-year follow-up. These findings also suggest that ESWT modulates pathological processes such as BME, which are responsible for the progression of knee OA. Further studies are required to investigate its potential as a disease-modifying physical agent, particularly for the treatment of knee OA with and without BME. Previous clinical trials have shown the effectiveness of ESWT to treat avascular necrosis and pain via reducing bone edema (10-17). A few studies have also showed the effectiveness of ESWT to treat hip BME (7,8), and a recent study showed that ESWT is highly effective for pain relief and functional improvement in knee OA with BME (10).

The pathological course of OA involves crucial subchondral bone changes, including local BME under the damaged articular cartilage. Some studies demonstrated that BME is clearly associated with pain and rapid cartilage damage. Previous

studies have also shown that the detection of BME on knee MRIs predicted the rate of radiographic changes in JSW, a risk factor for structural deterioration as well as the progression of knee OA (2,3). Additionally, BME is an indirect sign of knee OA-related cartilage damage (1). The mechanisms by which ESWT acts on BME and regenerates tissues in knee OA are not fully understood, and it is possible that they involve a neoangiogenic effect and anti-inflammatory action, including nitroxide and other molecular pathways (endothelial nitric oxide synthase, vascular endothelial growth factor, BMP-2, etc.) as well as a stimulation effect on osteoblasts and periosteal cells, a reduction effect on the production of pro-osteoclastogenic factors and the differentiation of mesenchymal stem cells to chondrogenic and osteogenic cells (7,8,13-21). Based on animal studies, other potential mechanisms are the following: decreased cartilage degradation, improved subchondral bone remodelling and reduced chondrocyte apoptosis (18-22).

Our trial showed that ESWT leads to functional and radiologic improvement as well as pain relief without substantial complications in knee OA with

and without BME. In the present study, focused ESWT was used. In line with our study, other previous studies showed successful treatment of knee OA using radial or focused ESWT (23-25). Radial and focused ESWT have comparable efficacy to treat musculoskeletal disorders, except deep nonunions (25). Our findings are also consistent with a recently published trial by Kang et al. (10) indicating that ESWT is an effective, non-invasive treatment of painful BME, along with its rapid normalisation of the MRI appearance, in patients with knee OA.

This study has several limitations. First, the mechanisms, standard doses, number of sessions and indications of ESWT in knee OA are not clearly determined. Second, there was no randomised

control group with BME. Thirdly, only radiographic JSN was investigated; control MRI to confirm BME resolution was not performed.

In conclusion, the current study showed that ESWT led to functional and radiologic improvement and pain relief without substantial complications in knee OA with and without BME. Those improvements were maintained at the 1-year follow-up. These findings also suggest that ESWT modulates the pathological processes underlying the progression of knee OA, such as BME, and further studies are required to investigate its potential as a disease-modifying physical agent, particularly for treating elderly patients with knee OA with BME.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344055
2018;21(3):402-409

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Received: 22.01.2018
Accepted: 07.09.2018

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RESEARCH

EARLY BLOOD TRANSFUSION MAY PREVENT POSTOPERATIVE COGNITIVE DYSFUNCTION AFTER HIP ARTHROPLASTY IN ELDERLY PATIENTS

ABSTRACT

Introduction: The number of joint arthroplasties in the elderly continues to increase with the increase in elderly population. Postoperative cognitive dysfunction is an important complication after surgery in elderly patients. However, the exact cause of postoperative cognitive dysfunction and factors contributing to its development remain unknown. We aimed to determine whether blood loss during or after surgery and the approach for the replacement of this loss affected postoperative cognitive dysfunction frequency and duration.

Materials and Method: A prospective study of elderly (>75 years) patients who underwent total/partial hip arthroplasty due to femoral neck or intertrochanteric fractures was conducted. Patients were randomised into two groups. The first group underwent transfusion when haemoglobin values reduced below 9.0 mg/dL, whereas the second group underwent earlier blood transfusion according to the volume of blood loss during and after surgery. All groups were similar in terms of factors considered to be associated with postoperative cognitive dysfunction. An experienced neurologist assessed patients' cognitive functions using the Standardized Mini-Mental Status Examination test and clinical examinations pre- and postoperatively.

Results: In total, 48 patients in the first group and 13 in the second group (early intervention group) were diagnosed with postoperative cognitive dysfunction. The duration of cognitive dysfunction was significantly lower in the second group (10.8±1.2 vs. 8.9±1.5 days; p<0.001).

Conclusion: Although the causal relationship between blood loss and postoperative cognitive dysfunction has not been elucidated in this study, our results demonstrate that postoperative cognitive dysfunction frequency and duration may be reduced by early replacement of blood loss in elderly patients who undergo total/partial hip arthroplasty.

Keywords: Arthroplasty, Replacement, Hip; Cognitive Dysfunction; Blood Loss, Surgical; Blood Transfusions

ARAŞTIRMA

KALÇA ARTROPLASTİSİ GEÇİREN YAŞLI HASTALARDA ERKEN KAN REPLASMANI AMELİYAT SONRASI BİLİŞSEL DİSFONKSİYONU ÖNLEYEBİLİR

Öz

Giriş: Yaşlanan insanlardaki eklem artroplastilerinin sayısı yaşlı nüfus artışı ile birlikte artmaya devam etmektedir. Postoperatif bilişsel disfonksiyon, yaşlı hastalarda cerrahiden sonra önemli bir komplikasyondur. Bununla birlikte, postoperatif bilişsel disfonksiyonun kesin nedeni ve gelişimine katkıda bulunan faktörler bilinmemektedir. Ameliyat sırasında veya sonrasında kan kaybının ve bu kaybın yerine konulma yaklaşımının postoperatif bilişsel disfonksiyon sıklığını ve süresini etkileyip etkilemediğini saptamak amaçlandı.

Gereç ve Yöntem: Femur boynu veya intertrokanterik kırıklara bağlı total/parsiyel kalça artroplastisi yapılan yaşlı (>75 yaş) hastalar prospektif olarak incelendi. Hastalar randomize olarak iki gruba ayrıldı. Birinci gruba hemogloblin değerleri 9.0 mg / dL'nin altına düştüğünde transfüzyon yapıldı, ikinci gruba cerrahi sırasında ve sonrasında kan kaybı hacmine göre kan transfüzyonu yapıldı. Tüm gruplar, postoperatif bilişsel disfonksiyon ile ilişkili olduğu düşünülen faktörler açısından benzerdi. Deneyimli bir nörolog, hastaların bilişsel işlevlerini, Standardize Mini-Mental Test, klinik muayene kullanarak operasyon öncesi ve sonrası değerlendirildi.

Bulgular: Birinci grupta 48 ve ikinci grupta (erken müdahale grubu) 13 hasta postoperatif bilişsel disfonksiyon tanısı aldı. Bilişsel disfonksiyon süresi ikinci grupta (10.8±1.2 vs. 8.9±1.5 gün; p<0.001) anlamlı derecede düşüktü.

Sonuç: Çalışmamızda kan kaybı ile postoperatif bilişsel disfonksiyon arasındaki nedensel ilişki aydınlatılamamış olmasına karşın, sonuçlarımız total / parsiyel kalça artroplastisi geçiren yaşlı hastalarda kan kaybının erken replasmanı ile postoperatif bilişsel disfonksiyon sıklığının ve süresinin azaltılabileceğini ortaya kondu.

Anahtar sözcükler: Artroplastisi, Replasman, Kalça; Kognitif Disfonksiyon; Kan Kaybı, Cerrahi; Kan Transfüzyonu



INTRODUCTION

The number of joint arthroplasties (TJAs) among the elderly has dramatically increased over the last 20 years. This uptrend in the number of TJAs has been predicted to synchronically continue with the growth in elderly population. Although successful results, such as improved physical activity and decreased pain, are obtained from TJAs, some individuals experience cognitive dysfunction postoperatively. Postoperative cognitive dysfunction (POCD), which may last for up to 3 months, is known to be associated with mortality. Reportedly, the incidence of POCD after TJA is 15%–30% (1, 2).

The pathophysiology of POCD remains unclear. Currently, the most valid theory is the microemboli theory, which suggests that microemboli develop during the surgery and occlude vascular structures within the brain. Another theory suggests that POCD develops due to general anaesthesia; however, researchers have failed to find a significant association between general anaesthesia and POCD (3-5). Other predisposing factors are considered to be older age, medications used for analgesia and prior cognitive impairments (6, 7). However, evidence regarding the association between these factors and POCD remains limited.

One of the seldom addressed issues in studies investigating the causes of POCD is blood loss during and after the surgery. We hypothesised that an association between POCD and blood loss during and after surgery may exist. In this study, we aimed to clarify whether cognitive dysfunction can be prevented and/or whether the cognitive dysfunction period can be shortened through early blood replacement in patients by performing early transfusion according to the volume of blood loss from drain and aspirator tube.

MATERIALS AND METHOD

Elderly patients older than 75 years who had undergone open surgery for femoral neck or intertrochanteric fractures were included in this

prospective study. Exclusion criteria were as follows: (1) the presence of a haematological disorder, (2) the history of another operation at the same surgical site, (3) the presence of respiratory or heart failure, (4) the presence of a disease that may adversely affect clotting, (5) the presence of a malignant neoplasm, (6) the presence of any type of cognitive dysfunction or a history of cognitive dysfunction, and (7) a preoperative haemoglobin value less than 9.5 mg/dl. From January 2013 to July 2017, 263 patients who met our inclusion/exclusion criteria were identified at our centre (Karabuk University Education and Training Hospital). Warfarin use was detected in 18 patients due to cardiological diseases and cardiology was consulted; these patients were switched to enoxaparin sodium instead of warfarin.

Ethical approval was obtained from the Karabuk University Clinical Research Ethical Committee. All patients provided informed consent. The study was conducted according to the Helsinki Declaration and Good Clinical Practice guidelines.

Preoperatively, all patients underwent cognitive function evaluation by an experienced neurologist using the Standardized Mini-Mental Test (SMMT). The validity and reliability analyses of SMMT were conducted by Güngen and colleagues (8). The cut off score of SMMT 23/24 was found to have the highest sensitivity (0.91), specificity (0.95), positive and negative predictive values (0.90 and 0.95) and kappa score (0.86). Interrater reliability analysis showed high correlation ($r:0.99$) and kappa value (0.92). SMMT evaluates following sub-dimensions: orientation, registration, attention and calculation, recall, language and praxis. For illiterate patients the modified version of SMMT was used (9). In addition to SMMT, clinical examinations were used to assess cognitive function. If necessary, cranial computed tomography (CT) was also performed.

Patients were re-evaluated postoperatively. A neurological consultation was requested for patients with cognitive dysfunction. The cognitive functions and mentioned tests were assessed by experienced Neurology Specialists. Patients were

followed-up according to the recommendations of the Neurology Department. Also, the verifications of diagnosis of cognitive dysfunction were made by Neurology Department

Patients were randomly divided into two groups according to the order of surgery. In the first group, blood replacement was performed if follow-up haemoglobin value dropped below 9 mg/dl. In the second group, blood replacement was performed according to the expected volume of blood loss, which was calculated on the basis of the volume of blood loss during the surgery and loss from the drainage/aspiration tube postoperatively. Consultations from the Neurology, Chest Diseases and Cardiology Departments were requested for patients with cognitive dysfunction. Patients were monitored for 21 days. If cognitive dysfunction lasted more than 21 days, patients were transferred to the Neurology Department.

Patient age, sex, height, weight, operation type, pre- and postoperative haemoglobin values, blood volume from drain and aspirator and fluid replacement values were recorded. Additionally, patients were examined in terms of postoperative complications, and complications were carefully monitored. For monitoring, chest x-ray; cranial CT; extremity Doppler ultrasonography and assessment of biochemical parameters, such as sodium, potassium, chlorine and D-dimer levels, were performed. Venous blood was drawn from the upper extremity in which fluid replacement was not performed. Patients whose cognitive functions were impaired in both groups were followed for the re-establishment of preoperative cognitive function. Blood replacement was administered in the form of erythrocyte suspension. After 4 units of erythrocyte suspension, fresh frozen plasma was added.

Standardized anaesthesia and analgesia protocols were applied to each patient to avoid the possible effect of type of anaesthesia and analgesia on the results. The anaesthesia protocol was as follows: Induction was performed with 2–3 mg/kg propofol, 0.6–1 mg/kg rocuronium, 1 mcg/kg

fentanyl and 0.05 mg/kg midazolam. Remifentanyl and sevoflurane were used for the maintenance of anaesthesia. Rather than opioids, diclofenac sodium and contramal retard were selected for analgesia.

The SPSS statistical software package (SPSS, version 22.0 for Windows; SPSS, Inc., Chicago, Illinois, USA) was used to perform all statistical evaluations. Descriptive statistics were expressed as mean±sd deviation for intermittent and continuous numerical variables, whereas categorical variables were expressed as the number of observations and percentage (%). Shapiro–Wilk test was used to investigate whether the distribution of variables was normal. Mann–Whitney *U*-test, which is a nonparametric method, was used to compare nonnormally distributed data. For normally distributed data, independent variable *t*-test was used. Using the parametric paired *t*-test and the nonparametric Wilcoxon test, we compared the patients' pre-test and post-test SMMT score. Categorical variables were compared using Pearson's Chi-squared test, and Fisher's exact Chi-squared test was used in diagonal tables with small expected frequencies. A *p*-value of <0.05 was considered significant in all statistical analyses.

RESULTS

The first group included 129 patients (mean age, 83.4±5.9 years), and the second group included 134 patients (mean age, 82.9±5.2). There was no statistically significant difference between the groups in terms of age (*p*=0.466), sex (*p*=0.745), educational status (*p*=0.206), operation type (*p*=0.064), the presence of a chronic disease (*p*=0.238), the diagnosis of diabetes mellitus (*p*=0.751) or hypertension (*p*=0.742), preoperative haemoglobin value (*p*=0.259), the volume of blood loss from drain (*p*=0.184) or aspirator (*p*=0.158) tube and body mass index (BMI) value (*p*=0.172) as well as biochemical biomarkers. Demographic and clinical characteristics of patients are shown in Table 1.

**Table 1.** Demographic and clinical characteristics of patients.

Variable	Group 1 (n=129)	Group 2 (n=134)	p
Age (mean±sd)	81.2±6.5	79.8±5.8	0.066
Sex			
Female	39	43	0.745
Male	90	91	
Operation type			
Total hip prosthesis	32	28	0.064
Partial hip prosthesis	97	106	
Chronic disease			
Absent	36	29	0.238
Present	93	105	
Educational Status			
Illiterate	81	94	0.206
Primary and High School	48	40	
Diagnosed with diabetes mellitus (n)	24	27	0.751
Diagnosed with hypertension (n)	59	64	0.742
Pre-op haemoglobin (mg/dL)	10.3±2.6	9.9±3.1	0.259
Blood volume from drain tube (cc)	868.3±86.4	852.7±102.3	0.184
Blood volume from aspirator (cc)	688.2±95.6	703.6±81.2	0.158
First day fluid replacement (cc)	2655.4±344.2	2721.6±381.5	0.141
Second day fluid replacement (cc)	2353.7±242.5	2221.7±314.6	<0.001
Third day fluid replacement (cc)	1987.1±321.6	1896.2±293.4	0.173
Fourth, fifth and sixth day fluid replacement (cc)	773.2±145.8	783.6±112.3	0.516
BMI	20.7±2.1	21.2±3.6	0.172

In total, 48 patients in the first group, and 13 patients in the second group were diagnosed with POCD ($p<0.001$). Furthermore, the duration of cognitive dysfunction was longer in patients in the

first group compared to those in the second group ($p<0.001$). Clinical characteristics of complications are summarized in Table 2.

Table 2. Clinical characteristics of complications.

Variable	Group 1 (n=129)	Group 2 (n=134)	p
Time with cognitive dysfunction (days)	10.8±1.2	8.9±1.5	<0.001
Number of cognitive dysfunction [n (%)]	48	13	<0.001
Confusion	22	7	
Somnolence	11	3	
Stupor	7	3	
Coma	2	0	
Delirium	5	0	
Other complications			
Decubitus ulcer	9	2	
Aspiration pneumonia	2	1	
Anaphylactic reaction during blood replacement	6	5	

According to comparisons of pre- and post-operative SMMT total and sub-dimensions' scores, in Group 1, total and all scores were decreased significantly; In Group 2 total and sub-dimensions' scores (except registration) were decreased.

However, greater decreases were observed in Group 1. Comparisons of pre- and post-operative SMMT total and sub-dimensions' scores are summarized in Table 3.

Table 3. Comparisons of pre- and post-operative SMMT total and sub-dimensions' scores.

	Group 1 (n=129)					Group 2 (n=134)				
	Pre-op Mean±sd	Post-op Mean±sd	MD	SE	p	Pre-op Mean±sd	Post-op Mean±sd	MD	SE	p
Orientation	8.41±0.73	7.28±0.86	1.12	0.11	0.001	8.69±0.64	8.23±1.09	0.46	0.10	0.001
Registration	2.56±0.50	2.01±0.72	0.55	0.07	0.001	2.36±0.54	2.41±0.68	0.05	0.07	0.465
Attention and Calculation	4.32±0.63	2.98±0.77	1.34	0.09	0.001	3.89±0.58	3.59±0.74	0.30	0.08	0.000
Recall	2.68±0.47	1.98±0.71	0.70	0.07	0.001	2.30±0.56	2.15±0.69	0.16	0.07	0.027
Language and Praxis	7.70±0.80	6.67±1.15	1.03	0.12	0.001	8.00±0.73	7.63±0.94	0.37	0.10	0.001
Total score	25.70±1.79	20.91±2.59	4.79	0.27	0.001	25.24±1.19	24.01±1.97	1.22	0.19	0.001

sd: Standard Deviation; MD: Mean Difference; SE: Standard Error



DISCUSSION

Postoperative cognitive dysfunction leads to increased duration of postoperative hospitalization and increased economic burden. Furthermore, it is associated with increased morbidity and mortality. Aetiological factors underlying POCD can be categorised as older age, prior cognitive impairment, depression, low education level, a longer duration of anaesthesia, abnormal blood pressure, the presence of emboli and certain medications used in anaesthesia and analgesia protocols (4,6,7,10,11). However, as mentioned previously, these associations have not been proven. In a systematic review, Fong et al. (12) investigated the potential role of analgesia in the progression of POCD, and they reported that the type of analgesia or administration technique did not influence the development of POCD. In our study, we excluded patients with prior cognitive impairment, and all patients received the same anaesthetics/analgesics via the same protocols. We performed Doppler USG, thorax CT and D-dimer measurements in all patients to exclude the presence of pulmonary or micro emboli. There were no differences between the groups in terms of characteristics, such as age and the presence of hypertension. Furthermore, many factors suggested to be associated with POCD in the literature were similar between the groups. Thus, we can conclude that the most important factor affecting POCD frequency and duration in this study was the difference in the protocol used for blood replacement.

Another important issue is whether THA surgery has a causal link to cognitive dysfunction. In a meta-analysis, Scott et al. (13) have concluded that there is no association between long-term cognitive dysfunction and THA. Because of the lack of control groups, it is difficult to determine whether THA surgery leads to cognitive problems. In our study, the prevalence of POCD was 23.2%, which can be considered as a low value for individuals older than 75 years. Even though the incidence of POCD is reported to be 15%–30%, it is known that these

values increase with age. Furthermore, Konekar et al. (14) have reported that POCD incidence was 40.9% in patients aged 71–80 years and 100% in patients older than 80 years. The low rate of POCD in our study may be explained by the absence of any cognitive dysfunction preoperatively in the included patients. The evaluation of patients pre- and postoperatively may help to identify factors associated with POCD. Further, it is important to consider that reduced cognitive function after THA is not surprising because these elderly patients underwent a major surgery and experienced a high level of pain. Therefore, to arrive at an accurate diagnosis, POCD should be assessed in depth pre- and postoperatively. In our study, all patients were examined by experienced neurologists.

Elderly individuals may have a predisposition to anaemia as an adverse event of surgery because of reduced haematopoiesis and blood reserves. Postler et al. (15) have stated that postoperative anaemia was detected in 53.3% of elderly patients who underwent THA. Blood transfusions are common after surgery in the elderly. After THA, blood transfusions are commonly performed according to haemoglobin levels. In recent years, indications for blood transfusion have become stricter in an attempt to reduce the frequency of transfusions due to the possibility of adverse events and complications caused by transfusion. However, in a Cochrane review published in 2012, liberal and restrictive blood transfusion protocols were compared and it was stated that restrictive transfusion strategies were not superior to liberal protocols in terms of decreasing adverse effects, including mortality, cardiac events and thromboembolism). It is also important to consider that the aged people are vulnerable to cognitive dysfunction due to natural cognitive decline with age and their intolerance to even a slight decline in brain perfusion. Thus, we preferred the liberal transfusion strategy and composed two groups on the basis of blood replacement time as follows: (1) after haemoglobin value decreased below 9.0 mg/

dL and (2) after evaluating blood loss from drain and aspirator tube. We observed that in the second group, POCD frequency was lower and the recovery time of POCD was shorter.

Patients were not followed-up in the long-term, which may be considered as a limitation of this study. The second limitation of our study may be the fact that some factors, such as the presence of depression and patient education level, which could be predisposing factors for POCD, were not evaluated. Furthermore, although oxyhaemoglobin has been reported to be a valid indicator of the requirement of postoperative blood transfusion after total hip/knee arthroplasty (16), we did not include a control group that underwent transfusion according to oxyhaemoglobin levels. To our knowledge, this is

the first study to evaluate the association between blood loss and POCD after THA.

In conclusion, POCD frequency and duration can be reduced via early blood transfusion in the event of blood loss after surgery. Our results do not reflect the causal link between blood loss and cognitive dysfunctions; however, we believe that investigating such associations may be worthwhile because these have been rarely studied, and studies focusing on this topic may draw attention to the importance of physiology in patients older than 75 years. Further studies investigating the potential role of inadequate blood replacement strategies and their causal relationships with POCD are required.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344056
2018;21(3):410-418

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Received: 26/01/2018
Accepted: 20/07/2018

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Presented at the 12th Congress of European
Forum for Research in Rehabilitation
September 11-14, 2013 Harbiye Military
Museum & Cultural Center,
İstanbul- Turkey Turk J Phys Med
Rehab 2013: (59 Suppl 2); 1-128

RESEARCH

DEPRESSIVE SYMPTOMS IN PATIENTS WITH STROKE AND THEIR CAREGIVERS

ABSTRACT

Introduction: In this study, it was aimed to assess the prevalence of depressive symptoms among patients with stroke and their caregivers and to determine factors associated with depression.

Materials and Method: This study included 97 patients with subacute and chronic stroke and 88 caregivers. Patients were evaluated using the Brunstrom motor recovery scale for motor functions, Mini-Mental State Examination for cognitive status, Rivermead Mobility Index for mobility and Barthel Index for functional status. The patients and their caregivers were evaluated for mood disorders using the Beck Depression Inventory, and quality of life was evaluated using the Nottingham Health Profile.

Results: Among the participants, 61.9% of the patients and 52.6% of the caregivers were found to have depressive symptoms. Although comparison of the quality of life scores of the patients and their caregivers revealed no significant difference, only the physical aspect of quality of life was significantly higher in the patients. Depression scores were higher in the patients than in their caregivers. Motor functional outcomes of the hand along with mobility, cognitive functions and functional status scores were significantly negatively correlated with depression scores of the patients. Functional status scores of the patients were significantly positively correlated with motor functional outcomes (hand and upper/lower extremity), mobility and cognitive function scores.

Conclusion: Functional independence and mobility are the best predictors of depressive symptoms in patients with stroke. Assessment and treatment of depression in not only in patients but also their caregivers should be a part of the general rehabilitation plan since the early stages of stroke.

Keywords: Caregivers; Depression; Stroke

ARAŞTIRMA

İNME HASTALARI VE ONLARA BAKIM VERENLERDE DEPRESİF SEMPTOMLAR

Öz

Giriş: Bu araştırmada inmeli hastalar ve bakım verenleri arasında depresif belirtilerin sıklığını ve depresyon ile ilişkili faktörlerin belirlenmesi amaçlanmıştır.

Gereç ve Yöntem: Çalışmaya subakut ve kronik inme geçiren 97 hasta ve 88 bakım veren dahil edildi. Hastalar motor fonksiyonlar için Brunstrom Motor Geri Kazanım Ölçeği, bilişsel durum için Mini-Mental Durum İncelemesi, hareketlilik için Rivermead Hareketlilik İndeksi ve fonksiyonel durum için Barthel İndeksi kullanılarak değerlendirilmiştir. Hastalar ve bakım verenler Beck Depresyon Envanteri kullanılarak duygudurum bozuklukları açısından ve yaşam kalitesi Nottingham Sağlık Profili kullanılarak değerlendirilmiştir.

Bulgular: Çalışmaya katılanların, hastaların %61.9'unun ve bakım verenlerin %52.6'sının depresif belirtileri saptanmıştır. Hastaların ve bakım verenlerin yaşam kalitesi skorlarının karşılaştırılmasının anlamlı bir fark göstermediği, hastaların Nottingham Sağlık Profili'ndeki sadece fiziksel yönün hastalarda anlamlı derecede yüksek olduğunu ortaya koymuştur. Depresyon skorları, hastalarda bakıcılarına göre daha yüksekti. Mobilite, kognitif fonksiyonlar ve fonksiyonel durum skorları ile birlikte elin motor fonksiyonel sonuçları, hastaların depresyon skorları ile anlamlı derecede negatif yönde koreleydi. Hastaların fonksiyonel durum skorları, motor fonksiyonel sonuçlar (el ve üst/alt ekstremiteler), mobilite ve bilişsel işlev skorları anlamlı derecede pozitif korelasyon göstermiştir.

Sonuç: Fonksiyonel bağımsızlık ve mobilite, inmeli hastalarda depresif belirtilerin en iyi belirleyicileridir. Depresyonun sadece hastalarda değil aynı zamanda bakım verenlerde de değerlendirilmesi ve tedavi edilmesi, inmenin erken evrelerinden itibaren genel rehabilitasyon planının bir parçası olmalıdır.

Anahtar sözcükler: Bakıcı; Depresyon; İnme



INTRODUCTION

Stroke is a major cause of death and disability in both developed and developing countries. It causes devastating consequences not only on physical and social requirements but also on psychological needs and significantly reduces the quality of life. A wide range of emotional and behavioural disorders affect patients during the post-stroke period and the most common is depression. Various studies have reported the prevalence of post-stroke depression as 20%-60%. Depression levels of patients with stroke vary according to different features of the patients. Many factors are known to influence the level of depression, including lesion location, stroke severity, cognitive and functional impairments, sex, educational status and socioeconomic status. Several studies have reported the negative effects of depression on recovery in terms of performing daily activities. Many studies have shown that depression negatively affects function and that treatment of depression increases functional recovery (1-4).

Patients with disability resulting from stroke need emotional and physical support from their caregivers, who are usually family members. Caregivers play an important role in stroke rehabilitation. Depression is very common in not only the patients with stroke but also their caregivers. Remarkably, various studies have shown that the prevalence of depression in patients with stroke and their caregivers is similar. Depression in and quality of life of caregivers are adversely influenced by their age, sex, and physical health. Therefore, to adapt to stroke, psychosocial support to patients and their caregivers is necessary (1,5,6).

The factors influencing depression and quality of life among patients with stroke and their caregivers have been investigated only in a few studies. Therefore, the aim of this study was to assess the prevalence of depressive symptoms among patients with stroke and their caregivers and to determine the factors associated with these symptoms.

MATERIALS AND METHOD

This cross-sectional study was conducted at a single centre (Eskisehir Osmangazi University, Physical Medicine and Rehabilitation Department, Eskisehir, Turkey) between 2013 and 2014.

Patients with stroke (n=118) who were referred to a polyclinic and those who are concerned about their caregivers (n=101) were included. Overall, 97 patients with chronic and subacute stroke and 88 caregivers were included in the study. All the patients and their caregivers were able to understand the questionnaires in Turkish and could read and write in Turkish. Stroke patients and caregivers with psychiatric illnesses and aphasia which caused co-operative problems were excluded.

A detailed anamnesis of the patients (age, sex, duration of stroke, educational status, socioeconomic status, family status, marital status, affected extremity, antidepressant usage and aphasia rehabilitation history) and their caregivers (proximity of relationship, age, sex, educational status, socioeconomic status and marital status) were conducted.

The motor functional outcome of the patients was evaluated using the Brunnstrom motor recovery scale. Movements of the fingers, arms and legs were classified into six grades: 1 point for no voluntary movement to 6 points for normal movement. Specific cognitive functions were evaluated using the Mini-Mental State Examination (MMSE), and MMSE scores range from 0 to 30 (7). Mobility was assessed using the Rivermead Mobility Index (RMI), and RMI scores range from 0 to 15 (8). Further, functional status was assessed using the Barthel Index (BI), BI contains 10 items that measure performance of self-care and mobility (0-100) (9). Depressive symptoms of the patients and their caregivers were evaluated using the 21-item Beck Depression Inventory (BDI). Responses were given on a scale of 0-3 in reference to the past fortnight [total score range 0-63: mild (10-18), moderate (19-29) and severe (30-63); patients with a score of >9 were considered to have depression] (10, 11).

Quality of life was assessed using the Nottingham Health Profile (NHP), Part 1 which reflects patients' and their caregivers' degree of discomfort or distress in six dimensions (emotional relations, sleep, lack of energy, pain, physical mobility and social isolation) in a total of 38 questions with yes/no responses. The ratings of each item were weighted to obtain a score of 0-100; a higher score indicates more problems (12). BDI and NHP questionnaires, which are self-instructive instruments, were administered to the patients and their caregivers and collected by the interviewer on completion. In a few cases, when the patients and their caregivers needed assistance in filling the questionnaire because of visual deficit or writing problems, the interviewer read the BDI and NHP questions aloud and, if necessary, wrote down their answers.

Statistical analysis

Data for each continuous variable were examined using the Shapiro–Wilk test to determine whether the assumptions of normality were valid. The independent samples Mann-Whitney U test and Spearman's correlation analysis were used when the data were not normally distributed. Descriptive statistics are the median values (quartiles). A p-value of <0.05 was considered statistically significant. Data were analysed using IBM SPSS Statistics 21.0 (SPSS Inc., Chicago, Illinois, US).

Ethics statement

The study was conducted in full compliance with the amended Declaration of Helsinki, after obtaining approval from the institutional review board of Eskisehir Osmangazi University (date/no: 14.05.2013/08-09). Informed consent was obtained from all patients and their caregivers before inclusion.

RESULTS

In total, 97 patients (34 women [mean age 62.26±14.91 years] and 63 men [mean age 63.30±10.51 years]) with an average post-stroke period of 18.3±28.8 months) and 88 caregivers (72 women [mean age

51.2±14.2 years] and 16 men [mean age 50±19.8 years], comprising spouses, children and others) were enrolled. Moreover, among the caregivers 46 (52.27%) were the patient's spouses, 39 (44.32%) were the patient's children and 3 (3.41%) were other individuals.

The demographic characteristics (age, sex, marital status, educational status, socioeconomic status and antidepressant usage) of the patients and their caregivers are summarised in Table 1.

In terms of the BDI scores (mild, moderate and severe), no significant differences were observed among working, non-working and retired patients, and no significant differences were found in terms of educational and marital status. Furthermore, 61.9% of the patients and 52.6% of the caregivers were found to be depressed. The rates for all patients and their caregivers are separately presented in Tables 2 and 3. Among the patients, 55 had a right-hemispheric lesions and 42 had left-hemispheric lesions. No significant difference was found in terms of the BDI scores of the patients with right-hemispheric lesion and those with left-hemispheric lesion. The majority of patients had ischaemic stroke; 80 patients had ischaemic stroke and 17 had haemorrhagic stroke. Notably, no significant difference was observed in terms of the BDI scores of the patients with ischaemic and haemorrhagic strokes. In addition, 80 patients had an elementary family and 17 had an extended family. No significant difference was noted in terms of the BDI scores of the patients with elementary and extended families (Table 4). There were also no significant differences in the BDI scores of the caregivers in terms of working, educational and marital statuses and antidepressant usage (Table 5).

Comparison results of the NHP scores of the patients and their caregivers revealed no significant difference ($p>0.05$), with one exception the physical scores of NHP were significantly higher in the patients ($p=0.003$, Table 6).

In the patients, there was no correlation between the Brunnstrom grades of upper/lower extremity



and the BDI scores. Not only Brunnstrom grades of the hand ($p=0.043$) but also RMI ($p<0.001$), MMSE ($p=0.003$) and BI ($p<0.001$) scores were significantly negatively correlated with the BDI scores of the

patients. However, the BI scores of the patients were significantly positively correlated with the Brunnstrom grades (hand and upper/lower extremity) and RMI and MMSE scores ($p<0.001$, Table 7).

Table 1. Demographic characteristics of patients and their caregivers.

Variable	Patients		Caregivers		p
	n	%	n	%	
Age (mean±sd)	62.94±12.17		51.22±15.35		<0.001
Sex					<0.001
Female	34	35.1	72	81.8	
Male	63	64.9	16	18.2	
Marital status					<0.001
Married	78	80.4	69	78.4	
Unmarried	19	19.6	19	21.6	
Socioeconomic status					<0.001
Working	1	1.0	16	18.2	
Not working	52	53.6	50	56.8	
Retired	44	45.4	22	25	
Educational status					0.144
Illiterate	8	8.2	2	2.3	
Primary school	67	69.1	56	63.6	
High school	12	12.4	17	19.3	
University	10	10.3	13	14.8	
Antidepressant usage					0.133
Yes	34	35.1	21	23.9	
No	63	64.9	67	76.1	

Table 2. The frequency and severity of depression scores of patients.

Severity of depression (BDI points)	Patients	
	n	%
0-9	37	38.1
10-18	17	17.5
19-29	35	36.1
30-63	8	8.2
Total	97	100.0

Table 3. The frequency and severity of depression scores of caregivers.

Severity of depression (BDI points)	Caregivers	
	n	%
0-9	46	47.4
10-18	23	23.7
19-29	17	17.5
30-63	2	2.1
Total	88	100.0

Table 4. Beck Depression Inventory scores of the patients by demographic characteristics.

Variable	Score				p
	0-9	10-18	19-29	30-63	
Working status					0.245
Working	1 (100.0%)	- (-)	- (-)	- (-)	
Not working	15(28.8%)	12 (23.1%)	22 (42.3%)	3 (5.8%)	
Retired	21 (47.7%)	5 (11.4%)	13 (29.5%)	5 (11.4%)	
Educational status					0.215
Illiterate	2 (25.0%)	3 (37.5%)	3 (37.5%)	- (-)	
Primary school	24 (35.8%)	9 (13.4%)	26 (38.8%)	8 (11.9%)	
High school	4 (33.3%)	3 (25.0%)	5 (41.7%)	- (-)	
University	7 (70.0%)	2 (20.0%)	1 (10.0%)	- (-)	
Marial status					0.619
Married	30 (38.5%)	15 (19.2%)	27 (34.6%)	6 (7.7%)	
Single	1 (50.0%)	1 (50.0%)	- (-)	- (-)	
Widow	6 (35.3%)	1 (5.9%)	8 (47.1%)	2 (11.8%)	
Affected extremity					0.148
Right	18 (42.9%)	10 (23.8%)	10 (23.8%)	4 (9.5%)	
Left	19 (34.5%)	7 (12.7%)	25 (45.5%)	4 (7.3%)	
Anti-depressant usage					0.085
Yes	- (-)	9 (26.5%)	5 (14.7%)	17 (50.0%)	
No	- (-)	28 (44.4%)	12 (19.0%)	18 (28.6%)	
Family type					0.693
Extended	8 (47.1%)	3 (17.6%)	4 (23.5%)	2 (11.8%)	
Elementary	29 (36.2%)	14 (17.5%)	31 (38.8%)	6 (7.5%)	
Stroke type					0.660
Ischaemic	29 (36.2%)	13 (16.2%)	31 (38.8%)	7 (8.8%)	
Haemorrhagic	8 (47.1%)	4 (23.5%)	4 (23.5%)	1 (5.9%)	



Table 5. Beck Depression Inventory scores of the caregivers by their demographic characteristics.

Variable	Score				p
	0-9	10-18	19-29	30-63	
Working status					0.161
Working	9 (56.2%)	5 (31.2%)	1 (6.2%)	1 (6.2%)	
Not working	21 (42.0%)	15 (30.0%)	13 (26.0%)	1 (2.0%)	
Retired	16 (72.7%)	3 (13.6%)	3 (13.6%)	- (-)	
Educational status					0.966
Illiterate	2 (100.0%)	- (-)	- (-)	- (-)	
Primary school	28 (50.0%)	14 (25.0%)	12 (21.4%)	2 (3.6%)	
High school	9 (52.9%)	5 (29.4%)	3 (17.6%)	- (-)	
University	7 (53.8%)	4 (30.8%)	2 (15.4%)	- (-)	
Marial status					0.086
Married	39 (56.5%)	17 (24.6%)	11 (15.9%)	2 (2.9%)	
Single	7 (53.8%)	4 (30.8%)	2 (15.4%)	- (-)	
Widow	- (-)	2 (33.3%)	4 (66.7%)	- (-)	
Anti-depressant usage					0.202
Yes	- (-)	7 (33.3%)	6 (28.6%)	6 (28.6%)	
No	- (-)	39 (58.2%)	17 (25.4%)	11 (16.4%)	

Table 6. Comparison of quality of life scores of patients and their caregivers.

Nottingham Health Profile	Patients (25%-75%) median	Caregivers (25%-75%) median	p
Energy	66.6(16.65-100)	66.6(33.3-100)	0.901
Pain	25 (0-100)	37.5 (3.13-87.5)	0.883
Emotional	55.5 (22.22-77.77)	55.53 (22.2-86.04)	0.740
Sleep	40 (10-100)	40 (20-80)	0.997
Social	40 (20-80)	40 (0-80)	0.152
Physical	62.5 (37.5-75)	31.25 (0-75)	0.003

Table 7. Correlation of Beck Depression Inventory and Barthel Index scores of patients with related variables.

Variable	Beck Depression Inventory	Barthel Index
Brunnstrom stage of upper extremity	ns	r=0.449 p<0.001
Brunnstrom stage of lower extremity	ns	r=0.517 p<0.001
Brunnstrom stage of hand	r=-0.206 p=0.043	r=0.356 p<0.001
Rivermead Mobility Index	r=-0.380 p<0.001	r=0.885 p<0.001
Mini-Mental Test	r=-0.301 p=0.003	r=0.524 p<0.001
Barthel Index	r=-0.428 p<0.001	-
Beck Depression Inventory	-	r=-0.428 p<0.001

ns indicates nonsignificant.

DISCUSSION

The present study was conducted to investigate various patient- and caregiver- related factors that influence depressive symptoms and quality of life among them. Untreated depression prevents successful recovery and rehabilitation in these patients. Our results showed that >50% of the patients (61.9%) and their caregivers (52.6%) had depressive symptoms. Various studies found differences in the prevalence of depression in patients with stroke and their caregivers (1,13,14). A previous study reported prevalence of depression of 40.1% (13). Kotila et al. reported that 41% of 321 patients participated in active rehabilitation programmes and that 42% of 195 caregivers were depressed at three months after experiencing stroke (1). In another study, the prevalence of depression in 21-45 year-old caregivers, was 40% (14). In the present study, the prevalence of depressive symptoms was higher than that reported in the above-mentioned studies. This may be associated with disease duration of stroke and the age of caregivers, which were higher in our study than those in the above-mentioned studies. Similarly, another study reported that the prevalence of depression was 52% in older patients with stroke and 53% in their geriatric caregivers (5).

The important question is which factors affect depression and quality of life of patients and their caregivers. Berg et al. Reported that age was the most significant determinant of depression and that older patients were more depressed after suffering acute strokes (15). Nakipoğlu et al. demonstrated that depression exists in 52.6% of geriatric patients with hemiplegia (5). In our study, the mean age of patients was 62.94±12.17 years, and depressive symptoms were found in 61.9% of the patients, similar to that reported in the study by Kotila et al. wherein which study older age was as an independent contributor to depression. This result may be associated with the patients' acceptance of their disabilities, adaptation to physical and psychosocial sequelae and learning how to live with them.

In some reports patients with left-hemispheric lesions were more depressed than those with right-hemispheric lesions, although no difference was found in some studies in the literature (1,5,16,17). In our study, no association was found between the hemispheric side and depressive symptoms of patients. In addition, no correlation was found among stroke subtype (infarct/haemorrhage), patients' family type (elementary/extended) and depressive symptoms.



Hand and lower/upper extremity motor functions, cognitive functions and mobility were significantly correlated with functional independence of patients. Hand motor functions, cognitive functions, mobility and functional independence were also significantly negatively correlated with depressive symptoms of patients. However, depressive symptoms are more likely to be influenced by functional independence and mobility. Our results were similar to those of earlier studies; Wade et al. (18) and Sharpe et al. (19) reported that physical disability is associated with depression. Schmid et al. investigated 174 patients with post-stroke depression for over 12 weeks and found that the severity of depression was negatively associated with functional independence (20). The primary objectives of stroke rehabilitation are to reduce functional dependency and allow patients to return to their communities. However, functional independence is mostly influenced by post-stroke depression, and this finding reinforces the importance of treating depression during stroke rehabilitation. Depression can often be overlooked or ignored, which delays the functional recovery of patient. Therefore, depression should be considered, and necessary support and treatment should be given (21).

In our study, the depression scores of patients and their caregivers were high. This result is not surprising because chronic diseases are consistently associated with an increased prevalence of depression and lower level of energy (22,23). Moreover, the severity of depression of the patients was positively associated with the severity of depression of their caregivers (1). Considering that >50% of the caregivers were depressed in our study, care for depression not only in patients but also in their caregivers is very crucial. Depression in caregivers may reduce the rehabilitation success of patients. Emotional support and encouragement to the caregivers may reduce depression in patients with stroke. Evans et al. have reported that depression is reduced in patients after counselling of their caregivers (24). A significant relationship was found between quality of life dimensions of the patients and their caregivers

in our study, and their results were similar. Only the physical dimension of quality of life was worse in the caregivers. This is an expected result because caregivers should already have the capacity to care for patients and meet their needs. These results showed that stroke adversely affects not only the quality of life of patients with stroke but also the quality of life of their caregivers owing to their workload and responsibilities.

High-level family support is associated with improvement in depression and functional outcomes in patients with acute-stage stroke (25). Moreover, 94.59% of the caregivers of such patients were first-degree relatives. To attain better rehabilitation outcomes, caregivers should have complete motivation and good attitude. In conclusion, caregivers as well as patients with stroke must obtain necessary support since the initiation of rehabilitation programme. In our study, the duration for which the caregivers cared for these patients was not considered. This is the main limitation of our study. In addition, the duration of the antidepressant usage was not considered, which is another limitation. However, our study is one of the few studies that investigated quality of life and depressive symptoms of patients with stroke and their caregivers.

In conclusion, our results showed that the best predictor of post-stroke depressive symptoms is functional independence and mobility of patient and that stroke affects patients and their caregivers. Post-stroke depressive symptoms have negative effects on functional independence. Assessment and treatment of depression not only in patients but also in their caregivers should be a part of the general rehabilitation plan since the early stages of stroke.

Conflict of interest

The authors have no conflicts of interest to declare. All authors have read the journal's policy on disclosure of potential conflicts of interest. All authors have read the journal's authorship agreement. The manuscript has been reviewed and approved by all named authors.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344057
2018;21(3):419-428

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Received: 19/03/2018
Accepted: 10/06/2018

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RESEARCH

SEXUAL FUNCTION AND QUALITY OF LIFE IN A SAMPLE OF POSTMENOPAUSAL WOMEN ADMITTED IN A MENOPAUSE CLINIC IN TURKEY

ABSTRACT

Introduction: Sexual issues in postmenopausal women have garnered limited interest despite their high prevalence. Menopause is a natural part of ageing in women and has been reported to have a negative impact on the quality of life. In the present study, we examined the association between sexual functions and quality of life parameters in postmenopausal women.

Materials and Method: In total, 67 postmenopausal women who sequentially presented to climacteric clinics were enrolled in this study. All participants were administered a structured sociodemographic data form, a 7-item relationship assessment scale, female sexual function index and the 36-item short-form health survey -SF-36-.

Results: Mean age, mean age at the beginning of menopause and mean menopause duration were 52.6 ± 6.14 , 46.46 ± 5.58 and 6.23 ± 4.94 years, respectively. 36-item short-form health survey -SF-36-social function score was positively correlated with sexual desire, arousal, degree of lubrication, ability to achieve orgasm, intercourse satisfaction, female sexual function index pain domain score, and total female sexual function index score. Moreover, 36-item short-form health survey -SF-36-physical function score was positively correlated with arousal, pain and total female sexual function index score. 36-item short-form health survey -SF-36-physical role difficulties score was positively correlated with the ability to achieve orgasm and female sexual function index pain scores. female sexual function index score correlated with SF-36 social function, physical function and physical role difficulties subscale scores. 36-item short-form health survey -SF-36-social function score predicted arousal, ability to achieve orgasm, intercourse satisfaction, pain and total female sexual function index scores after controlling for age and menopause duration.

Conclusion: In the evaluation of sexual functioning in postmenopausal women, problems related to relationship with partner and quality of life, especially physical functions, should be taken into account carefully.

Keywords: Post-menopause; Life quality; Sexual dysfunction, physiological; Sexual dysfunction, psychological

ARAŞTIRMA

TÜRKİYE'DEKİ BİR MENOPOZ KLİNİĞİNE BAŞVURAN BİR GRUP POSTMENOPOZAL KADINDA CİNSEL İŞLEV VE YAŞAM KALİTESİ

Öz

Giriş: Yüksek prevalans oranına rağmen postmenopozal kadınlarda görülen cinsel sorunlara yeterince ilgi gösterilmemiştir. Menopoz kadınlardaki yaşlanma sürecinin doğal bir parçasıdır ve yaşam kalitesi üzerine negatif bir etkisi olduğu bilinmektedir. Bu çalışmada, yaşam kalitesi alt boyutları ile postmenopozal dönemdeki cinsel fonksiyonlar arasındaki ilişkiyi inceledik.

Gereç ve Yöntem: Menopoz kliniğine başvuran postmenopozal 67 hasta çalışmaya dahil edildi. Tüm katılımcılara yapılandırılmış sosyodemografik form, 7 maddelik ilişki değerlendirme ölçeği, kadın cinsel işlev ölçeği ve kısa form sağlık ölçeği -SF-36- uygulandı.

Bulgular: Ortalama yaş 52.6 ± 6.14 yıl, ortalama menopoz başlangıç yaşı 46.46 ± 5.58 yıl ve ortalama menopoz süresi 6.23 ± 4.94 yıldır. SF-36 sosyal fonksiyon skorları, cinsel istek, uyarılma, ıslanma düzeyi, orgazm olabilme, ilişki memnuniyeti, kadın cinsel işlev ölçeği ağrı içeren skorları ve kadın cinsel işlev ölçeği toplam skorları ile pozitif korelasyona sahiptir. Kısa form sağlık ölçeği -SF-36- fiziksel rol güçlük skorları, orgazma ulaşma ve ağrı skorları ile pozitif korelasyon göstermektedir. Kadın cinsel işlev ölçeği, sosyal işlev, fiziksel işlev ve SF-36 fiziksel rol güçlük alt ölçeği ile koreledir. Sosyal işlev skorları, yaş ve menopoz süresi kontrol edildiğinde, uyarılabilmeyi, orgazma ulaşmayı, ilişki memnuniyetini, ağrıyı, kadın cinsel işlev ölçeği toplam puan alanlarını öngörmektedir.

Sonuç: Postmenopozal kadınlarda cinsel işlevlerin değerlendirilmesinde eşlerle ilişki sorunları, yaşam kalitesi, özellikle fiziksel işlevlerle ilgili sorunlar dikkate alınmalıdır.

Anahtar sözcükler: Postmenopoz; Yaşam kalitesi; Cinsel işlev bozukluğu, fizyolojik; Cinsel işlev bozukluğu psikolojik

INTRODUCTION

In addition to its major role in the continuation of the human race, sex between couples serves several purposes, particularly as a crucial part in relationship maintenance, self-esteem, physical and mental health and subjective well-being (1). In a typical situation, couples' engagement in the novel and arousing activities such as sex serves to generate positive feelings towards each other, increases cooperation between partners, reinforces closeness and interdependence and may have an overall positive effect on the assessment of relationship quality between partners (2).

Several studies have indicated a significant association between sexual functioning and satisfaction and marital adjustment and subjective well-being. However, several factors might mediate this association. Age and menopause have been reported to be significant predictors of sexual desire and functioning; as people age, sexual functioning decreases, and vaginal dryness during menopause might negatively impact sexual desire (2,3).

According to the World Health Organization, quality of life (QoL) is defined as individuals' perception of their position in life in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concerns. QoL assessment is important for determining an appropriate treatment as well as treatment outcomes. QoL is a multidimensional concept that includes variables related to physical and psychological health, levels of independence, social relationships and their association with salient features of the patient's environment.

Menopause is a natural part of ageing in women and is defined as occurring at 12 months after the last menstrual period and marks the end of menstrual cycles (4). This process results from

the ageing of the ovaries which leads to a decline in the production of the ovarian gonadotrophins estrogen and progesterone. These hormonal deficiencies elicit various somatic, vasomotor, sexual and psychological symptoms that impair the overall quality of life in women (5). Overall, 50%–80% of women complain of menopausal symptoms, such as hot flashes, night sweats, sleep disturbances, tiredness and depression. Menopause-related symptoms are the principal determinants of a reduced health-related QoL, which is detectable soon after the onset of menopause (6-8).

Given the increased interest in understanding women's sexuality and sexual dysfunction in women during different life stages, there is a growing need for valid, multidimensional measures of female sexual function. The female sexual function index (FSFI) is the most widely used questionnaire for studies on sexual dysfunction in women. Current literature includes only few studies on sexual functioning, relationship satisfaction and subjective well-being.

In the present study, we aimed to determine the association between female sexual functioning, relationship satisfaction and QoL among menopausal women in Turkey. We hypothesized that relationship satisfaction and QoL inflicted significant effects on sexual functioning in menopausal women.

MATERIALS AND METHOD

Study participants

Study participants were menopausal women who were registered for a routine postmenopausal control at a major hospital in Turkey. All study procedures were performed in accordance with the Declaration of Helsinki, and the study protocol was approved by the ethical committee of the Zekai Tahir Burak Women's Health Research



and Education Hospital. All participants were provided information regarding the study, and all participants provided written informed consent. Inclusion criteria were female sex, the presence of menopause, minimum reading and writing ability. A total of 67 participants who fulfilled the inclusion criteria were included in the study.

Psychometric measurements

Sociodemographic Data Form. All participants were administered a questionnaire prepared by study investigators that was designed to obtain sociodemographic data. The demographic variables included sex, age, marital status, the number of children, education, location, occupation, employment status, the number of siblings, the family history of chronic diseases, the relatives who provided support during treatment, other known physical illnesses and previous psychiatric treatments.

Female Sexual Function Index (FSFI). The FSFI has been developed as a brief, multidimensional self-report for assessing the key dimensions of sexual function in women (9). FSFI consists of 19 items that assess sexual function during the previous 4 weeks that yield domain scores in six areas as follows: sexual desire, arousal, lubrication, orgasm, satisfaction and pain. Each item is rated on a scale ranging from 0 or 1 to 5. A score of zero indicates that the respondent has had no sexual activity in the previous month. Individual domain scores are obtained by adding the scores of individual items that comprise the domain and multiplying the sum by the domain factor (i.e. 0.6 for desire, 0.3 for arousal and lubrication and 0.4 for the other three domains). A full-scale score can be obtained by adding the scores for all six domains. The internal consistency reliability of FSFI score has been reported as 0.97 (9). The Turkish version of the FSFI has been validated by Aygin and Eti Aslan (10), who reported that the range of internal consistency coefficient was

0.70–0.96, with an average Cronbach alpha value of 0.98, among women with breast cancer; they have also reported that the test-retest reliability measured over a 1-month interval was 0.75 (10). The Turkish FSFI measure was validated in an initial cohort of women with female sexual arousal disorder and women without sexual difficulties who served as the control group (11). In a second validation study, The Turkish FSFI was shown to discriminate between women without sexual dysfunction and those who met the DSM-IV-TR (Diagnostic and statistical manual of mental disorders, text revision) criteria for female sexual orgasmic disorder or hypoactive sexual desire disorder (12). Significant discriminant validity was shown in all domains of sexual function as well as in total FSFI score between sexually dysfunctional and non-dysfunctional samples in both studies. In the field of female sexual dysfunction, FSFI has emerged as the primary PRO for the assessment of female sexual function, in both clinical practice and research (13).

Relationship Assessment Scale (RAS). RAS is a 7-item scale designed to measure global relationship satisfaction, which is one of the key areas of relationship assessment, used with individuals who are in an intimate relationship, such as married, cohabiting, engaged or dating couples. The brevity of RAS increases its utility in clinical settings and for online administration. Respondents answer each item using a 5-point scale ranging from 1 (low satisfaction) to 5 (high satisfaction). Studies have shown that RAS score is correlated with other measures of love, sexual attitudes, self-disclosure, commitment and investment in a relationship. Internal consistency reliability of RAS has been reported to be 0.85 (14).

Medical Outcomes Study (MOS) 36-Item Short-Form Health Survey (SF-36). SF-36 was constructed for use in clinical practice and

research, health policy evaluations and general population surveys to examine health status in the MOS (15). SF-36 can be used to evaluate QoL in patients with physical illness. It includes one multi-item scale that assesses eight health concepts as follows: (1) limitations in physical activities because of health problems; (2) limitations in social activities because of physical or emotional problems; (3) limitations in usual role activities because of physical health problems; (4) bodily pain; (5) general mental health (psychological distress and well-being); (6) limitations in usual role activities because of emotional problems; (7) vitality (energy and fatigue); and (8) general health perceptions reflecting QoL (15). Lower scales are evaluated from 0 to 100, and higher scores are interpreted as higher QoL. The Turkish version of the SF-36 was validated by Kocyigit et al., who found that internal consistency reliability of SF-36 was 0.89 (16).

Statistical analysis

Data were analyzed using the SPSS for Windows version 15 (SPSS, Chicago, IL, United States). Data were presented as means±standard deviation for metric discrete variables, and the number of cases and percentages were used for categorical variables. Degrees of association among discrete metric variables were calculated using Pearson's product-moment correlation coefficient. The association between independent and dependent variables was assessed by multiple hierarchical regression analyses to determine best predictors of independent variables. A p value of <0.05 was considered statistically significant. Cronbach's alpha was used to determine the internal consistency reliability of measurement tools.

A priori power analysis for a total R2 value was conducted with a power level of 0.80 and an alpha level of 0.05 for 13 predictor variables, and the software for general power analysis indicated 68

as the sample size required for a medium effect size ($f^2=0.15$). These 13 predictor variables were divided into two groups as follows: demographic variables (age, menopause age, menopause type and education level) and relationship satisfaction (total RAS score) and SF-36 subscale scores (pain, general health, social function, energy/fatigue, emotional well-being, role limitations due to emotional problems, physical functioning and role limitations due to physical health).

RESULTS

The average age of a total of 67 women who participated in the study was 52.67 ± 6.15 years. On average, the subjects entered menopause at 46.59 ± 5.55 years of age. Demographic characteristics of all participants are presented in Table 1.

Pearson's correlation coefficients for associations between variables are shown in Table 2. All testing assumptions of regression analyses were met; multicollinearity test indicated there was no multicollinearity between the variables.

Wiegel et al. have identified a cut-off FSFI score of 26.55 to indicate high and lower FSFI scores, where a low adjusted FSFI score below this cut-off value could be a sign of sexual dysfunction (11). To determine if patients with high and low FSFI scores differed in relationship satisfaction and QoL variables, several Student's t-tests with Bonferroni correction were performed, which revealed significant differences in relationship satisfaction ($t_{65}=-6.30$, $p<0.001$), physical role difficulties ($t_{65}=-5.84$, $p<0.001$), social functioning ($t_{65}=-4.76$, $p<0.001$) and pain ($t_{65}=3.89$, $p<0.01$) between patients with high and low FSFI scores (Table 3).

Hypothesized relationships between female sexual function variables and relationship satisfaction were examined; QoL variables were



tested using hierarchical multiple regression analyses. The demographic variables (age, menopause age, menopause type and education level) were induced in the first step of the hierarchical multiple regression, and the relationship satisfaction as measured with the RAS and QoL variables (physical function, physical role difficulties, emotional difficulties, vitality, mental health, social function, pain and general health) were included in the second step of the hierarchical regression analyses. The full model of FSFI accounted for 47% of the variance [$R^2=0.468$, $F(13, 53)=3.586$, $p < 0.001$]. Additionally, the demographic variables included in the first step of the regression analysis were not significant predictors of the total FSFI score

[$R^2=0.109$, $F(4, 62)=1.890$, $p=0.123$]. Conversely, the relationship satisfaction and QoL variables included in the second step of the regression analyses explained a significant level of variance above and beyond the demographic variables [$R^2=0.468$, $\Delta R^2=0.359$, $\Delta F(9, 53)=3.977$, $p=0.001$]. The examination of standardized partial regressions indicated that when other variables were controlled for, relationship satisfaction ($b=0.527$, $t_{47}=4.293$, $p=0.000$) and SF-36 social function score ($b=-0.375$, $t_{35}=2.265$, $p=0.028$) were significant predictors of total FSFI. In addition, physical function ($r=0.356$), physical role difficulties ($r=0.291$), social function ($r=0.451$) and pain ($r=-0.257$) had significant one-on-one correlations with total FSFI score.

Table 1. Socio-demographical characteristics of the participants.

Variable	Mean±sd	n (%)
Age	52.7±6.15	
Menstruation age	46.59±5.55	
Education		
Elementary School		18 (26.9)
Middle School		4 (6.0)
High School		22 (32.8)
College		21 (31.3)
Graduate School		2 (3.0)
Menopause type		
Natural		52 (77.6)
Surgical		15 (22.4)
Employment status		
Unemployed		26 (38.8)
Full-time		15 (22.4)
Retired		26 (38.8)

sd= Standard deviation.

Table 2. Correlations between the FSFI subscale scores and RAS Total and SF-36 subscale scores.

FSFI Subscales		SF-36 Subscales								
		Physical function	Physical role difficulties	Emotional difficulties	Vitality (Energy)	Mental health	Social function	Pain	General health	
RAS Total										
Desire	r	0.382**	0.207	0.064	0.113	-0.036	0.025	0.292*	-0.215	-0.054
Arousal	r	0.479**	0.350**	0.242*	0.179	0.113	0.177	0.388**	-0.202	0.090
Lubrication	r	0.461**	0.257*	0.182	0.158	0.127	0.133	0.310*	-0.129	-0.071
Orgasm	r	0.521**	0.315**	0.343**	0.305*	0.103	0.108	0.526**	-0.312*	-0.019
Satisfaction	r	0.477**	0.302*	0.269*	0.206	0.049	0.110	0.453**	-0.229	-0.017
Pain	r	0.438**	0.419**	0.361**	0.184	0.023	0.089	0.386**	-0.262*	-0.136
FSFI Total	r	0.521**	0.356**	0.291*	0.222	0.075	0.124	0.451**	-0.257*	-0.041

RAS: Relationship Assessment Scale

FSFI: Female Sexual Function Index

SF-36: 36-Item Short-Form Health Survey

*p<0.05; **p <0.01

Table 3. RAS Total and SF-36 scores comparison of the participants using FSFI cut-off scores.

Variable	FSFI<26.55 N=58		FSFI>26.55 N=9		t	p
	Mean	sd	Mean	sd		
Age	52.83	6.29	51.67	5.32	0.594	0.564
Menopause age	46.59	5.69	46.59	4.79	0.001	0.999
	n	%	n	%	t/x2	p
Menopause type	45/13	86.6	7/2	13.4	0.017	0.987
RAS Total	31.89	27.25	41.60	3.12	-6.301	0.000
Physical function	70.85	23.98	81.15	16.14	-1.652	0.120
Physical role difficulties	54.33	44.24	94.44	11.02	-5.836	0.000
Emotional difficulties	47.65	41.51	85.19	33.79	-3.000	0.011
Vitality (Energy)	51.04	13.54	47.78	10.64	0.821	0.427
Mental health	50.08	11.43	48.44	20.44	0.235	0.820
Social function	60.52	28.45	86.11	11.59	-4.760	0.000
Pain	41.24	22.71	16.94	16.43	3.896	0.002
General health	51.86	17.54	47.92	14.25	0.747	0.469

RAS: Relationship Assessment Scale

FSFI: Female Sexual Function Index

SF-36: 36-Item Short-Form Health Survey



Table 4. A multiple linear regression analysis between FSFI domain and total score and SF-36 scores.

Sexual function dimension			B	p	F	df	R ²	Model p
Sexual desire	RAS Total		0.456	0.002	2.045	13	0.334	<0.01
	Quality of Life	—			2.045	13	0.334	NS
Arousal	RAS Total		0.507	0.000	3.004	13	0.424	<0.001
	Quality of Life	—			3.004	13	0.424	NS
Degree of lubrication	RAS Total		0.504	0.001	2.003	13	0.329	<0.01
	Quality of Life	—			2.003	13	0.329	NS
Ability to achieve orgasm	RAS Total		0.456	0.000	3.737	13	0.478	<0.001
	Quality of Life	SF	0.478	0.005	3.737	13	0.478	<0.01
Intercourse satisfaction	RAS Total		0.486	0.000	3.234	13	0.442	<0.001
	Quality of Life	SF	0.460	0.009	3.234	13	0.442	<0.01
Pain	RAS Total		0.417	0.002	2.866	13	0.413	<0.01
	Quality of Life	—			2.866	13	0.413	NS
Total score	RAS Total		0.527	0.000	3.586	13	0.468	<0.001
	Quality of Life	SF	0.375	0.028	3.586	13	0.468	<0.05

Adjusted by patients' age, menstruation onset age, education status, and menopause reason.

SF SF-36 – Social Functioning Subscale

NS: Not significant

DISCUSSION

In this present study, we performed the general assessment of relationship quality and sexual functions and QoL parameters in a cohort of postmenopausal women. The study population comprised relatively young postmenopausal women (mean age, 52.67±6.15 years), and their average perception of relationship quality was fair (mean, 4.82). In this cohort; perceived general relationship quality strongly correlated with arousal, lubrication, orgasm, satisfaction, and painlessness parameters, but not correlated with desire. However, RAS query that measures general satisfaction in relationships was correlated with desire. As expected, general relationship satisfaction was strongly associated with sexual functioning in postmenopausal women, and this association appeared to be independent of age and menopause duration. These results are

consistent with the results of several previous studies demonstrating that relationship factors showed a greater impact than did age or menopause on low sexual function (1,3).

In the study cohort, a high FSFI score, which indicates better sexual function, correlated with SF-36 social function, physical function and physical role difficulties subscale scores. SF-36 social function subscale score predicted arousal, ability to achieve orgasm, intercourse satisfaction, pain and total FSFI score after controlling for age and menopause duration, suggesting that women with better social function, physical function and less physical role difficulties had also better sexual function and that women with good social function, when stimulated, achieved orgasm easily and had higher sexual satisfaction. These results are consistent with those of a study by Hawton et al. who have reported that

partners with a low physical function did not have a good sexual function (1).

The demographic variables were not significant predictors of FSFI, implicating that sexual function in women included in the present study did not significantly change with changes in age, menopause onset age, menopause type or education level; this finding was not consistent with those of previously reported studies, which suggest that age and menopause are significant predictors of sexual desire and function, given that decreased sexual functioning and vaginal dryness during menopause might negatively affect sexual desire during ageing (2,3).

Relationship satisfaction and social functioning were two significant predictors of sexual function in the present study. Moreover, physical functioning, physical role difficulties, social function and pain significantly correlated with sexual function; in essence, women who were satisfied with their relationship and those who had high social functioning ability showed better sexual functioning scores. In addition, there was an association between sexual function and physical function, physical role difficulties, social function and pain. Nevertheless, not enough studies have examined such associations between sexual function, relationship satisfaction and subjective well-being, and further investigations are imperative to generalize the findings of the present study.

Esposito et al. have found that women with sexual dysfunction showed lower scores in all domains of the FSFI compared with those without dysfunction (17). FSFI score was enhanced by the establishment of a cut-off value for total FSFI score that could differentiate between women with or without sexual dysfunction (11). Any individual woman who obtained a total FSFI score of ≤ 26.55 should be considered at a risk for sexual dysfunction and should be evaluated further. Additionally, increased pain scores can be an

evidence of sexual pain disorder, and decreased lubrication scores might be associated with sexual arousal disorders.

In our patient group, the mean age was 52 and the average duration of menopause was 6 years. As the age advances and the duration of menopause progresses, the decrease in QoL had been observed in many studies.

Aghamolaei T et al, and Shobeiri F. et al, showed that age is a predictor of reduction in QoL. (18 19) Also Rabah et al. showed that aging is associated with reduced QoL, (20).

Caylan et al. reported that duration of menopause was associated with higher scores in psychosocial, physical and sexual domains in QoL (21). It seems that low QoL more than four years after menopausal duration may be due to various factors such as race, age and culture (22). Charandabi et al showed the reduction of QoL with the elapsing time from menstruation cessation (23). Therefore the worsening of QoL will be inevitable for the women who has been in menopause for a long time.

Another issue is the existence of the chronic diseases parallel to the advancing age. Due to aging, in many cases menopause causes the start or aggravation of underlying diseases such as diabetes, osteoporosis, cardiovascular diseases, atherosclerosis, respiratory diseases, musculoskeletal disorders, and reduced physical activity (24). Unfortunately chronic diseases affect sexual function adversely and are associated with reduced QoL (25).

Therefore, it is necessary to plan for the education of these postmenopausal women to broaden their understanding of the changes of menopause and ways to improve their QoL.

In the present study, with the exception of social function, other subscales of SF36 lost their significance when they were included into the regression analysis with other predictor variables, indicating that relationship satisfaction and social function might have mediated the association



between physical function, physical role difficulties, pain and total FSFI score. Given that Turkish society is a sexually restrictive society, physical function, physical role difficulties and pain might be lower-order constructs than social function and relationship satisfaction in expressing difficulties in Turkish women.

Some limitations of the present study should be highlighted. First, there were no physiological parameters that were directly measured, but the study participants were queried regarding menopause, hormone therapy, contraceptive use, age and overall health. Second, this qualitative study was conducted using the convenience sampling of women attending the climacteric clinic and may not thus be a representative of all women with hypoactive sexual desire disorder, particularly those among minorities. Third, spouses of the study participants were not interviewed because this would have reduced the number of women who would consent for participation in the study. Fourth, small sample size is another limitation that might have been effective on inability of finding some of the significant predictive parameters reported in the

literature. Finally, the cross-sectional study design did not allow for the separation of the potential causes from effects in relation to time.

In conclusion, our findings indicated that relationship satisfaction and social functioning might have mediated the relationship between physical functioning, physical role limitations, pain and FSFI. Given that Turkey is a sexually restricted society, physical functioning, physical role limitations, and pain might be lower order constructs than social functioning and relationship satisfaction in expressing difficulties in Turkish women. Hence, gynecologists might attempt to work with physical functioning and physical role limitations of patients to increase social functioning and relationship satisfaction and eventually improve female sexual functioning. Our findings also supported the utility of FSFI as a screening tool and potential instrument in diagnostic assessment. Future investigation is necessary to examine the association between female sexual function in postmenopausal women and various socioeconomic and psychological factors in order to provide a better QoL in these women.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344058
2018;21(3):429-437

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Received: 01/02/2018
Accepted: 04/06/2018

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RESEARCH

INTERGENERATIONAL SOLIDARITY AND LIFE SATISFACTION IN ELDERLY

ABSTRACT

Introduction: Intergenerational solidarity is defined as social cohesion between generations or intergenerational cohesion between parents and children once the children grow up and create their own families. This study investigates the effect of intergenerational solidarity on life satisfaction in parents of adults.

Materials and Method: The data were collected from parents of adults above 60 years of age. Participants in this study included 216 in parents of adults. The questionnaire used in this research consisted of 3 sections. The first section focussed on demographic information such as age, gender, marital status. In the second section, the Satisfaction With Life Scale (SWLS) developed by Diener et al was used to measure the parents' satisfaction with life. The third section comprised the two subscales given by Bengtson and Schrader in the Intergenerational Solidarity Scale: affectual and functional solidarity.

Results: The average for affectual solidarity dimensions was 54.08, the average of functional solidarity dimensions was 12.26, the average of the standardised intergenerational solidarity scale was 66.35 and the average of the Satisfaction With Life Scale was 21.62.

Conclusion: When the Satisfaction With Life Scale was compared with affectual solidarity in moderating a positive linear relationship, results were $r=0.401$, $p<0.01$. Between the Satisfaction With Life Scale and the standardised intergenerational solidarity average, a positive linear relationship was found to be insignificant ($r=0.368$, $p<0.01$).

Keywords: Aging; Intergenerational relations; Life; Personal satisfaction

ARAŞTIRMA

YAŞLILARDA KUŞAKLAR ARASI DAYANIŞMA VE YAŞAM TATMİNİ

Öz

Giriş: Kuşaklar arası dayanışma, nesiller arası sosyal açıdan bütünlük ya da çocukları büyüyüp kendi ailelerini oluşturmadan önce ebeveyn ile çocukları arasında kuşaklararası bütünlük olarak tanımlanmaktadır. Bu araştırmanın amacı yetişkin ebeveynlerde kuşaklar arasındaki dayanışmanın yaşam kalitesine etkilerini belirlemektir.

Gereç ve Yöntem: Araştırmanın verileri 60 yaş ve üstü yaşlı ebeveynlerden toplanmıştır ve 216 yaşlı ebeveyn bu araştırmaya katılmıştır. Araştırmada kullanılan soru formu 3 bölümden oluşmaktadır. Birinci bölümde, yaş, cinsiyet, evlilik statüsü gibi demografik bilgiler bulunmaktadır. 2. bölümde yetişkin ebeveynlerin yaşam tatminlerini ölçmek amacıyla Diener ve arkadaşları tarafından geliştirilen Yaşam Tatmini ölçeği bulunmaktadır. 3. Bölümde Bengtson ve Schrader'in Nesiller Arası Dayanışma Ölçeğinin iki alt boyutu kullanılmıştır; Duygusal ve Fonksiyonel Dayanışma.

Bulgular: Duygusal Dayanışma alt boyutunun ortalaması 54,08, Fonksiyonel Dayanışma alt boyutunun ortalaması 12,26, standardize edilmiş nesiller arası dayanışma ölçeğinin ortalaması 66,35, Yaşamdan Duyulan Tatmin ölçeğinin ortalaması ise 21,62 bulunmuştur.

Sonuç: "Yaşamdan Duyulan Tatmin" ölçeği ile "Duygusal Dayanışma" arasında orta düzeyde pozitif yönde doğrusal bir ilişki ($r:0,401$, $p<0,01$). "Yaşamdan Duyulan Tatmin" ölçeği ile "Standardize edilmiş nesiller arası dayanışma ortalamasının" arasında ise zayıf düzeyde pozitif yönde doğrusal bir ilişki bulunmuştur ($r:0,368$, $p<0,01$).

Anahtar sözcükler: Yaşlanma; Kuşaklar arası ilişkiler; Yaşam; Kişisel tatmin

INTRODUCTION

Average life expectancy has increased in all industrialised nations. These demographic change impacts families, rendering the lifetimes shared by parents and their children even more significant (1). Considering the consistent increase in the ageing populations and changes in family structures, norms and behaviours, the connection between intergenerational solidarity and the wellbeing of older parents takes on added significance (2).

Intergenerational solidarity can be described as intergenerational interactions in the family that represent sentiments, attitudes, and behaviors that bond family members across generations (3). Bengtson and Roberts (4) developed a conceptual framework for the study of inter-generational relations that is based on exchange theory: the 'inter-generational solidarity model'. It conceptualizes inter-generational family solidarity as a multi-dimensional phenomenon with six components associated with its structural, associational, affectual, consensual, functional and normative dimensions. Affectual solidarity which is one of the sub-dimensions of intergenerational solidarity is type and degree of positive sentiments (warmth, closeness, understanding, trust, respect, etc.) held about family members and ratings of perceived reciprocity in positive sentiments among family members (5). Functional solidarity which is another intergenerational solidarity dimension is concerned with the degree of intergenerational support and perception of reciprocity. Possible predictors of functional solidarity include affection, income, education, health status, family status, family size, birth order, and proximity (4).

Older parents and their adult children have significant roles in each other's lives. Since the 1940s, social gerontologists have focused on the association between intergenerational relations and older people's life satisfaction, happiness, morale and psychological well-being (6). In fact, life satisfaction is the situation or the result of comparison of expectations of a person (what one wants) and what one possesses (what one has). Therefore, many researchers are interested in examining the factors

influencing life satisfaction in older adults. The central goal for most people is obtaining a high level of life satisfaction, which refers to the subjective appraisal of one's life (7).

Intergenerational solidarity whether in the strict family context or in the broader societal context seems to be increasingly interesting nowadays. This justifies the application of the intergenerational solidarity model, the most important paradigm in social gerontology in the last three decades, to the study of the relationships between parents and emerging adults' children (8).

MATERIALS AND METHOD

This study analyses the impact of intergenerational solidarity on life satisfaction in parents of adult children. The data for this study were collected from elderly people aged over 60 who have adult children and who are willing to undertake research. After obtaining the necessary permits from the Ankara governor, elderly people's number and address were obtained from different neighborhood headmen in the Çankaya district in Ankara, Turkey and face-to-face interview was conducted with 216 elderly people. Type of the study is quantitative research study.

The questionnaire used in the research consists of 3 parts. In the first chapter demographic information such as age, gender, marital status working status and perceived health status of parents of adult children are available.

In the second section, The Satisfaction with Life Scale (SWLS) developed by Diener et al. (9) is used to measure adult children's satisfaction with life. Satisfaction with Life Scale (SWLS) consists of 5 items that represents satisfaction with life (Ranging from 1 to 7; 1 strongly disagree, 7 strongly agree). The translation and adaptation of the scale to Turkish was made by Koker (10) and the confidence coefficient of the scale was calculated to be .82. In this research, the Cronbach Alpha coefficient has also been measured as 0.86.

In the third section, two subscales of Bengtson and Schrader's Intergenerational Solidarity Scale (3) is used; Affectual and Functional Solidarity. In



this research, validity and reliability studies were carried out for the Positive Affect Index and the Intergenerational Functional Solidarity Scale. For both scales, firstly the content validity of the scales was determined, and then reliability calculations were made by factor analysis. The texts translated by the experts into Turkish, again with the expert opinion, was translated back to English with the Method of Back-translation the meaning shifts that could arise from the translation were removed. As a result, it has been accepted that your parallels are provided for translation.

The Affectual Solidarity: The Positive Affect Index (3) is used to measure the affectual solidarity or the family relations between older adults and adult children. The scale consists of 10 items concerning the degree of positive affect (understanding, fairness, trust, respect, and affection) toward and perceived by the other generation. In this study, older adults were asked if they felt they understood the referent child and if they felt the referent child understood them on a six-point scale (scale ranged from 1 to 6, "not well" to "extremely well"). Exploratory factor analysis was conducted to determine the construct validity. As a result of the analysis made, the value of KMO was determined as 0,669. The χ^2 value of the Bartlett test was 528,329 ($p < 0.001$, $sd = 10$). The total variance explained was determined as 58,389%. Lastly, the scale is consistent with the original scale. This scale is considered to be highly reliable with the 0.92 Cronbach Alpha (3). The reliability of the scale has also been measured as 0.912 in this study. The reliability results of this scale are highly reliable.

In the Intergenerational Functional Solidarity Scale that consists of 5 items, 4-point system is used to measure the scale of financial exchange (varies between 1-4 from "none" to "regularly") and 8-point system is used to measure the frequency of the support and gift exchange (varies between 1-8 from "almost never" to "almost all the time"). Exploratory factor analysis was conducted to determine the construct validity. As a result of the analysis made, the value of KMO was determined as 0,719. The χ^2 value of the Bartlett test was 338,329 ($p < 0.001$, $sd = 22$). The

total variance explained was determined as 60,252%. Lastly, the scale is consistent with the original scale. The study conducted by Coimbra and Mendonca (11) points out that the Cronbach Alpha coefficient is 0.85 for the support given to parents. The reliability of the scale has also been measured as 0.623 in this study.

The affectual and functional solidarity items were summarised and the total was used to measure intergenerational solidarity. For data analysis, the two dimensions of affectual and functional solidarity were treated as one construct measuring intergenerational solidarity. Therefore, the reliability of these two scales was recalculated after all the items had been standardized, with Cronbach's alphas of .798.

Possible differences between two independent groups were analyzed on the basis of an independent sample test; possible differences between more than two independent groups were analyzed using one-way analysis of variance. The Pearson Correlation coefficient was used to determine the degree of causal relationship between two continuous variables. Functional interdependence and solidarity-between-generations multiple linear regression analysis was performed to determine the influence of demographic variables on affectual solidarity.

Ethical consideration

Signed informed consent was obtained from all elderly. The ethics committee of university approved the study, which was conducted according to the Declaration of Helsinki. Scale was used after receiving permission from the authors.

RESULTS

Of the elderly parents surveyed, 47.7% were male and 52.3% were female, with 1.9% being single, 64.4% married and 33.8% widowed or divorced. While 25.5% worked full time and 0.5% worked part time, 47.7% were retired and 26.4% were not working. For geographical proximity, 16.2% lived with their children, 9.3% on the same street as their children, 13% in the same district within driving distance, 23.1% within the same city and 38.4% lived in different cities or countries (Table 1).

Table 1. Distribution of demographic characteristics.

Variable	n	%
Gender		
Male	103	47.7
Female	113	52.3
Age group		
60-65	75	34,7
66-71	57	26,4
72-77	34	15,7
78+	50	23,2
Marital status		
Single	4	1.9
Married	139	64.4
Divorced/Widowed	73	33.8
Work status		
Full time	55	25.5
Part time	1	0.5
Retired	103	47.7
Non-working	57	26.4
Number of children		
1-2	61	28,2
3+	155	71,8
Geographical proximity		
Same house	35	16.2
Same street	20	9.3
Same neighbourhood with car	28	13.0
Same city with car	50	23.1
Different city/country	83	38.4
Perceived health status		
Bad	18	8,3
Middle	96	44,4
Good-Excellent	102	47,3
Total	216	100.0



In this research founded that the average for affectual solidarity dimensions was 54.08, the average of functional solidarity dimensions was 12.26, the average of the intergenerational solidarity was 66.35 and the average of the SWLS was 21.62 (Table 2).

When the demographic factors affecting intergenerational solidarity are examined; while no statistically significant differences were found between elderly parents and their average gender, age, marital status, employment status, number of children, or perceived health status ($p > 0.05$) on the intergenerational solidarity scale, significant statistical differences were observed among elderly parents with respect to geographical proximity on the intergenerational solidarity scale ($p < 0.05$). The intergenerational solidarity average (74.11 ± 10.532) of parents living with adult children was significantly higher than that of parents living on the same street (66.15 ± 9.750), in the same neighbourhood (accessible by car) (64.39 ± 9.286) or in different cities or countries (62.48 ± 9.059). The intergenerational solidarity average of parents living in different cities or countries (62.48 ± 9.059) was significantly lower than that of parents living in the same town (accessible by vehicle) (68.54 ± 8.848). (Table 3)

In terms of demographic factors affectual solidarity; while no significant statistical differences were found between the affectual solidarity of elderly parents and gender, age, marital status, employment status, number of children, geographical proximity ($p > 0.05$), statistically significant differences were observed between the average perceived health status of elderly parents and affectual solidarity ($p < 0.05$), with the affectual solidarity average of elderly parents with good-excellent health (55.21 ± 7.403) being significantly higher than that of those with bad health (50.72 ± 7.756) (Table 3).

In this study while no differences were observed between the functional solidarity average of elderly parents and age, employment status, number of children and perceived health status ($p > 0.05$), a statistically significant difference was observed between functional solidarity and geographical proximity, gender, marital status ($p < 0.05$). In this study, the functional solidarity average of female parents (13.28 ± 5.171) is significantly higher than male parents (11.15 ± 5.216), single parents (13.29 ± 5.343) is higher than married parents (11.70 ± 5.193) and living in the same house or very close (19.37 ± 5.672) is higher than other living condition (Table 3).

Table 2. Summary of all scales.

Variable	N	M	sd
Affectual Solidarity (10–60)	216	54.08	7.78
Functional Solidarity (5–32)	216	12.26	5.28
Intergenerational Solidarity (Standardised Scales) (15–92)	216	66.35	10.15
Satisfaction with Life (5–35)	216	21.62	6.57

When the relationship between intergenerational solidarity (affectual, functional and intergenerational solidarity-standardised scale) and life satisfaction is analyzed by Pearson’s correlation, the SWLS was compared with affectual solidarity in moderating a positive linear relationship, results were $r = 0.401$,

$p < 0.01$. Between the SWLS and the intergenerational solidarity average, a positive linear relationship was found to be insignificant ($r = 0.368$, $p < 0.01$). However, no significant relationship was observed between the SWLS and functional solidarity ($r = 0.117$, $p > 0.05$). (Table 4).

Table 3. Differences between intergenerational solidarity and affectual solidarity- functional solidarity and demographic variables.

	Intergenerational solidarity (Standardised scales)			Affectual solidarity			Functional solidarity		
	mean±sd	p	Different	mean±sd	p	Different	mean±sd	p	Different
1.Gender									
Male	65.35±10.709	0.169	-	54.20±7.838	0.835	-	11.15±5.216	0.003 **	
Female	67.26± 9.579			53.98±7.774			13.28±5.171		
2.Age group									
60–65	67.91±10.260	0.393	-	54.66±7.565	0.837	-	13.25±5.700	0.193	-
66–71	65.38±10.761			53.42±8.413			11.96±5.351		
72–77	66.41±10.213			54.23±6.919			12.17±5.078		
78 +	65.13±9.219			53.90±8.080			11.23±4.593		
3.Marital status									
Single	67.36±10.665	0.279	-	54.08±8.085	0.989	-	13.29±5.343	0.035*	
Married	65.80± 9.857			54.09±7.648			11.70±5.193		
4.Work status									
Full time	64.78±10.829	0.439	-	53.25±7.972	0.652	-	11.52±4.932	0.402	-
Retired	66.87±10.252			54.16± 7.894			12.70±5.652		
Not working	66.70± 9.221			54.58± 7.440			12.12±4.957		
5.Number of children									
1–2	66.73 ±11.578	0.730	-	53.39 ±8.252	0.412	-	13.34 ±5.935	0.061	-
3 +	66.20 ±9.574			54.36 ±7.607			11.84 ±4.968		
6. Geographical proximity									
Same house	74.11± 10.532	0.000**	1-2.3.5 5-4	54.74± 7.841	0.338	-	19.37±5.672	0.000 **	1-2.3.4.5 5-4
Same street	66.15± 9.750			54.150±7.527			12.00±4.679		
Same neighborhood with car	64.39± 9.286			53.214±7.345			11.17±3.507		
Same city with car	68.54± 8.848			55.82±8.011			12.72±3.769		
Different city/ country	62.48± 9.059			53.04±7.803			9.43±3.489		
7. Perceived health status									
Bad	62.33±10.742	0.086	-	50.72 ±8.756	0.049*	1–3	11.61±4.876	0.207	-
Middle	65.71±9.989			53.52 ±7.837			12.19±4.945		
Good/ Excellent	67.66±10.062			55.21 ±7.403			12.45±5.694		

*:p<0.05 **p < 0.01



Table 4. Analysis of the relationship between intergenerational solidarity and affectual solidarity-functional solidarity and life satisfaction (Pearson correlation) .

		Affectual solidarity	Functional solidarity	Intergenerational solidarity (Standardised scales)
Satisfaction with life	R	0.401	0.117	0.368
	P	0.000**	0.086	0.000**

*:p<0.05 **p < 0.01

DISCUSSION

It was found that the average level of affectual solidarity of elderly parents was high and that the average of intergenerational solidarity and life satisfaction was moderate and that of functional solidarity was lower.

Bengtson (2) has stated that the older generation is more affectual solidarity than the younger generation. In the study conducted by Hazer, Ozturk and Gursoy (12) on adult children, they found that the averages of the affectual solidarity of the elderly (54.08 ± 7.78) were higher than the younger ones (49.30 ± 7.23).

Researches differs on the question of which side benefits more from the exchange relations (functional solidarity). Some studies highlight the benefit to the adult children (13), while others accentuate the contribution made to elder parents (14). When the results of the research on adult children by Hazer, Ozturk and Gursoy (12) are compared with the results of this study; adult children (14.42 ± 5.58) were found to have higher functional solidarity than older parents (12.26 ± 5.28).

Previous studies reported inconsistent associations between subjective well-being, life satisfaction and age. Larson (15), reported subjective well-being (life satisfaction) declines with advancing age; however, Diener, Suh, Lucas and Smith (16) found the levels of life satisfaction were similar across different age groups despite the decline in other resources such as income and becoming widowed. When the factors of health and demographic characteristics such as financial

resources, widowhood, and loss of friends were controlled, the associations between subjective well-being and age became not significant. When the findings obtained from this study were compared with those of Hazer, Ozturk and Gursoy's study (12) on adult children, the life satisfaction levels of adult children (22.56 ± 6.56) were almost similar to the elderly adults (21.62 ± 6.57).

When the demographic factors affecting intergenerational solidarity are examined; significant statistical differences were observed among elderly parents with respect to geographical proximity on the intergenerational solidarity scale in this research.

Many studies have pointed to geographical distance as an important determinant of intergenerational support: living nearby increases the amount of mutual support provided (17). These studies introduced geographic proximity as an independent variable, or as an explanation of the level of intergenerational support. Geographic proximity can be considered a dimension of intergenerational solidarity in its own right as well. The proximity of family members can play a key role in this decision making process. For example, couples with young children may choose to live closer to their parents in order to take advantage of a potential source of low-cost childcare (18). Also in this research our analysis shows that geographical proximity is the determinant of intergenerational solidarity.

In this research, results show that the most important factor affectual solidarity is the perceived

health status. As the health status of the elderly parent improves, affectual solidarity increases. The impaired health is can lead to a decline in quality of life and good living conditions, so the level of affectual solidarity may be reduced. In addition; some sick and weak elderly adults need a lot of support. This may cause them to feel addicted and lose their autonomy or control. This gives the impression that it may lead to a decrease in affectual solidarity with each other.

In this study, the functional solidarity average of female parents is significantly higher than male parents, single parents is higher than married parents and living in the same house or very close is higher than other living condition. Other research results also support this situation.

It was found that mothers receive more help from their children than father and family status was found to be associated with intergenerational exchange patterns (19). Married parents tend to provide greater help to their children than widowed and divorced parents, while the latter tend to receive more help from their children (5).

Silverstein and Litwak (19) found that living in shared households or nearby places is the predecessor of functional solidarity. The studies suggest that proximity can be used as an adaptive strategy: e.g., working adult children in France receive more help with childcare because of their greater proximity to their mothers. Having a greater care need may have triggered this choice of residence. Similarly, single parents with no partner to rely on tend to live closer to their mothers, and therefore receive more help.

Research findings by Knijn ve Liefbroer (17) showed that single parents received more help, again because they tended to live closer to their mothers.

When the relationship between life satisfaction and intergenerational solidarity and two sub-dimensions is examined, it was founded that there was a positive relationship between SWLS scale and

affectual solidarity and intergenerational solidarity, but there was no significant relationship between SWLS scale and functional solidarity.

Mancini and Blieszner (6) suggested higher levels of affectual solidarity determine the intergenerational relationship quality and older adults' and adult children's life satisfaction. This finding is consistent with other studies, which suggested better relationship quality between older adults and adult children was associated with better life satisfaction in both generations. These results also support our research findings.

Although functional solidarity positively affects wellbeing, the role played by emerging adults seems to influence this process. The level of support provided by adult children, their value, the level of maturity and the quality of relationship with both parents, adult children's work status, the health status of the parents and the size of care networks are influential on life (3). However, research on intergenerational support (functional solidarity) has indicated that it does not necessarily enhance the psychological wellbeing and life satisfaction of the elder generation, and sometimes even reduces it. Negative effects of intergenerational solidarity are found in several studies. High family solidarity creates heavy demands on families of low economic status. An unbalanced resource exchange seems to reduce satisfaction with life, as well as filial maturity and satisfaction with the relationship. There was no correlation between life satisfaction and functional solidarity in this study (4).

In conclusion; scientific studies in this area have primarily identified the conditions required for older people to become more active in society, recommending that a balance should be sustained between welfare state practices and intergenerational solidarity networks to institutionalise intergenerational solidarity. Without such support, the entire burden of elder care may fall on the family. In line with that, time and amount of intergenerational communication decreased.



Unfortunately, decreasing intergenerational interaction increases conflicting values in the society. To protect and sustain our social values, it is important to increase the number of studies that strengthen intergenerational relations, facilitate transfers, and gather older individuals with younger individuals as well as young individuals with children.

This study has some limitations. First, it assumes the perspective of parents of adult children. Thus,

the research should be repeated with a broader sample and in areas of varying socioeconomic levels. Similarly, repeating the study with different cultures and comparing the findings will provide useful results.

Conflict of interest

The authors declare that they have no conflict of interest.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344059
2018;21(3):438-445

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Received: 08/05/2018
Accepted: 22/07/2018

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Presented at the 11th Academic
Geriatric Congress.

RESEARCH

A STUDY ON EFFICACY OF HYDRATION ADMINISTERED BY SUBCUTANEOUS INFUSION IN GERIATRIC PATIENTS

ABSTRACT

Introduction: The study was conducted to investigate the effectiveness of subcutaneous infusion (Hypodermoclysis) in geriatric patients with mild and moderate dehydration.

Materials and Method: This randomized controlled study to determine the efficacy of hypodermoclysis in hydration in a private geriatric care unit included 30 patients, who received both experimental and control administration. Control administration included three intravenous infusions, whereas experimental administration included three subcutan infusions.

Results: Rates of redness, bleeding and agitation were significantly higher at the administration site with intravenous infusion than with subcutan infusion method ($p<0.01$). By subcutan infusion, development rate of edema was significantly lower after the first administration; no edema was observed in the second and third administration. There was a statistically significant difference in the number as well as the duration and insertion times of the catheters used between the two infusion methods ($p=0.001$).

Conclusion: The findings revealed that hypodermoclysis was more effective than intravenous infusion based on the laboratory findings, incidence of side effects, amount and cost of consumables and catheter insertion and duration times. Therefore, hypodermoclysis can be used in mild and moderately dehydrated geriatric patients who need parenteral support.

Keywords: Nursing; Hypodermoclysis; Geriatrics; Fluid therapy

ARAŞTIRMA

GERİATRİK HASTALARDA SUBKUTAN İNFÜZYONLA YAPILAN HİDRASYONUN ETKİNLİĞİNE İLİŞKİN BİR ÇALIŞMA

Öz

Giriş: Çalışma hafif ve orta dehidratasyonu olan geriatric hastalarda subkutan infüzyon (Hypodermoclysis) uygulamasının etkinliğini incelemek amacıyla yapıldı.

Gereç ve Yöntem: Deneysel ve randomize kontrollü olarak yürütülen araştırma özel bir geriatric bakım ünitesinde yapıldı. Örneklem 30 hastadan oluştu. Deney ve kontrol uygulamaları aynı hastalar üzerinde gerçekleştirildi. Kontrol uygulamalarında intravenöz yolla üç hidrasyon uygulaması, deney uygulamalarda ise subkutan yolla üç infüzyon uygulaması yapıldı.

Bulgular: Intravenöz yolla yolla infüzyon uygulanan hastaların uygulama alanında kızarıklık, kanama ve ajitasyon görülme oranlarının subkutan infüzyon yönteminden anlamlı düzeyde daha fazla olduğu ($p<0.01$) saptandı. Subkutan infüzyon infüzyon uygulamalarında birinci uygulamada çok düşük oranda ödem gelişti; ikinci ve üçüncü uygulamada ise hiç oluşmadığı görüldü. Intravenöz infüzyon yöntemine göre subkutan infüzyonda kullanılan intraket sayı ve takılış sürelerinin daha az, katater kalış sürelerinin ise daha uzun olduğu belirlendi ($p=0.001$).

Sonuç: Laboratuvar bulguları, yan etki görülme oranları, sarf malzeme miktarı, maliyet, kateter takılış ve kateterin kalış süresi açısından değerlendirildiğinde subkutan infüzyonun intravenöz infüzyona göre daha etkin olduğu; bu nedenle parenteral olarak desteklenmesi gereken hafif ve orta dehidratasyonlu geriatric hastalarda, subkutan infüzyon uygulamasının kullanılabilir olduğu sonucuna varıldı.

Anahtar sözcükler: Hemşirelik; Hipodermokliz; Geriatri; Sıvı tedavisi



INTRODUCTION

Dehydration is one of the health problems with high morbidity and mortality rates in elderly individuals. Behavioral and physiological mechanisms responsible for body fluid and sodium homeostasis are impaired in aging (1). Natural aging causes a decrease in the intracellular fluid, along with a reduction in total body fluid, renal capacity and decreased thirst sensation. In the presence of these changes along with mental problems, even the intake of minimum amount of fluids can pose a serious health challenge (2,3). Intravenous (IV) route is the only option for treatment of dehydration in patients (refusing to take fluid by oral route, or difficulty in swallowing etc.) when fluid support is not possible by the oral route. However, in older patients, challenges such as finding vascular access, fragility of veins, pulling off the vascular access by patients, infiltration and phlebitis are some of the problems associated with IV infusion for both the patient and the nurse. Conversely, because monitoring, care and chronic disease management of elderly patients are performed at geriatric care centres and homes of the patient outside the hospital, IV treatment is a serious burden and a challenge that requires qualified staff and is costly. The prevalence of dehydration in older patients, high cost and side effects associated with IV infusions have led to a search for a more convenient, faster, more reliable and cost-effective method. Hypodermoclysis (HDC) is subcutaneous (SC) infusion method that was initially introduced 150 years ago (4). HDC is described as SC administration of isotonic fluids and other solutions, which can be effective in the management of dehydration, one of the most important problems of aging populations (5). HDC is based on the principle that fluids are absorbed from SC tissue into the circulatory system through diffusion and perfusion. In the literature, HDC was first mentioned in 1865 as treatment of dehydration in patients with high cholesterol. Since then,

HDC has been used for hydration of infants, children, adults and elderly people, especially those with difficult vascular access (4,6,7). Despite the long-term awareness of HDC for over a century, it has not attracted the necessary attention due to insufficient scientific studies and, accordingly, lack of knowledge and experience of nurses; therefore, HDC has not been included in educational programs in a widespread manner. However, HDC can be easily implemented by healthcare staff with minimal training and can be utilized as an efficient method for management of dehydration (4). As studies comparing the efficacy and cost of HDC with IV infusion are lacking, we conducted a randomized controlled study to evaluate the comfort and convenience of HDC in elderly dehydrated patients.

MATERIALS AND METHOD

Design and samples

This randomized controlled study was conducted to examine the efficacy of HDC in geriatric patients with mild and moderate dehydration. This study was conducted at a 41-bed private long-stay geriatric care unit in Istanbul, Turkey and included 30 geriatric individuals fulfilling the following inclusion criteria: age, over 65 years; daily fluid intake, less than 1000 ml; mild-moderate dehydration or elevated risk of dehydration; insufficient fluid intake despite lack of difficulty in swallowing; requirement of parenteral fluid support due to insufficient oral/enteral fluid intake; presence of symptoms of dehydration including dryness of skin, clouding of consciousness, dark urine, scented urine, weakness, loss of appetite, state of sleep and elevated creatinine and sodium levels. Patients with infection, acute dehydration and/or skin problems and edema and those receiving IV medication administration or total parenteral nutrition were not included in the study.

Instruments

Patient identification form had two components: introductory characteristics and questionnaire on health/disease conditions. Specifically, this form collected information on health/disease status such as demographic information and existing diseases, personal history and family history, measurement of arm-calf circumference, nutritional status, diet, fluid intake, urine output, stool output and movement.

Administration monitoring form had several sections. One section collected data on edema, redness, bleeding and agitation that could develop during or after infusion practices. Another section collected information on the use of consumables. In addition, before and after the procedure, data on urine density, pH values and vital signs with duration of the process and number and duration of used materials were collected.

Procedure

Control (IV infusion) and experimental (SC infusion) administration were administered to the same patient. As required by the hydration protocol of the institution that included hydration administration for those with a daily fluid intake of less than 1000 ml and no signs of dehydration, a randomized drawing method was used to determine the order in which the IV method and HDC would be initially used for patients who required hydration therapy. According to the drawing method, patients were divided into two groups of 15 at the start of administration. Therefore, the order of administration methods was predetermined. In this study, three experimental administration and three control administration were performed on the same patient. Thus, 90 experimental and 90 control administration were applied to the sample group included 30 geriatric individuals. Patients who started with IV infusion were initially hydrated with three consecutive IV infusions and were then hydrated with three SC

infusions, which were performed with 21–23-gauge SC infusion butterfly needles. For each administration, 1000 ml of 0.9% saline solution was used after prescription by doctor. Administration rate was 125 ml/hour for SC infusions. All parameters were measured again at the end of the administration. All administrations were performed on abdomen by the researcher, whereas the side effects were evaluated by a nurse, who came from a different institution, which connected of the institution.

Statistical analysis

Data were evaluated by a biostatistician, and IBM SPSS Statistics v. 22 software was used for all statistical analyses. Data were evaluated with descriptive statistical methods as well as the Wilcoxon's signed-rank and McNemar's tests.

Ethical approval

Institutional permission and approval was obtained from Acibadem University Ethics Board before the start of the study (date, 25.02.2016; decree no: 2016-3/30). For all patients included in the study, consent of the patient and/or legal guardian was requested with the informed volunteer consent form for their voluntary approval to participate in the study.

RESULTS

These patients have Alzheimer's or other types of dementia. Nutrition and dependency status characteristics of all patients are shown in Table 1. 90% of the patients were female, with ages ranging from 65 to 94 years (mean, 81.97±8.81 years). In addition, 66.7% of the patients were dependent for nutritional support, and 60% were dependent for fluid intake support. Only 56.7% of the study cohort were fed orally, and 66.7% of the patients were bed-bound.



Assessment of the incidence rates of side effects according to the infusion route (Table 2) revealed that the rates of redness and agitation were significantly higher with the IV infusion than with the SC infusion ($p < 0.01$). After the first administration, redness was observed in ninety percent of the patients who received IV infusion and 23.3% of the patients who received SC infusion, which were significantly different ($p < 0.01$). In patients who received hydration therapy with IV infusion, the rates of edema were 20%, 26.7% and 20% in the first, second and third administration, respectively. With HDC, edema occurred only in 20% of the patients during the first administration (Table 2). In patients who received hydration therapy with IV infusion, the rates

of bleeding were 86.7%, 63.3% and 70% in the first, second and third administration, respectively, due to leakage or catheter displacement by the patient. However, the rate of bleeding with HDC was below 20%, and the difference between the two groups was significant ($p < 0.001$).

Assessment of all three administration revealed that there were significant differences in the number of catheters used and catheter duration and insertion times between the two methods ($p = 0.001$). The number of catheters used was lower in HDC compared to IV infusion. The time spent for catheter insertion and duration times were shorter in HDC than IV infusion (Table 3).

Table 1. Patients' demographic and health condition characteristics (n=30).

Characteristics	Groups	n	%
Gender	Female	27	90.0
	Male	3	10.0
Status of dependency for nutrition	Independent	7	23.3
	With help	3	10.0
	Dependent	20	66.7
Nutrition route	Oral	17	56.7
	Enteral	13	43.3
Fluid intake	Independent	8	26.7
	With help	4	13.3
	Dependent	18	60.0
Mobility status	With help	10	33.3
	Bedbound.	20	66.7
Age (mean±sd)	81.97±8.81		

Table 2. Frequency of side effects according to route of infusion.

Side effect conditions		n (%)	IV	SC	p
			n (%)		
Edema in the Infusion Area	1 th administration		6 (20.0)	4 (13.3)	0.754
	2 nd administration		8 (26.7)	- (-)	
	3 th administration		6 (20.0)	- (-)	
	Total		20 (22.2)	4 (4.4)	0.002
Redness in the Region	1 th administration		27 (90.0)	7 (23.3)	0.001
	2 nd administration		19 (63.3)	15 (50.0)	0.481
	3 th administration		21 (70.0)	14 (46.7)	0.143
	Total		67 (74.4)	36 (40.0)	0.001
Bleeding	1 th administration		26 (86.7)	6 (20.0)	0.001
	2 nd administration		19 (63.3)	2 (6.7)	0.001
	3 th administration		21 (70.0)	3 (10.0)	0.001
	Total		66 (73.3)	11 (12.2)	0.001
Agitation	1 th administration		24 (80.0)	2 (6.7)	0.001
	2 nd administration		22 (73.3)	5 (16.7)	0.001
	3 th administration		22 (73.3)	3 (10.0)	0.001
	Total		68 (75.6)	10 (11.1)	0.001

McNemar Test $p < 0.01$

Table 3. Evaluation of consumed time and material according to hydration method.

		mean±sd (median)	IV	SC	p
			mean±sd (median)		
Number of catheters	1 th administration		2.033±0.96	1.20±0.41	0.001
	2 nd administration		2.033±1.00	1.07±0.25	0.001
	3 th administration		2.67±3.42	1.10±0.31	0.001
	Total		2.04±0.97	1.12±0.33	0.001
Catheter duration time (hour)	1 th administration		18.27±15.85	39.20±12.97	0.001
	2 nd administration		12.83±11.52	24.87±11.69	0.001
	3 th administration		14.03±10.70	33.07±12.60	0.001
	Total		15.04±12.96	32.38±13.63	0.001
Time spend for catheter insertion (minute)	1 th administration		5.83±2.61	1.90±0.31	0.001
	2 nd administration		4.77±3.39	1.47±0.51	0.001
	3 th administration		5.82±4.50	1.60±0.50	0.001
	Total		5.47±3.58	1.66±0.48	0.001

Wilcoxon Signed Ranks Test $p < 0.01$



DISCUSSION

Many comorbidities such as Alzheimer's disease, diabetes, hip fractures, heart disease, depression and the presence of four or more chronic diseases are risk factors associated with the disease which cause the elderly to be vulnerable to dehydration (8,9). In addition, medications for the treatment of these diseases may increase the risk of dehydration by disrupting the sensitive fluid and electrolyte balance in this population (2). The mean age of geriatric patients participating in the present study was 81.97 ± 8.81 years (Table 1). In a study of residents in a nursing home associated with the Alzheimer's Foundation, the rates of Alzheimer's disease, diabetes, hip fractures, heart diseases, major depression and ≥ 4 chronic diseases were 63.3%, 23.3%, 10%, 3.3%, 3.3% and 13.3%, respectively. The characteristics of the sample reflect the appropriateness of the study group. Importantly, unlike younger residents, dehydration is more complex and dangerous in elderly individuals due to widespread dementia and other mental problems; thus, approaches for prevention and treatment of dehydration in geriatric patients are important (3). The most common potential local side effects of SC infusion are edema, redness, pain and ecchymosis (5, 10-12). In HDC, redness, which is the leading cause of inflammation and a symptom of infection, is very limited (5,12,13); edema disappears within a few hours after the termination of infusion; pain is very rare and may occur due to penetration of needle into the muscle or due to tension caused by a large fluid volume. Regarding bleeding, there is minimal risk of puncturing a blood vessel, and bleeding is rare in patients with normal coagulation (4,14). In the current study that investigated the efficacy of HDC for hydration treatment of geriatric patients, IV and SC infusion approaches, which revealed that side effects were significantly fewer with HDC (Table 2). Subcutaneous infusion causes similar but fewer metabolic and hormonal changes compared to IV infusion (15). In a study by Remington and Hultman (2007) which HDC and IV infusion practices were reviewed, HDC was

associated with comparable or lower complication rates compared to the IV infusion (2). In the literature, there are also other study findings indicating that subcutaneous infusion is similar to intravenous infusion in terms of side effects (6,16-18). Dasgupta *et al.* reported that fluid treatment-related complications were observed less with HDC, which was an effective and safer approach for both chronic care associated with mild-moderate dehydration and acutely developing conditions, and that HDC could prevent referral of patients to the hospital for rehydration (10). Even in a study on nutrition of elderly inpatients with SC infusion, the rate of major local side effects was lower than that observed with IV infusion (7). The same study also emphasized that SC infusion was tolerated better.

Edema caused by a leakage in the infusion area due to disconnection of catheter outside the vein is one of the most common complications of IV infusion. Edema due to IV infusion is more common in elderly patients and those incontinent with the treatment. However, the rate of edema is very low or absent with HDC (4). In adults, two litres of fluid can be administered in 24 hours without edema using HDC (19). In the current study, the rate of edema at the site of infusion area in HDC was statistically lower, and no edema was observed in the second and third administration with HDC (Table 2). The absence of edema indicated that fluid was absorbed in a sufficient time and that the patient benefited from HDC.

In IV infusion practices, another common complication in the catheter area is redness. It is rarely seen in HDC (19). In the current study, the incidence of redness with HDC was significantly lower in the first administration compared with the IV infusion; although this difference was not statistically significant in the second and third administration, it was still lower compared to the IV infusion (Table 2). This finding is in agreement with other studies (4,10-14).

Albeit rare, bleeding is possible in SC infusion. During or after the IV infusion, agitated or confused

patients can aggravate bleeding due to dislodgement/dislocation of the needle by pulling on the infusion set (4). Bleeding, which is sometimes caused by pulling out the set in order to directly terminate the IV administration, is more common in with IV infusion. The lower incidence of bleeding in the current study reflects the superiority of SC infusion for patient safety and comfort. Bleeding was observed in the infusion area in 2.5% of patients who were administered HDC in a study by Yap *et al.* (20). In the current study, bleeding occurred in the form of ecchymosis with SC infusion. However, comparison of the infusion methods revealed that the rate bleeding/ecchymosis with HDC was significantly lower than that observed with the IV infusion in all three administration (Table 2). Additionally, the fasteners used to complete IV administration without interruption can cause more agitation in the patient. In the current study, the rate of agitation, which was very high with the IV infusion, was significantly lower with HDC when all administrations were assessed (Table 2).

For all patients, but especially in geriatric patients, those in palliative care and oncology patients, IV catheter insertion is a difficult and painful procedure. This is a challenging situation for the nurse because of the pain and uneasiness of the patient and stress caused by loss of time and negativity. Therefore, choosing an appropriate method can eliminate many problems for both the patient and the nurse. SC infusion provides several advantages over infusion via the IV route. In the current study, there were significant differences in catheter insertion and duration times between the two methods (Table 3). Catheters were inserted via the SC route in less than half the time it took for IV insertion, which can enhance the comfort of the patient compared with the IV infusion and positively affect the nursing labour force. With SC infusion, catheter

duration time is approximately 2–2.5 times the time with IV infusion, which is suitable for providing a longer duration of hydration. Previous studies reported similar results on the efficacy of HDC. In a study of Slesak *et al.*, HDC was superior to IV infusion in patients who were confused and in whom finding an IV vascular access was difficult (18). Remington and Hultman stated that nurses saved time to initiate and maintain due to higher patient comfort, whereas Walsh indicated that HDC was an easier and safer alternative to IV infusion for elderly patients who needed long-term care (2,21).

In the current study, the number of catheters used in IV infusion was significantly higher than that used in the SC infusion (Table 3, $p < 0.001$). Catheter cost was also lower with HDC than IV infusion. These findings are also important for healthcare policies in the search for effective, safe and affordable approaches. Similar results demonstrating that HDC might be more affordable were also reported by numerous studies (2,6,13,19-21).

In the current study, edema was not observed, and the incidence rates of side effects such as redness, bleeding and agitation were lower with HDC compared to IV infusion.

In conclusion; in order for the method used to be considered effective, it must be superior in many ways for both the patient and the practitioner, as well as being beneficial and not damaging. Overall, HDC was more suitable in cost and ease of administration according to IV hydration. Patients are less agitated; the risk of infection is low, the application period and the material used are advantageous. These findings lend support to HDC as an easier, cheaper and more cost-effective method for treatment of mild and moderate dehydration in geriatric patients.



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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344060
2018;21(3):446-455

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Received: 31/10/2017
Accepted: 06/06/2018

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RESEARCH

ATTITUDES TOWARD THE OLDER PERSONS AND AGEISM ATTITUDES OF HEALTHCARE ASSISTANTS WORKING IN NURSING HOMES

ABSTRACT

Introduction: Rapid increase in the older persons population and accompanying sociodemographic changes result in family caregiving problems, thereby impelling the older persons and their family to opt for nursing care institutions. Because of insufficient nurses working in nursing homes, healthcare assistants usually care for the older persons. This study assessed the attitudes of healthcare assistants toward the older persons and ageism.

Materials and Method: This descriptive study assessed the attitudes of 108 healthcare assistants working in a public nursing home using Kogan's Attitudes Toward Older People (KAOP) scale and Ageism Attitude Scale (AAS).

Results: The mean age of the 108 healthcare assistants was 40.1 ± 7.7 years. These individuals are 58.3% male, 85% are married and 62% are primary school graduates. The mean duration of employment of the participants at the nursing home was 80.1 ± 56.9 months, and 91.7% had caregiving certificates. Participants had positive attitudes based on their total KAOP and AAS scores and sub-dimension AAS scores. KAOP scores varied according to sex and living with an older persons from the family, whereas AAS scores varied according to sex, income status, living with an older persons from the family, considering training for senior care a necessity, and educational background. According to hierarchical regression analysis for determining the variability of the total AAS score, Model 1 (sociodemographic variables) predicted 25.6% and Model 2 (sociodemographic, caregiving certificate, duration of employment) predicted 28.4% of the AAS scores.

Conclusion: Attitudes of healthcare assistants toward the older persons and ageism are positive. Educational background, gender, and income level are predictive variables for ageism.

Keywords: Nursing home; Attitude; Aged; Ageism

ARAŞTIRMA

HUZUREVİNDE ÇALIŞAN BAKIM PERSONELİNİN YAŞLILARA KARŞI TUTUM VE AYRIMCILIK DÜZEYLERİ

Öz

Giriş: Yaşlı nüfusun artışı ve buna eşlik eden sosyo-demografik değişimler, ailede bakım sorunlarının yaşanmasına ve kurum bakımının yaşlı birey ve aileleri tarafından tercih edilmesine neden olmaktadır. Yaşlı için ilk kez karşılaştığı bir ortam olan huzurevinde bakım personelinin yaşlılara ve yaşlı ayrımcılığına karşı tutumları yaşlının kurum bakımına uyumu açısından önemlidir. Huzurevlerinde çalışan hemşire sayısının yetersizliği nedeniyle yaşlı bakımı bakım personeli yürütmektedir. Bu çalışma bakım personelinin yaşlılara ve yaşlı ayrımcılığına ilişkin tutumlarını belirlemek amacıyla yapılmıştır.

Gereç ve Yöntem: Kamuya ait bir huzurevinde çalışan 108 bakım personelinin yaşlılara ve yaşlı ayrımcılığına yönelik tutumlarını belirlemek amacıyla yaşlılara karşı tutum ve yaşlı ayrımcılığı ölçekleri kullanılarak yapılan tanımlayıcı bir araştırmadır.

Bulgular: Araştırmaya katılan bakım personelinin yaş ortalaması 40.1 ± 7.7 olarak bulunmuştur. Bu bireylerin %58.3'ü erkek, %85'i evli, %62'si ilköğretim mezunudur. Bakım personelinin huzurevinde çalışma süre ortalaması 80.1 ± 56.9 aydır ve %91.7'sinin yaşlı bakım sertifikası vardır. Katılımcıların yaşlılara karşı tutum, yaşlı ayrımcılığı ölçekleri ve alt boyutlarından alınan puanlara göre tutumlarının olumlu olduğu bulunmuştur. Yaşlılara karşı tutum ve yaşlı ayrımcılığı ölçekleri puanları cinsiyet, gelir durumu, aileden bir yaşlı ile yaşama durumu, yaşlı ayrımcılığı ölçeği puanları cinsiyet, gelir durumu, aileden bir yaşlı ile yaşama, yaşlı bakımı eğitiminin gerekliliğini düşünme ve eğitim durumuna göre farklılaşmaktadır. Hiyerarşik regresyon analizi sonuçlarına göre; yaşlı ayrımcılığı ölçek toplam puanının değişkenliğinin belirlenmesinde Model 1'in (sosyodemografik değişkenler) % 25.6 ve Model 2'nin (sosyodemografik, bakım sertifikası ve çalışma süresi değişkenleri) % 28.4 yordayıcı olduğu bulunmuştur.

Sonuç: Sonuç olarak bakım personelinin yaşlılara ve yaşlı ayrımcılığına yönelik tutumları olumlu yöndedir. Ayrımcılık değişkeni için cinsiyet, eğitim ve gelir düzeyi yordayıcı değişkenlerdendir.

Anahtar sözcükler: Huzurevi; Tutum; Yaşlı; Yaşlı ayrımcılığı



INTRODUCTION

Current trends in demographic indicators reveal that the older persons population will increase both worldwide and in Turkey (1,2). The increase in the older persons population and accompanying sociodemographic changes result in family caregiving problems, which in turn impel the older persons and their family to opt for nursing care institutions (2). In Europe, healthcare services for the older persons are classified as institutional care, home care, and day care (3). In Turkey, healthcare services for the older persons are provided by nursing homes, nursing and rehabilitation centers, home care services, and 41 retirement homes that operate within the scope of the retirement home project (4). Because of insufficient nurses working in nursing homes, healthcare assistants usually care for the older persons. Healthcare assistants, as a professional group, are defined as assistive personnel for the older persons and individuals with disabilities; they are responsible for preliminary preparing older persons care, providing personal hygiene to individuals receiving the service, organizing living space, ensuring adequate and balanced nutrition, fostering mobilization and active participation of an individual in daily activities, and supporting healthcare personnel with the treatment process (5).

Nursing homes are places that the older persons encounter for the first time and in which they have to live with people coming from different cultures and backgrounds. Thus, the attitudes of nursing staff toward the older persons and ageism are crucial factors for the adaptation of older persons to nursing care institutions (6). Providing care to the older persons may negatively influence attitudes toward them because of the complicated nature of multiple diseases. In addition, age-old stereotypes of the older persons negatively affect attitudes toward the older persons. Negative attitudes toward the older persons arise from the lack of knowledge regarding the aging process and gerontology (7). Adequate knowledge and clinical experience on senility mitigates negative attitudes toward the older persons and prompts the development of positive attitudes concerning care for the older persons (8).

In the literature, age (9), sex (10), marital status (11), family type (12), educational level (13), and professional conditions positively, negatively, and neutrally affect attitudes toward the older persons.

Attitudes toward the older persons and those toward ageism would affect the care provided to the older persons. We think that the results of this study will be utilized especially in the hiring and supervision of healthcare assistants in the prevention of abuse and neglect towards older persons. This study aimed to investigate the attitudes toward the older persons and those toward ageism and to assess the association between these attitudes and sociodemographic and occupational characteristics. In addition, we believe that this study will contribute in improving the care provided to the older persons.

MATERIALS AND METHOD

Design and sample

This descriptive study included all 108 healthcare assistants working in a public nursing home rather than sampling and aimed to cover the entire research population. Complete count sampling methods used for sample recruitment (14). Criteria for inclusion in research is to be healthcare assistants working in a nursing home.

Ethical consideration

The Ethics Committee of Research on Non-Medicine and Non-Medical Devices (Approval no. 2016/486) and Ministry of Family and Social Policies, Department of Education and Publication approved the study. In addition, we obtained informed consent from all healthcare assistants who participated in the study.

Data collection method and instruments

The data were collected with using sociodemographic questionnaire, Kogan's attitudes toward older people, ageism attitude scale by first researcher between March-April 2016 in nursing home. The data collection phase was carried out in the nursing home and the elderly care personnel working at 7:00 am to 15:00 pm and 15:00 pm to 19:00 pm.

23:00 pm were informed by the researcher based on their own expression under supervision.

Sociodemographic questionnaire

The sociodemographic and occupational characteristics questionnaire that was constructed in line with a literature review (2,10,12,15) comprised 16 questions regarding parameters such as age, sex, educational status, marital status, family type, perceived income level, living with an older persons, duration of employment as a healthcare assistant for the older persons, job satisfaction with working in a nursing home, problems encountered when working as a healthcare assistant for the older persons, and having a senior care certification.

Kogan's Attitudes Toward Older People

Kogan's Attitudes Toward Older People (KAOP) scale, which was developed by Nathan Kogan in 1961, measures individuals' attitudes toward the older persons. The scale is used to determine the attitudes of healthcare professionals and societal attitudes toward the older persons. The scale comprises 34 social items that avoids medical terms and is scored using a 6-point Likert-type scale (16). In this study, we used the version adapted by Kılıç and Adibelli (2011) (17), which was tested for its validity and reliability in the Turkish population. The scale was reduced to 26 items, with 13 positive and 13 negative statements in compliance with the validity test; Cronbach's alpha was calculated to be 0.82. The lowest total score that could be achieved was 26 and the highest score was 156 for items numbered 1–26 (17). Higher scores indicated positive attitudes toward the older persons (16). For this study, Cronbach's alpha was calculated to be 0.60.

Ageism Attitude Scale

Ageism Attitude Scale (AAS) was developed by Vefikuluçay Yılmaz and Terzioğlu (2011) (18) and comprised 23 items that were scored using a 5-point Likert-type scale; AAS was tested for its validity and reliability. In the validity and reliability test of the scale, Cronbach's alpha was found to be 0.80. The scale comprises the following three 3 sub-dimensions:

1. *Restricting life of the older persons*: Beliefs and perceptions of the society that limits the social life of the older persons.

2. *Positive ageism*: Positive beliefs and perceptions of the society for the older persons.

3. *Negative ageism*: Negative beliefs and perceptions of the society for the older persons.

The highest score that could be achieved of the scale was 115 and the lowest score was 23. Higher scores indicated positive attitudes toward ageism, whereas lower scores indicated negative attitudes toward ageism. The maximum score of the sub-dimension "restricting life of the older persons" is 45, and the minimum score is 9. The maximum score that can be obtained in the "positive ageism" sub-dimension is 40, whereas the minimum score is 8. The maximum score of the sub-dimension "negative ageism" is 30, and the minimum score is 6. Cronbach's alpha for this study was calculated to be 0.53.

Data analysis

Data are presented as percentage, mean, standard deviation, and median values. For analyzing normal distribution, quantitative variables of skewness and kurtosis $[(-1)-(+1)]$ were considered to be normally distributed. For analyzing dependent variables with regard to independent variables, t test was used for the normally distributed dependent variables in two independent groups, whereas Mann-Whitney U test was used for non-normally distributed variables. Kruskal-Wallis test was used for variables in three or more independent groups that did not show normal distribution. AAS predictors were analyzed by hierarchical regression analysis. Model 1 included sociodemographic variables, such as age, educational level (years), gender (0=Female, 1=Male, dummy variable), and income level (0=Low, 1=Middle-High, dummy variable), whereas model 2 included caregiving certificate (0=Yes, 1=No, dummy variable) and duration of employment (months). The interpretation of the results was based on a confidence level of 95% and an error margin of 0.05.



Limitations of the study

There are limitations of our study. The fact that validity reliability studies of the scales were conducted with university students led to inadequate understanding of the scale items of participants with a low education level and Cronbach alpha coefficients were lower than the validity and reliability studies. This is an important limitation for research.

RESULTS

The mean age of the participants was 40.1 ± 7.7 years. Of 108 participants, 58.3% were males, 78.7% were married, 62% were primary school graduates, 82.4% lived in a nuclear family, and 78.7% had upper middle income levels. Furthermore, 73.1% of participants replied yes to the question "Have you ever lived with an older persons individual?" The mean duration of living with older persons in the family was 11.1 ± 8.9 years. The mean duration of healthcare assistants working at the nursing home was 80.1 ± 56.9 months. Of 108 participants, 42.2% reported that they had communication problems while caring for the older persons. Moreover, 91.7% of the participants had caregiving certificates (Table 1).

The mean KAOP and AAS scores of the participants were 93.2 ± 10.8 and 79.4 ± 7.9 , respectively. The mean scores of the AAS sub-dimensions "restricting life of the older persons," "positive ageism," and "negative ageism" were 32.9 ± 4.3 , 29.8 ± 6.3 , and 16.6 ± 4.3 , respectively (Table 2). Comparison of KAOP and AAS scores of healthcare assistants with regard to sociodemographic characteristics are given in Table 3. Total KAOP and AAS scores and total scores of sub-dimensions "restricting life of the older persons" and "positive ageism" were higher in females than in males, and the difference was statistically significant ($p < 0.05$). The total score of the sub-dimension "negative ageism" was higher in males than in females; however, the difference was not statistically significant ($p > 0.05$). The median AAS and "positive ageism" values were higher in

participants with upper middle income levels than in those with low income levels, and the difference was statistically significant ($p < 0.05$). The attitudes of the participants who found training for senior care a necessity were found to be positive with respect to the sub-dimension "positive ageism" ($p < 0.05$).

When the distribution of KAOP and AAS scores were evaluated in terms of the educational level, there was a statistically significant difference in AAS scores and the sub-dimension "restricting life of the older persons." Post-hoc analysis, performed to determine variables that showed difference, revealed that the median values of AAS and sub-dimension "restricting life of the older persons" were significantly lower in primary school graduates than in high-school and university graduates. There was no statistically significant difference among KAOP, "negative ageism," and "positive ageism" scores with respect to the educational level ($p > 0.05$).

No statistically significant difference was found among KAOP, AAS, and all sub-dimensions of AAS scores with respect to marital status, family type, perceived income level, place of residence, having a caregiving certificate, satisfaction with working at a nursing home, and problems encountered while caring for the older persons.

Table 4 presents the results of hierarchical regression analysis. Among the independent variables in Model 1, in the order of importance, educational level ($\beta = 0.302$; $p = 0.002$) and income level ($\beta = 0.184$; $p = 0.038$) were positive predictors, whereas gender was a negative predictor ($\beta = -0.319$; $p = 0.001$) for total AAS scores. Sociodemographic variables in Model 1 showed 25.6% variance. Among the independent variables in Model 2, in the order of importance, educational level ($\beta = 0.317$; $p = 0.001$) was a positive predictor, whereas gender ($\beta = -0.296$; $p = 0.002$) was a negative predictor for total AAS scores. Sociodemographic variables, caregiving certificate, and duration of employment in Model 2 showed 28.4% variance. Thus, with respect to determining the variability of the total AAS score, Model 1 predicted 25.6% and Model 2 predicted 28.4% of the AAS scores.

Table 1. Sociodemographic and working characteristics of healthcare assistants.

Sociodemographic and working characteristics	\bar{x}	sd
Age	40.1	7.7
Duration of living with an older persons in the family (year)	11.1	8.9
Duration of healthcare assistants working at the nursing home (month)	80.1	56.9
Sociodemographic and working characteristics	n	%
Sex		
Female	45	41.7
Male	63	58.3
Marital status		
Married	85	78.7
Single	23	21.3
Educational background		
Primary education	67	62.0
High school	35	32.4
University	6	5.6
Family type		
Nuclear family	89	82.4
Extended family	19	17.6
Perceived income level		
Low income	23	21.3
Upper middle income	85	78.7
Living with an older persons in the family		
I have lived with an older persons in the family	79	73.1
I have never lived with an older persons in the family	29	26.9
Which problems do you have while caring for the older persons?		
Communication	38	42.2
Visitor	20	22.2
Teamwork	11	12.2
Care	10	11.1
Others	11	12.2
Caregiving certificate		
I have the caregiving certificate	99	91.7
I do not have the caregiving certificate	9	8.3
Training for senior care		
Necessary	56	51.9
Not necessary	52	48.1



Table 2. The mean KAOP and AAS scores of the healthcare assistants (n=108)..

Variable	$\bar{X} \pm sd$	Min	Max
Kogan's Attitudes Toward Older People Scale (KAOP)	93.2±10.8	66.0	124.0
Ageism Attitude Scale (AAS)	79.4±7.9	61.0	94.0
1. Subdimension: Restricting life of the older persons	32.9±4.3	22.0	42.0
2. Subdimension: Positive ageism	29.8±6.3	9.0	38.0
3. Subdimension: Negative ageism	16.6±4.3	8.0	29.0

DISCUSSION

This study demonstrated that the attitudes of healthcare assistants toward the older persons were positive with regard to ageism and the sub-dimensions "restricting life of the older persons," "positive ageism," and "negative ageism." In the literature review, we identified insufficient number study that specifically investigated healthcare assistants' attitudes toward and the ageism level who cared for the older persons.

This study revealed that the mean KAOP score of the participants was 93.2±10.8, showing that participants had a positive attitude toward the older persons. Coffey and Whitehead (2015) (19) assessed healthcare assistants who worked for a long period in a nursing home and reported that attitudes toward the older persons were positive. Strugala et al. (2016) (8) assessed nursing students and revealed that 63.1% of them had negative attitudes toward the older persons; they also stated that negative attitudes toward the older persons reduced the quality of care provided to the older persons.

When KAOP scores were assessed according to sex, more positive attitudes toward the older persons were observed among females than among males. Afarigan and Abedi (2016) (20) supported our study result, whereas Ayoğlu et al. (2014) (12) reported that males had more positive attitudes

toward the older persons. Because women usually perform the role of caregiver in the family in the Turkish population, it may be the reason for having compassion and developing positive attitudes toward the older persons.

This study found that participants who lived with older persons in the family had more positive attitudes toward the older persons than those who did not live with an older persons. Consistent with our study results, Kızılcı et al. (2013) (15) stated that people who lived with an older persons had more positive attitudes toward the older persons, whereas Seferoğlu et al. (2016) (21) stated that living with an older persons negatively influenced attitudes toward the older persons. It may be argued that it is easier for an individual who cares for an older persons in the family to develop empathy toward the older persons.

The mean AAS score of the participants was 79.4±7.9, showing that participants have positive attitudes toward ageism. When the mean scores obtained in the AAS sub-dimensions were evaluated, the scores in the sub-dimensions "restricting life of the older persons," "positive ageism," and "negative ageism" were 32.9±4.3, 29.8±6.3, and 16.6±4.3, respectively. Accordingly, participants had positive attitudes toward the older persons for all sub-dimensions. Arun and Pamuk (2014) (10) assessed healthcare personnel

in nursing homes and demonstrated that they had discriminatory attitudes against the older persons. In contrast, studies have reported the positive attitudes toward ageism (22,23). Although the majority of the sample population in these studies comprise healthcare students, they also include personnel in geriatric care centers (healthcare and administrative personnel), nurses, physicians, young adults, and students studying in different fields.

The total AAS score and the AAS sub-dimension "restricting life of the older persons" and "positive ageism" scores were significantly higher in females than in males ($p < 0.05$). A previous study conducted with a similar group demonstrated that females rather than males had more positive attitudes toward the older persons with respect to ageism, "restricting life of the older persons," and "positive ageism;" this is in line with our findings (24). In addition, another study conducted with a similar group demonstrated that discriminatory attitudes toward the older persons were higher in females than in males (10). When the mean score on the sub-dimension "negative ageism" was evaluated, the mean scores of females and males were similar.

When AAS scores were assessed according to the educational level, the median AAS score and sub-dimension "restricting life of the older persons" scores were lower in primary school graduates than in high-school and university graduates. Consistent with our study results, Yılmaz et al. (2012) (25) and Bulut and Çilingir (2016) (13) reported that AAS scores increased with increased educational levels. Furthermore, Ünal et al. (2012) (24) assessed on the personnel working in a geriatric center and showed that AAS scores of university graduates were lower than those of primary and high-school graduates. It may be argued that performing critical duties such as caring for the older persons by individuals with primary school education causes problems in caregiving. A caregiver must undergo a qualified training to be able to understand the physiological and psychological conditions of the older persons.

According to the results of the hierarchical regression analyses that evaluated the AAS scores in terms of educational level (0.30, positive), income level (0.18, positive), and gender (-0.32; negative), Model 1 predicted the variation in total AAS scores as follows: educational level (0.32, positive) and gender (-0.30; negative). Overall, Model 1 predicted 25.6% and Model 2 predicted 28.4% of the total AAS scores. Arun and Pamuk (2014) (10), who investigated the reasons of healthcare personnel's attitudes toward aging and ageism, revealed that according to logistic regression analysis, the duration of employment (0.26; positive) was the most important factor that influenced ageism, whereas age was not a predictor of attitudes toward the older persons. Gallagher et al. (2006) (26) compared the attitudes of acute and long-term healthcare personnel toward the older persons, and multiple regression analysis revealed that educational level predicted negative attitude scores (0.49; positive). In line with the abovementioned studies, we concluded that gender, educational level, and income level predicted the attitude toward older individuals. We did not identify any studies in the literature that compared AAS results using regression analysis. Therefore, comparison of regression analysis results of the current study with those of other studies is limited.

In general, all healthcare assistants, specifically male assistants, should undergo training to develop empathy for the older persons and to develop positive attitudes toward ageism; experimental research should be planned with such subjects. In addition, it should be ensured that individuals spend time with an older persons family member from childhood. A restriction should be introduced in the employment of healthcare assistants caring for the older persons for a minimum high-school education level. Special attention should be paid for healthcare assistants with low income levels, and on-the-job training that is oriented toward communication with the older persons should be encouraged.



Table 3. Comparison among total KAOP, total AAS, and sub-dimensions of AAS scores with regard to sociodemographic characteristics of healthcare assistants.

Characteristics (n)	Total KAOP score X±Sd/ [Q(Q ₁ -Q ₃)]	Total AAS score X±Sd/ [Q(Q ₁ -Q ₃)]	Restricting life of the older persons X±S/ [Q(Q ₁ -Q ₃)]	Positive ageism X±Sd/ [Q(Q ₁ -Q ₃)]	Negative ageism X±Sd/ [Q(Q ₁ -Q ₃)]
Sex (n)					
Female (45)	95.6±12.5	83.1±7.7	34.6±3.7	[32.0(29.0-35.0)]	16.5±4.0
Male (63)	91.5±9.2	76.7±6.9	31.8±4.3	[30.0(27.0-33.0)]	16.7±4.6
Test value	t=2.005	t=4.514	t=3.623	z=-2.595	t=-0.222
p	0.048	<0.001	<0.001	0.009	0.825
Perceived income level (n)					
Low income (23)	88.0(82.0-93.0)	[73.0(71.0-80.0)]	[31.0(29.0-35.0)]	[28.0(26.0-32.0)]	[15.0(12.0-21.0)]
Upper middle income (85)	[94.0(86.5-100.5)]	[80.0(76.0-85.0)]	[33.0(30.0-26.5)]	[32.0(29.0-34.0)]	[16.0(14.0-19.5)]
Test value	z=-1.874	z=-2.799	z=-0.858	z=-2.993	z=-0.501
p	0.061	0.005	0.391	0.003	0.617
Living with an older persons in the family (n)					
I have lived with an older persons in the family (79)	[94.0(87.0-101.0)]	[78.0(74.0-85.0)]	[32.0(30.0-36.0)]	[32.0(28.0-34.0)]	[16.0(14.0-19.0)]
I have never lived with an older persons in the family (29)	[87.0(82.0-95.0)]	[80.0(73.0-85.0)]	[33.0(30.5-36.5)]	[30.0(27.5-32.0)]	[17.0(13.5-20.5)]
Test value	z=-2.348	z=-0.349	z=-0.480	z=-1.273	z=-0.643
p	0.019	0.757	0.631	0.203	0.520
Caregiving certificate (n)					
I have a caregiving certificate (99)	[92.0(85.0-99.0)]	[79.0(74.0-85.0)]	[33.0(30.0-36.0)]	[31.0(28.0-34.0)]	[16.0(14.0-19.0)]
I don't have a caregiving certificate (9)	[93.0(88.0-105.0)]	[78.0(74.5-87.5)]	[33.0(27.5-36.0)]	[32.0(30.0-33.0)]	[18.0(14.5-20.0)]
Test value	z=-0.795	z=-0.028	z=-0.669	z=-0.307	z=-0.976
p	0.426	0.978	0.503	0.759	0.329
Educational background (n)					
Primary education (67)	[92.0(85.0-99.0)]	[77.0(72.0-84.0)]	[32.0(29.0-36.0)]	[31.0(27.0-33.0)]	[16.0(13.0-20.0)]
High school (35)	[91.0(86.0-102.0)]	[83.0(77.0-87.0)]	[36.0(30.0-38.0)]	[32.0(28.0-34.00)]	[16.0(14.0-19.0)]
University (6)	[94.5(90.5-106.0)]	[83.0(79.5-90.3)]	[35.5(32.8-38.5)]	[30.0(28.5-36.3)]	[17.5(15.0-18.8)]
Test value (Kw)	1.576	8.886	8.250	1.093	0.687
p	0.455	0.012^a	0.016^a	0.579	0.709
Training for senior care (n)					
Necessary (56)	93.6±11.1	80.0±7.7	32.7±4.5	[32.0(29.3-35.0)]	16.1±4.1
Not necessary (52)	92.8±10.7	78.6±8.1	33.2±4.0	[30.0(27.0-32.0)]	17.2±4.5
Test value	t=0.400	t=0.922	t=-0.558	z=-3.178	t=-1.245
p	0.690	0.358	0.578	0.001	0.216

t: Independent simple t test

z: Mann-Whitney U test

a: Primary school graduates are different from high-school and university graduates

Table 4. Results of linear regression analyses (hierarchical) of AAS scores with regard to predictors, such as sociodemographic variables, caregiving certificate, and duration of employment (n=108).

	β	t	p
Model 1 (Sociodemographic Predictors)			
Age	0.122	1.259	0.211
Educational level (years)	0.302	3.134	0.002
Gender (0 = Female, 1 = Male)	-0.319	-3.561	0.001
Income Level (0 = Low, 1 = Middle-High)	0.184	2.104	0.038
Model 2 (Predictors Related to Caregiving Certificate and Employment)			
Age	0.186	1.829	0.070
Educational level (years)	0.317	3.297	0.001
Gender (0 = Female, 1 = Male)	-0.296	-3.297	0.002
Income Level (0 = Low, 1 = Middle-High)	0.158	1.797	0.075
Caregiving certificate (0 = Yes, 1 = No)	0.033	0.346	0.730
Duration of employment (months)	-0.164	-1.612	0.110
Model 1	R=0.506	R ² =0.256	F=8.859, p<0.001
Model 2	R=0.533	R ² =0.284	F=6.673, p<0.001

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344061
2018;21(3):456-466

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Received: 29/11/2017
Accepted: 18/05/2018

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RESEARCH

DEVELOPMENT OF THE BURDEN SCALE FOR CAREGIVERS OF DEMENTIA PATIENTS

ABSTRACT

Introduction: The purpose of this study is to develop Scale of Care Burden of Caregivers of Dementia Patients.

Materials and Method: This methodically planned study, 145 caregivers who the care of patients with a diagnosis of dementia in Dementia Outpatient Clinic of Turgut Ozal Medical Center were included. 30-item question pool which was created as a result of literature review, was presented to five specialists in order to evaluate language and content validity. After the arrangements made in accordance with expert opinion, 29-item scale draft has begun to be implemented between the dates of November 2015 and January 2016. In order to determine the construct validity and sub-scales of the scale, factor analysis was conducted. To measure the scale's internal consistency, item analysis (item-total correlations) and Cronbach Alpha Reliability Coefficient were evaluated. In order to conduct reliability study and for invariance principle according to time, after 30 days the data has been reached again and the correlation coefficient was calculated by using retest method.

Results: Cronbach's Alpha value was found to be .88. For construct validity of the scale, as a result of the factor analysis, care burden scale is consisted by four factors as social (7 items), psychological (10 items), physical (4 items) and economic (3 items). As a result of factor analysis, the questionnaire was evaluated over 24-items. When the invariance according to time of the scale was evaluated with test and re-test analysis, there was no difference between the both two applications ($p>0.05$).

Conclusion: The scale was found highly valid and reliable.

Keywords: Dementia; Caregivers; Nursing

ARAŞTIRMA

DEMANS LI HASTALARA BAKIM VERENLERDE BAKIM YÜKÜ ÖLÇEĞİNİN GELİŞTİRİLMESİ

Öz

Giriş: Bu araştırma demanslı hastalara bakım verenlerde oluşan bakım yükü ölçeğinin geliştirilmesi amacıyla planlanmıştır.

Gereç ve Yöntem: Metodolojik olarak planlanan bu çalışmaya Turgut Özal Tıp Merkezi Demans Polikliniğinde demans tanısı almış hastalara bakım veren 145 bakımveren alınmıştır. Literatür taraması sonucuyla oluşturulan 30 maddelik soru havuzu beş uzmana dil, içerik ve kapsam geçerliliği'ni değerlendirmek üzere sunulmuştur. Uzman görüşleri doğrultusunda yapılan düzenlemeler sonrası 29 maddelik olan ölçek taslağı Kasım 2015-Ocak 2016 tarihleri arasında uygulamaya başlanmıştır. Ölçeğin yapı geçerliliği ve ölçek alt boyutlarının belirlenmesi için faktör analizi yapılmıştır. Ölçeğin iç tutarlılığını değerlendirmek üzere madde analizi (madde toplam puan korelasyonu) ve Cronbach Alfa Güvenirlik Katsayısı değerlendirilmiştir. Güvenirlik çalışması için zamana göre değişmezlik ilkesi için 30 gün sonra örnekleme tekrardan ulaşılmış ve test tekrar test yöntemi kullanılarak korelasyon katsayısı hesaplanmıştır.

Bulgular: Cronbach Alpha değeri .88 olarak bulunmuştur. Ölçeğin yapı geçerliliği için açıklayıcı faktör analizi sonucunda bakım yükü ölçeği sosyal (7 madde); psikolojik (10 madde), fiziksel (4 madden) ve (3 mddde) olmak üzere dört faktörden oluşmaktadır. Alt boyutların Cronbach Alfa iç tutarlılık değerleri incelendiğinde sosyal alt boyutu için 0.85; psikolojik alt boyutu için 0,84; ekonomik alt boyutu için 0.74 ve fiziksel alt boyutu için 0.51 olarak saptanmıştır. Yapılan faktör analizi sonucunda anket soruları 24 madde üzerinden değerlendirilmiştir. Ölçeğin zamana göre değişmezliği test-tekrar test analizi ile incelendiğinde her iki uygulama arasında fark olmadığı saptanmıştır ($p>0.05$).

Sonuç: Demans hastalarına bakım verenlerde bakım yükünü ölçeği geçerli ve güvenilir bir ölçme aracı olduğu söylenebilir.

Anahtar sözcükler: Demans; Bakım yükü; Hemşirelik



INTRODUCTION

Increasing awareness of preserving and maintaining health, facilities provided by advances in technology, developments in the field of medicine and the delivery of quality healthcare services have led to an increase in life expectancy at birth and the proportion of elderly people. There has been a significant increase in the proportion of elderly people, particularly in developed countries (1). According to data from the Turkish Statistical Institute, the proportion of people aged ≥ 65 years was 8.3% in 2016 (2). Due to a significant increase in the proportion of elderly people, chronic conditions commonly occurring at older ages have become an important issue in society. Dementia, which is one of these conditions, has gradually become a significant problem threatening the health of the elderly (3). It is estimated that 30 million people have dementia worldwide. Furthermore, this number is expected to double every 20 years (4-6). Chronic and progressive courses of dementia increase the responsibility of caregivers of dementia patients (7). People with dementia often require high-level care, and most dementia patients are provided care informally or by family members. Burnout and depression are among the most common negative consequences in individuals providing care to the elderly and people with chronic diseases such as dementia. Caregiver burden negatively affects caregivers' social, occupational and personal roles, and it is considered to be the initial symptom of depression. Caregivers suffer from stress, depression and other health problems. Burnout and stress in caregivers result in various adverse outcomes including depression in patients and caregivers and a reduced quality of life (8).

Various scales such as the Zarit Caregiver Burden Scale and Caregiver Self-Assessment Questionnaire have been developed and are widely used to measure burnout in caregivers of patients with dementia and those with chronic diseases. However, these scales are more suitable for use in Western communities. Asian cultures differ from Western cultures in terms of providing care to elderly family members. Healthcare professionals provide care to the elderly in Western communities, whereas family

members and relatives play an important role in taking care of the elderly in Asian communities (9). In Turkish society, providing care to the diseased and elderly people at home is a widely accepted norm owing to the cultural fabric (10). Abstract concepts such as providing care and coping with stress, anxiety and pain are frequently measured in nursing studies (11,12). To measure abstract variables, scales have been developed to address different aspects and involve multiple indirect indicators of the variable (11,13). Healthcare professionals can determine the difficulty of caregiving using clinical data and measurement tools and provide appropriate nursing care (12,14).

Although no scale has been developed to evaluate the burden of caregivers of dementia patients in Turkey, there are many scales for which validity and reliability studies have been conducted; in contrast, numerous scales have been developed in other countries (11-16).

The present study aimed to develop a scale to measure the burden of caregivers of dementia patients and to evaluate its reliability and validity.

MATERIALS AND METHOD

The research population comprised caregivers of dementia patients who resided in Malatya city centre and who were diagnosed with dementia in Dementia Outpatient Clinics of the Department of Neurology at Turgut Özal Medical Center. The study was conducted between February 2015 and February 2016. According to the records of the Dementia Outpatient Clinics, 480 patients were diagnosed with dementia in 2015. Caregivers who died and whose contact information changed during the study period and those who did not provide consent to participate were excluded. The sample of the study was included 145 caregivers who at least six months in the care of patients with dementia. The sample size in the study was determined according to the formula that requires the sample size to be more than five times the number of items and less than 10 times the number of items. As a result, the sample size was set as 5 times the number of items ($29 \times 5 = 145$) (17-21).

Measurement of the Burden Scale for Caregivers of Dementia Patients Literature Review and Constructing the Item Pool

An item pool for the Burden Scale for Caregivers of Dementia Patients was constructed following an extensive literature review (9-11). To determine the extent of correspondence between the items and the characteristics to be measured, expert opinion was taken and the content validity of the items was evaluated. The question item pool of the scale was sent to five experts. Each expert was requested to rate each item on a scale from 1 to 4 (1-Item is

relevant, 2-Item needs partial revision, 3-Item needs complete revision, 4-Item is not relevant). Items for which experts requested revision were changed based upon their feedback. To evaluate the content validity of the draft items, Lawshe's Content Validity Ratio (CVR) were used.

$$\text{For each item, } CVR = NG / (N/2) - 1$$

where NG is the number of experts who indicated all items as essential and N is the number of experts who presented their opinions about a particular item.

Table 1. Calculation of CVR.

Items	Revelant 3 or 4	Non relevant 1 or 2	CVR	Items	Revelant 3 or 4	Non relevant 1 or 2	CVR
Item 1	5	0	1.00	Item 16	4	1	.80
Item 2	4	1	.80	Item 17	4	1	.80
Item 3	4	1	.80	Item 18	4	1	.80
Item 4	5	0	1.00	Item19	4	1	.80
Item 5	4	1	.80	Item 20	4	1	.80
Item 6	4	1	.80	Item 21	5	0	1.00
Item 7	4	1	.80	Item 22	4	1	.80
Item 8	5	0	1.00	Item 23	4	1	.80
Item 9	4	1	.80	Item 24	4	1	.80
Item 10	4	1	.80	Item 25	4	1	.80
Item 11	4	1	.80	Item 26	5	0	1.00
Item 12	5	0	1.00	Item 27	4	1	.80
Item 13	4	1	.80	Item 28	4	1	.80
Item 14	5	0	1.00	Item 29	4	1	.80
Item 15	4	1	.80	Item 30	3	2	.60
Total							.84

After revising the draft scale and decreasing the number of items based on expert opinions, the scale was administered to a pilot study group of

20 subjects and the intelligibility of the scale was evaluated.



Factor analysis was used to determine construct validity and various sub-dimensions of the scale. Item analysis (item-total correlation) and Cronbach's alpha reliability coefficient were used to evaluate the internal consistency of the scale. To measure reliability and the invariance principle, the subjects were contacted 30 days after the completion of the study and the correlation coefficient was measured using the test-retest method.

Ethical principles

Ethical approval was obtained from the Editorial and Scientific Board Ethics Committee of Inonu University. Official approval was obtained from the Neurology Department of Turgut Özal Medical Center for conducting the study. The study aim was explained to the caregivers who met the study criteria and volunteered to participate. In addition, the subjects were informed that they had a right to withdraw from the study at any time. Caregivers' written consent was obtained in line with the confidentiality principle, and they were assured that their personal information would be protected.

RESULTS

One of the methods used for content validity was the Davis technique. The Davis technique evaluates expert opinion on a scale from 1 to 4 points: 1-Item is relevant, 2-Item needs partial revision, 3-Item needs complete revision, 4-Item is not relevant. In this technique, the CVR is calculated by dividing the number of experts rating as 1) and 2) to the total number of experts for each item, and the ratio was measured to be 0.80 and above (17). The CVR of the 30th item, which was below 0.80, was revised according to feedbacks. Following the evaluation of expert opinions, the final scale was composed of 29 items (Table 1).

Cronbach's alpha reliability coefficient was calculated to confirm the internal consistency and homogeneity of the scales. This coefficient was 0.88 for the Burden Scale for Caregivers of Dementia Patients (Table 2). When Cronbach's alpha values of different sub-dimensions of the Burden Scale for Caregivers of Dementia Patients were evaluated, they were 0.85 for the social sub-dimension, 0.84 for the psychological sub-dimension, 0.74 for the economic sub-dimension and 0.51 for the physical sub-dimension (Table 2).

Table 2. Internal consistency of overall and sub-dimensions of the Burden Scale for Caregivers of Dementia Patients.

Sub-dimensions	Number of questions	Cronbach's alpha
Social	7	0.85
Psychological	10	0.84
Economic	3	0.74
Physical	4	0.51
Total	24	0.88

Principal component analysis was used to determine the construct validity of the Burden Scale for Caregivers of Dementia Patients (varimax rotation). The Kaiser-Meyer-Olkin (KMO) test and

Bartlett's sphericity test were used to measure the applicability of principal component analysis (Table 3).

Table 3. Results of the KMO test and Bartlett's sphericity test.

KMO test measure of sampling adequacy		0.85
Bartlett's sphericity test	Chi-Square	1388.299
	df	276
	Sig.	0.001

Exploratory factor analysis was used to evaluate the construct validity of the Burden Scale for Caregivers of Dementia Patients, the number of items of which was reduced to 24 following item analysis. Principal component analysis and varimax rotation were used to analyse the factor structure of the scale. Following the application of varimax rotation in principal component analysis, the items of the Burden Scale for Caregivers of Dementia Patients were divided into four factors. The results of exploratory factor analysis are shown in Table 4. Factor loadings ranged from 0.33 to 0.84.

The Burden Scale for Caregivers of Dementia Patients was composed of 29 items. This is a five-point Likert-type scale: Always (5), Usually (4), Sometimes (3), Rarely (2) and Never (1). Following

factor analysis, questions 15 and 17 were omitted as their factor loadings were below 0.50; questions 2, 27 and 29 were also omitted as their factor loadings were below 0.25 and they had similar coefficient loadings for multiple values. As a result, the final version of the scale was composed of 24 items. As a result of the item-total correlation analysis of the scale, the reliability coefficients were found to be between $r=0.08$ and $r=0.717$ and statistically significant in the positive direction ($p<0.05$) (Table 5). Furthermore, the 'Alpha if Item Deleted' value was measured to test to what extent and in what way each item affected Cronbach's alpha reliability coefficient. These values demonstrated the internal consistency of the remaining items when an item is excluded.

**Table 4.** Exploratory factor analysis of the Burden Scale for Caregivers of Dementia Patients.

Items	Component			
	1. factor	2. factor	3. factor	4. factor
Item 20	0.79			
Item 22	0.78			
Item 21	0.68			
Item 25	0.62			
Item 23	0.60			
Item 19	0.43			
Item 9	0.35			
Item 13		0.73		
Item 14		0.64		
Item 6		0.61		
Item 11		0.59		
Item 18		0.58		
Item 12		0.54		
Item 7		0.52		
Item 10		0.52		
Item 24		0.45		
Item 1		0.41		
Item 26			0.84	
Item 28			0.81	
Item 16			0.64	
Item 5				0.74
Item 3				0.55
Item 8				0.42
Item 4				0.33
Eigen value	4.20	3.63	2.92	1.76
Total variance explained %	17.50	15.13	12.20	7.37

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Table 5. Item-total correlation of the Burden Scale for Caregivers of Dementia Patients.

Items	Item-total correlation	Alpha if Item Deleted'
Item 1	0.53	0.87
Item 3	0.08	0.89
Item 4	0.09	0.88
Item 5	0.24	0.88
Item 6	0.49	0.87
Item 7	0.55	0.87
Item 8	0.43	0.87
Item 9	0.37	0.88
Item 10	0.47	0.87
Item 11	0.53	0.87
Item 12	0.58	0.87
Item 13	0.64	0.87
Item 14	0.39	0.88
Item 16	0.30	0.88
Item 18	0.32	0.88
Item 19	0.52	0.87
Item 20	0.71	0.87
Item 21	0.63	0.87
Item 22	0.63	0.87
Item 23	0.62	0.87
Item 24	0.53	0.87
Item 25	0.56	0.87
Item 26	0.44	0.87
Item 28	0.51	0.87

Confirmatory Factor Analysis (CFA) was conducted using LISREL 8.7 (Scientific Software International, Inc., Lincolnwood, IL, USA) with

covariance matrices serving as the input; solutions were generated based on the maximum likelihood.



Table 6. Goodness-of-Fit Indices for the Burden Scale for Caregivers of Dementia Patients.

Goodness-of-Fit Indices	Value
RMSEA	0.054
NNFI	0.96
CFI	0.96
IFI	0.96
RMR	0.072
RFI	0.88
X^2/df	1.42

According to CFA, the X^2/df rate was 1.42, and all indices (RMSEA=0.054, NNFI=0.96, CFI=0.96, IFI=0.96, RMR=0.072 and RFI=0.88) had an acceptable fit between the four-dimensional model and the observed data. A diagram of the four-

dimensional model is shown in Figure 1. Coefficients of the observed data were between 0.29 and 0.78. According to these results, the four-dimensional structure of the Burden Scale for Caregivers of Dementia Patients was validated.

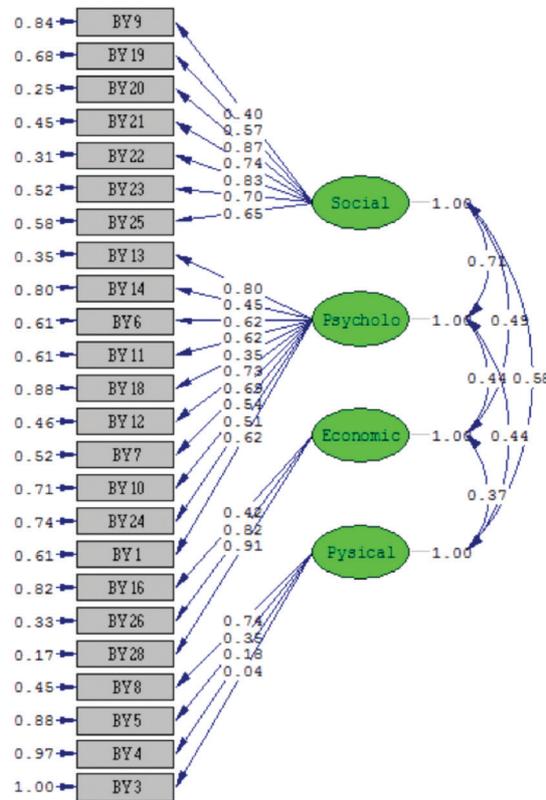


Figure 1. The burden Scale for Caregivers of Dementia Patients confirmatory factor analysis.

The test-retest method was used to test scale invariance (22). The scale was assessed for the second time with 32 caregivers after the initial research. When the test-retest scores of the Burden Scale for Caregivers of Dementia Patients were

evaluated in comparison with the initial scores, we found a positive relationship between the correlation analysis of social, psychological, economic, physical and total scores at an alpha level of 0.01 ($p > 0.05$, $r = 0.83$) (Table 7).

Table 7. Sub-dimensions of the Burden Scale for Caregivers of Dementia Patients according to test-retest results and evaluation of the total average score (n=32).

Sub-dimensions	First adminst. X± sd	Test-retest adminst. X±sd	Cronbach's alpha (n=145)	Test-retest Cronbach's alpha (n=32)	r*	p
Social	20.90±8.48	21.43±8.48	0.85	0.88	0.88	0.001
Psychological	23.90±9.38	24.68±10.16	0.84	0.91	0.79	0.001
Economic	6.12±3.38	6.15±3.53	0.74	0.74	0.64	0.001
Physical	16.00±2.99	15.34±3.16	0.51	0.48	0.59	0.001
Total	66.93±18.96	67.62±20.36	0.88	0.92	0.83	0.001

* ICC (Intraclass Correlation Coefficient)

DISCUSSION

Cronbach's alpha value was measured to determine the internal consistency and homogeneity of the Burden Scale for Caregivers of Dementia Patients. Cronbach's alpha values were 0.85 for the social sub-dimension, 0.84 for the psychological sub-dimension, 0.74 for the economic sub-dimension, 0.51 for the physical sub-dimension and 0.88 for the overall scale (Table 2). Cronbach's alpha values should preferably be close to 1. If the value is between 0.80 and 1.00, the scale is considered to be highly reliable; if the value is between 0.60 and 0.79, the scale considered to be very reliable; if the value is between 0.40 and 0.59, the scale considered to be less reliable; and if the value is between 0.00 and 0.40, the scale considered to be not reliable (23). Therefore, the present scale was found to be highly reliable (Table 2).

KMO factor analysis is an essential index for measuring the adequacy of sampling. If the KMO value is close to 1, sampling is considered adequate for factor analysis. KMO values between 0.90 and 1.00 indicate perfect sampling, between 0.80 and 0.89 indicate very good sampling, between 0.70 and 0.79 indicate good sampling, between 0.60 and 0.69 indicate moderate sampling, between 0.50 and 0.59 indicate poor sampling and below 0.50 indicate unacceptable sampling (21). According to these evaluation criteria, the KMO score of the Burden Scale for Caregivers of Dementia Patients was 0.85, indicating very good sampling for factor analysis (Tables 3). Besides the adequacy of sampling, Bartlett's sphericity test, which determines the relevance of the correlation matrix of items in the scale, was used to evaluate the adequacy of the scale (24). The result of Bartlett's sphericity test in the present study was



extremely relevant ($X^2=1388.299$, $p=0.001$), and the scale was suitable for factor analysis (Table 3).

The Eigenvalue coefficient is used to determine the number of substantial factors and measure the variance ratio represented by each factor in factor analysis. It is recommended to select factors with an eigenvalue coefficient of >1 (24). Higher variance ratios indicate stronger factor structure of the scale. Variance ratios between 40% and 60% are considered adequate (18). In the present study, the ratio was 52.2% (Table 4).

As shown in Table 4, four factors were identified with an initial variance of >1 . The variance of the first factor was 17.50%, that of the second factor was 32.6%, that of the third factor was 44.8% and that of the fourth factor was 52.2%. The first factor in the scale represented the social sub-dimension and was composed of item numbers 9, 19, 20, 21, 22, 23 and 25. The second factor in the scale represented the psychological sub-dimension and was composed of item numbers 1, 6, 7, 10, 11, 12, 13, 14, 18, and 24. The third factor represented the economic sub-dimension and was composed of item numbers 16, 26 and 28. Finally, the fourth factor represented the physical sub-dimension and was composed of item numbers 3, 4, 5 and 8.

Subsequent to exploratory factor analysis, we designated the four factors as 'social', 'psychological', 'economic' and 'physical'. When we investigated the sub-dimensions of other burden scales, we found that the Burden Scale Inventory that was created by Novak and Guest in 1989 and the Turkish version of which was confirmed to be reliable and valid by Kucukguclu et al. was composed of five dimensions of burden: time-dependence, physical, social, developmental and emotional. The total Cronbach's alpha coefficient of the inventory was 0.94, with Cronbach's alpha of time-dependency as 0.94, of social burden as 0.82, of physical burden as 0.94, of emotional burden as

0.94, and of developmental burden as 0.94 (10). The Burden Scale for Caregivers of Dementia Patients developed by Taameeyapradit et al. is composed of 18 items and three sub-dimensions: psychological, economic and physical burden (9). The burden scale created by Zarit, Reever and Bach-Peterson and the Turkish version of which was tested for validity and reliability by Inci and Erdem is composed of 22 items and a single sub-dimension. The internal consistency coefficient of the scale was 0.95 (11).

In item-total correlation analysis, the consistency coefficient of the Burden Scale for Caregivers of Dementia Patients was calculated to be between 0.085 and 0.71 and a significant positive relationship was found (Table 5). The lower limit of the item-total score correlation coefficient differs according to various sources. An item-total score correlation coefficient of >0.20 may be problematic (25). When an item with a low correlation coefficient is to be excluded, Cronbach's alpha coefficient and the change in the overall score should be considered (25). When we excluded items 3 and 4, Cronbach's alpha coefficient did not change; consequently, we decided to not exclude these items from the scale.

To evaluate scale invariance, we re-administered the test to 32 caregivers 2 weeks after the initial test. The test-retest reliability coefficient of the scale varied from $r=0.59$ to $r=0.88$ between the items and was $r=0.83$ for the overall scale ($p<0.05$) (Table 7). In the present study, as there was a relevant interval between the two measurements and consistency did not show any changes within this interval, the scale was determined to be consistent; in other words, the scale was invariant.

In conclusion, we suggest that the scale developed in the present study is a reliable and valid measurement tool to evaluate the Burden Scale for Caregivers of Dementia Patients.

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Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018344062
2018;21(3):467-482

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Received: 27/01/2018
Accepted: 06/07/2018

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REVIEW ARTICLE

VULNERABILITY OF ELDERLY PEOPLE IN DISASTERS: A SYSTEMATIC REVIEW

ABSTRACT

Introduction: Disasters significantly affect the physical, emotional, and psychological health of individuals and result in high numbers of deaths, injuries, and economic losses. Elderly people are among the groups most vulnerable to the negative impacts of disasters. In this direction, this systematic review aims to provide an overview of relevant studies on the vulnerability of elderly populations during disasters.

Materials and Method: A literature search was conducted from 2000 to 2017 using MEDLINE, Pub Med, Science direct, and Scopus and Cochrane libraries. This review was conducted in September 2017, and the keywords included "older adults", "elderly", "disasters", "vulnerable groups." In total, 29 research articles composed the main sample of the study.

Results: Several studies have found that older adults are vulnerable in disasters. The results of these studies were examined and are presented according to the physical effects, psychosocial effects, relocation trauma, and ethical aspects as the main themes.x

Conclusion: In countries with rapidly aging populations, a large number of vulnerable elderly people require assistance in the event of a disaster. Many studies have reported that the health of these vulnerable populations is frequently worsened by disasters, to the point of a higher incident of fatal consequences. Therefore, disaster planning needs to include strategies for attending to care-giving needs, unique psychosocial needs, relocation trauma, medications, and medical needs of this population.

Keywords: Aged; Disasters; Vulnerable populations; Disaster planning

DERLEME MAKALE

AFETLERDE YAŞLILARIN İNCİNEBİLİRLİĞİ: SİSTEMATİK DERLEME

Öz

Giriş: Afetler, bireylerin fiziksel, duygusal ve psikolojik sağlıkları üzerinde önemli etkilere sahiptir ve ölüm, yaralanma ve ekonomik kayıpların artmasına neden olur. Afetlerin olumsuz etkilerine karşı en incinebilir gruplardan biri yaşlılardır. Bu sistematik derlemenin amacı, yaşlı nüfusun afetlerde incinebilirliğine ilişkin ilgili çalışmalara genel bir bakış sunmaktır.

Gereç ve Yöntem: MEDLINE, Pub Med, Science direct, Scopus ve Cochrane kütüphaneleri kullanılarak 2000'den 2017 yılına kadar literatür araştırması yapıldı. Bu inceleme Eylül 2017'de gerçekleştirildi ve anahtar sözcükler "yaşlılar", "afetler", "incinebilir gruplar" idi. Toplam 29 araştırma makalesi, çalışmanın ana örneklemini oluşturdu.

Bulgular: Birçok çalışma afetlerde yaşlı bireylerin incinebilir olduğunu belirlemiştir. Bu çalışmaların sonuçları fiziksel etkilere, psikososyal etkilere, yer değiştirme travmasına ve etik konulara ilişkin ana temalara göre sunulmuştur.

Sonuç: Hızla yaşlanan nüfusa sahip ülkelerde, çok sayıda incinebilir yaşlı afet durumunda yardıma ihtiyaç duymaktadır. Birçok çalışma, bu incinebilir nüfusun sağlığının, afetler sonucunda sıklıkla ölümcül sonuçlara varabilecek şekilde kötüleştiğini rapor etmiştir. Afet planlaması, bu nüfusun bakım gereksinimlerine, bireysel psikososyal ihtiyaçlarına, yer değiştirme travmasına, ilaçlarına ve tıbbi gereksinimlerine yönelik stratejiler içermelidir.

Anahtar Sözcükler: Yaşlı; Afetler; İncinebilir gruplar; Afet planlaması

INTRODUCTION

Disasters are extraordinary and catastrophic events that affect thousands of people and occur somewhere in the world every day despite several economic, social, and scientific developments. Disasters have significant effects on the physical, emotional, and psychological health of individuals and result in high numbers of deaths, injuries, and economic losses (1-3).

The World Disasters Report noted a 60% increase in disasters in the last decade. According to the World Disasters Report in 2013, proposed by the International Federation of Red Cross and Red Crescent Societies, during the period 2003–2012, 6699 disasters occurred, causing 1.1 million deaths and 2,167.4 million injuries. Earthquakes and tsunamis occurred in Indonesia and neighboring countries in 2004 and in Japan in 2011. An earthquake in Asia occurred in 2004 and left at least 266,000 dead (1). Over the past 30 years, natural disasters have affected over 16 million Australians, causing almost AU\$40 billion dollars' worth of damage and killing thousands of people (3).

During any disaster, there are some demographic groups of people who are more vulnerable than others. Elderly people are among the groups most vulnerable to the negative impacts of disasters (4-6). The World Health Organization has identified older adults as a vulnerable population that is more likely to be at a greater risk in a disaster. The worldwide population of people aged 65 years or older is predicted to increase from 550 million to 973 million between 2000 and 2030. Globally, the population of older people will exceed the number of children for the first time in 2045, and by 2050, the proportion of older people will rise to 22%. Therefore, the number of older adults who will be negatively impacted by disasters will continue to rise as this demographic group increases over time (6).

Disaster statistics frequently report higher mortality and morbidity rates for older adults compared to the rest of the population. In the 2011

Japanese Tsunami, 77% of the people who died were aged 65 or older (5). In the great Hanshin Earthquake, more than half of the fatalities were among people over 60 years of age. The same patterns were observed in the Guatemalan and Armenia earthquakes, in which higher death rates were observed among elderly populations (7). Among the fatalities from the Aceh (Indonesia) Tsunami in 2004, the highest death rate was recorded for those over 60 years old. When Hurricane Katrina hit New Orleans in 2005, 71% of the people killed were aged 60 years and above (3).

In regions with rapidly aging populations, vulnerable elderly people need assistance in the event of a disaster. Along this line, this systematic review aimed to show the known vulnerability of elderly people in disaster situations. The study provides a general overview of relevant studies on the vulnerability of elderly populations during disasters and identifies research gaps. Results of this review may be useful in establishing appropriate disaster-management plans.

MATERIALS AND METHOD

Data sources

For the instant study, a literature search was conducted from 2000 to 2017 using MEDLINE, Pub Med, Science direct, and the Scopus and Cochrane libraries. This review was conducted in September 2017, and the keywords included "older adults", "elderly", "disasters", "vulnerable populations".

Inclusion criteria

Research articles from 2000 to 2017 that focused on topics relevant to the research question were included in this review. Because the present review was intended to provide a general overview of studies on the vulnerability of elderly populations during disasters, there was no limitation on the study type, and all types of full-text research articles were included. The articles reviewed included ecological, descriptive, retrospective cohort, prospective



cohort, quasi-experimental, methodological, and qualitative and systematic reviews, published in academic journals.

Exclusion criteria

The study excluded articles published before 2000, non-English articles, not full-text access articles, those published in non-academic journals, those that did not focus on the vulnerability of elderly people during disasters. Fig. 1 gives a quick review of the search and selection of papers in the present study process.

Risk of bias assessment

The risk of bias assessment was performed by two researchers by using the Cochrane risk of bias tool. The assessment included selection bias (random sequence generation and allocation concealment), performance bias, detection bias, attrition bias, reporting bias, and "other" bias. Biases were rated as "low," "unclear," or "high" risk. The researchers independently performed bias assessment, and disagreements were resolved through discussion. The potential for bias in all the reviewed studies was estimated as "low".

RESULTS

Ninety-five articles were accessed in the first search, of which 60 were related to the vulnerability of the elderly in disasters. From these articles, eight articles were not accessed as full-text, and 23 articles did not directly focus on the research question. Finally, 29 articles focusing on the research question composed the main sample of the present systematic review (2,3,5,7-32) (Table 1). The results of these studies were examined and are presented according to the physical effects, psychosocial effects, relocation trauma, and ethical aspects as main themes (Table 2).

Physical effects:

Older adults have less physiologic reserves when their body is stressed. Physiologic changes including decreased bone mass, diminished fat stores, loss of

subcutaneous tissues, and muscle atrophy leave an elderly body prone to more severe injuries (7, 17). Having chronic illnesses that need specific treatment interventions, slower reaction times, and difficulties in seeking assistance may increase their susceptibility to the impact of disasters (17).

Zhang et al. determined that during the Wenchuan earthquake, elderly victims who experienced being crushed by heavy debris more frequently developed acute kidney injury (AKI). Elderly patients with AKI requiring dialysis were at a relatively higher risk of mortality and had a greater incidence of pneumonia than younger patients. Sepsis was independently associated with mortality in the elderly (7).

In a study from Greece on the nutritional status of vulnerable groups who had experienced an earthquake, it was shown that dietary energy and protein intake in elderly were inadequate due to multiple physiological and psychological factors (8).

Furthermore, Brilleman et al. indicated in their article that exposure to a disaster could worsen disability by disrupting the adapted environment that individuals had crafted around themselves to mitigate physical risks for disability. Disasters may disrupt ongoing medical care for therapies ranging from daily insulin availability to longitudinal chemotherapy courses (14). Tomata et al. performed an ecological study to determine whether the disability prevalence among the elderly population increased after the Great East Japan earthquake. This analysis showed that disability prevalence in disaster-stricken areas increased more markedly over three years after the Great East Japan Earthquake (13). Wu et al. (2015) investigated the health status and health-related quality of life (HRQoL) of the elderly in the city of Bazhong after a major flood in 2011. The results indicated a marked decline in the health status among the elderly (27). Additionally, results of Zhu and Sun's study showed that in the 2008 Wenchuan earthquake and the 1995 Kobe earthquake, mortality rates were higher than that of children (17).

Psychosocial effects

Many survivors of disasters experience psychosocial problems in their adjustment to the loss of resources (e.g., housing and belongings) or loved ones. Post-traumatic stress disorder (PTSD) is the most frequently reported psychiatric morbidity among disaster victims. Numerous studies have documented the estimated rate of probable PTSD or PTSD symptoms among elderly people after disasters (10, 30-32). In a population-based sample of the 33,340 flood victims in China, Liu et al. reported that the risk of PTSD increased in older victims (31). Symptoms of PTSD, such as re-experiencing, emotional numbing and avoidance, and heightened arousal, are among the most commonly reported and examined mental health outcomes (10, 32). A longitudinal prospective quantitative study of 274 older Australians found that those who were affected by a flood reported significantly higher PTSD symptoms, with one in six reporting PTSD symptoms that might require clinical attention (32). Tanji et al. (2017) demonstrated that psychological distress was associated with an increased risk of functional disability among elderly survivors of a natural disaster (12).

There were several studies on the social vulnerability of the elderly in disasters (1,2,29). In Tuohy et al.'s study, social vulnerability was linked to three themes including personal protection, practical preparedness, and social preparedness (1). Cherry et al. found that perceived social support had a protective effect for all mental health outcomes, which also held for symptoms of depression and generalized anxiety disorder in multivariate models (2). Fatemi et al.'s systematic review highlights the indicators of social vulnerability in disasters. Elderly people living alone are dependent on others and are likely to require protection, financial support, transportation, medical care, access to medication, and assistance with ordinary daily activities during disasters (29).

In contrast to the above research, some research suggests that elderly disaster survivors are relatively resilient and tend to report fewer negative emotional effects and those prior experiences of disasters reduce adverse psychological effects (15, 26). Chronological age, life experience, and prior experience of coping with disasters may lead to many older adults having more coping resources and increased resilience. Rafiey et al. (2016) showed a higher level of positive mental health among elderly earthquake survivors compared to their younger counterparts in the wake of natural disasters, which suggests that advanced age per se does not contribute to increased vulnerability (26). Behavioral examples of older adults displaying resilience during disasters include providing support to family, friends, and the local community; assisting in disaster recovery; engaging with social networks to provide emotional support for other victims; and using the event as a source of spiritual growth or personal learning (15).

Relocation trauma

Studies have reported that the relocation of elderly inpatients increases their mortality risk (9,11). After the accident at the Fukushima Daiichi nuclear power plant, which followed the Great East Japan Earthquake, analysis showed excess mortality due to evacuation, which reflected increased vulnerability of institutionalized elderly to change and their need for special attention and care in disaster evacuations. Pneumonia was the most common cause of death, indicating the influence of poor living conditions during relocation (9).

Ethical aspects

A systematic review by Gutman and Yon highlights the ethical aspect of elderly vulnerability in disasters. They have reported that the elderly as a vulnerable group may be at the risk of exposure to ethical problems. Ethical problems include financial abuse, most commonly theft in shelters and contractor fraud, neglect (primarily abandonment), and actual physical abuse (domestic violence) (19).



Table 1. Studies of disaster vulnerability of the elderly.

Author/ publication date	Place	Design	Aim	Study period	Sample/ Specificities of population	Key findings
Magkos et al. (2004) (8)	Greece: Athens	Descriptive study	To assess the nutritional status of the homeless and identify the groups at risk of under-nutrition following the earthquake.	1999–2000	225 homeless and temporarily housed after the earthquake: 80 men, 145 women, Two major camps in the area: Aetos camp (tents, 47 men and 76 women) Kaputa camp (prefabricated houses, 33 men and 69 women).	Inadequate dietary energy and protein intake during Greece Earthquake.
Liu et al. (2006) (31)	China: Hunan	Descriptive study	To estimate the occurrence and to assess the determinants of post-traumatic stress disorder (PTSD) in flood victims.	2000	33,340 flood victims: A total of eight counties, 40 towns, 310 villages, 13,450 households, and 38,760 individuals aged seven years or older.	The risk of PTSD increased in older victims.
Spitzer et al. (2008) (30)	Germany	Descriptive study	To determine the risk of trauma exposure and subsequent PTSD in an elderly community sample.	2002–2006	3170 adults living in a German community within three age groups: young (44 years and younger; N = 997), middle-aged (45–64 years; N = 1322), and elderly (65 years and older; N = 851).	Higher rates of trauma exposure in older adults compared to younger and middle-aged adults. PTSD is not rare in the elderly and some may have a lifetime diagnosis of PTSD, which is associated with symptoms of depression and anxiety.
Zhang et al. (2012) (7)	China: Sichuan province	Descriptive study	To compare epidemiological and clinical features of crush-related acute kidney injury (AKI) between elderly and younger adults in the Wenchuan earthquake.	2008	17 reference hospitals: 228 patients, 211 adult patients aged between 15 and 96 years. 45(19.7%) old adults aged 65 years or older. 118(55.9%) men.	More frequent AKI and dialysis associated with relatively high risk of mortality. Greater incidence of pneumonia than younger patients. Sepsis associated with mortality.

Tuohy and Stephens (2012) (22)	New Zealand: Kaitiaki	Narrative interviews	To analyze stories told by older adults about their experiences of a flood disaster from a life-course perspective.	No information	Nine older adults: four participants lived in a rest home (two were male and two were female aged between their late 70s and late 80s); and five participants lived alone (two were male and three were female aged between their late 60s and late 70s).	Disasters became a reference point for previous challenging experiences, which created biographical continuity, coherence, and order over time.
Kun et al. (2013) (10)	China: Wenchuan	Descriptive study	To estimate the prevalence of PTSD and assess determinants related to PTSD symptoms among adult earthquake survivors.	2008	2004 respondents from households (91% participation rate). The median age of participants was 35.2 years, and the mean age was 36.1 years (range 15–80 years).	Older age was an independent risk factor for PTSD symptoms in heavily damaged areas.
Yasumura et al. (2013) (9)	Japan: Fukushima	Descriptive study	To report data on excess mortality among relocated institutionalized elderly after the nuclear disaster.	2011	1,770 institutionalized elderly at 34 community facilities: Seventy percent (207/295) of the deaths after the disaster occurred among women, and 93% (244/262) of deaths occurred in individuals aged ≤75 years.	Excess mortality reflecting the vulnerability of institutionalized elderly to disaster evacuation. Pneumonia was the most common cause of death.
Claver et al. (2013) (5)	US: New Orleans, Gulfport, Biloxi, Houston	Qualitative case study	To provide information about the evacuation experiences and characteristics of vulnerable nursing home residents.	2007	Thirteen nursing home administrative and clinical staff and medical center administrators: Eight of whom held primarily administrative roles at the time of the hurricanes, two of whom had a clinical role, and three of whom characterized their role as both administrative and clinical.	Physical harm, psychological distress, cognitive decline, and increased social isolation were areas deserving special attention for this vulnerable population.
Beiet al. (2013) (32)	Australia: Victoria, New South Wales	Longitudinal prospective study	To examine the impact of floods on the mental and physical health of older adults and explored risk and protective factors.	2010	274 older adults: Mean age of 71.69; most were married or in de facto relationships (80.9%); over half (64.8%) were retired.	Those who were affected by a flood (21%) reported significantly higher PTSD symptoms, with one in six reporting PTSD symptoms that might require clinical attention.



Gutman and Yon (2014) (19)	An electronic search of the databases.	Systematic review	To provide an overview of what is known about elder mistreatment in disaster situations, identify research gaps, and discuss possible policy interventions.	2012	A total of 19 articles, chapters, reports, and one dissertation that mentioned elder mistreatment during or in the aftermath of a disaster.	The types of abuse most commonly occurring included financial (theft in shelters and contractor fraud), neglect (primarily abandonment), and physical abuse (domestic violence). Three central themes were identified: personal protection, practical preparedness, and social preparedness. The findings provide future practical direction for age specific preparedness planning during non-disaster times, which will also assist with improving outcomes for independent older adults during and after a disaster.
Tuohyet al.(2014) (18)	New Zealand: Canterbury	Qualitative study	To understand the meanings of preparedness from a sample of older adults who experienced the Canterbury earthquakes.	2012	10 older adults aged between 66 and 90 years (median age 80 years)	A marked decline in health status among elderly.
Wu et al. (2015) (27)	China: Bazhong	Cross-sectional survey	To provide assessment of post-disaster health-related quality of life (HRQoL) and the underlying associated factors among the elderly in the flood-affected Southwest China.	No information	1,183 elderly: The mean age was 68.9±7.8 years (range 60–99 years); male-to-female ratio was 1.4:1. Most of the participants received primary education (73.8%) or below.	
Tomata et al. (2015) (13)	East Japan	Ecological study	To examine the increase in the rate of disability prevalence among the older population during the three years after the Great East Japan Earthquake.	2010–2014	1,570 municipalities: Mean number of insured elderly persons aged 65 years was 19,346 in the coastal disaster areas, 9787 in the inland disaster areas, and 18,969 in the non-disaster areas.	The mean rate of increase in disability prevalence in coastal and inland disaster areas was higher than that in non-disaster prone areas.

Miller and Brockie (2015) (15)	Australia: Queensland	Qualitative study	To explore the individual experiences of older adults during the Queensland floods.	2013	10 older adults: Aged over 65 years, lived independently in their homes and had been evacuated in both the 2011 and 2013 Queensland floods.	Poems highlight the different social resources older people have to draw on in their lives, especially during a crisis, and how they are supported.
Cherry et al. (2015) (2)	US: Louisiana	Descriptive study	To examine long-term psychological outcomes in older adults after disaster.	No information	219 older residents of disaster-affected communities in south Louisiana.	Non-organizational religiosity was a significant predictor PTSD. Low income was a significant predictor of depression symptoms. Perceived social support had a protective effect for all mental health outcomes.
Al-rousan et al. (2015) (28)	US	Cohort study	To determine natural disaster preparedness levels among older US adults and assess factors that may adversely affect health and safety during such incidents.	2010	1,304 older adults; the average age was 70.2 years. Most had an educational attainment beyond a high-school diploma (79.0%), and 25.7% lived alone.	Preparedness scores indicated that increasing age, physical disability, lower educational attainment, and income were independently and significantly associated with poorer overall preparedness.
Rafey et al. (2016) (26)	Iran: East Azerbaijan	Cross-sectional survey	To examine the post-disaster mental health differences between elderly and younger adult survivors after an earthquake in Iran.	2015	324 earthquake survivors: The elderly group comprised 56 elderly persons aged ≥ 60 years. The young group (aged 18–30 years) included 268 respondents.	A higher level of positive mental health among elderly earthquake survivors compared to their younger counterparts in natural disasters.
Nomura et al. (2016) (11)	Japan: Fukushima	Descriptive study	To assess associations between evacuation and mortality after the Fukushima nuclear incident.	2013	1,215 residents admitted to seven elderly care facilities: 409 elderly are female. 262 elderly are at the ages of 80–89 years	Initial evacuation from the original facility associated with 3.37 times higher mortality risk than non-evacuation.



Kwok and Ku (2016) (16)	China: Hong Kong	Cohort study	To challenge the dominant biomedical discourse on aging, neglecting the integrative and cultural perspectives that provide a meaningful understanding of human aging.	No information	Eight older adults between the ages of 75 and 93.	The study participants had struggled for survival through unprecedented political disasters and social turmoil in their youth.
Annear et al. (2016) (20)	Japan: Kansai, Okinawa and Tohoku	Descriptive study, Constitution of a scale	To explore perceptions of vulnerability to disasters in the context of population aging. To test the reliability and validity of the Perceptions of Ageing and Disaster Vulnerability Scale (PADVS)	2016	172 health students and professional; over 75% of the cohort were undergraduate nursing students, and the majority were women.	The PADVS provides a reliable and valid measure. Results of PADVS completion showed clear respondent concerns about social isolation, lack of support networks, and poor functional capacity among older adult populations.
Sugano (2016) (23)	East Japan	Quasi-experimental	To explore the wellbeing of elderly survivors after natural disasters	No information	4,619 survivors of the 2009 wave, 3,572 survivors of the 2011 wave and earthquakes	The results by difference-in-difference estimation show that there was a significant impact on expenditure and employment, but little significant impact on subjective well-being or health.
Tsukasaki et al. (2016) (25)	Eastern and Western Japan	Semi-structured survey	To clarify preparedness measures and the support necessary to protect the health of community-dwelling vulnerable elderly people in natural disasters by analyzing their status and the challenges they face.	2013	Centers managed or contracted by municipalities and are operated by three types of professionals: care managers, social workers, and nurses; 304 centers responded (response rate, 20.5%).	The disaster preparedness of elderly users requiring support was insufficient in 150 (51.9%) centers.

Tanji et al. (2017) (12)	East Japan	Prospective cohort	To examine whether psychological distress would have increased the incident risk of functional disability among elderly survivors after the Great East Japan Earthquake.	2011–2014	1,037 older residents: Mean age was 73.8; 45.8% elderly were men.	Psychological distress was associated with an increased risk of functional disability among elderly survivors of a natural disaster.
Brockie and Miller (2017) (3)	Australia: Queensland	Qualitative study	To explore older residents' experiences of floods.	2013	10 older residents: Six women and four men who were evacuated from their homes during both the 2011 and 2013 Queensland floods. Average age of 73 years (ranging from 67 to 83 years).	Many older people had lived through multiple floods and were just beginning to acknowledge how aging, specifically their increasing frailty, was changing and impacting their ability to prepare, respond to, and recover from a severe weather event.
Brilleman et al. (2017) (14)	US Federal Emergency Management Agency	Longitudinal and time to event (Joint modeling approach)	To determine associations between community-level disaster exposure and individual-level changes in disability and death risk for older Americans.	2000–2010	18,102 American individuals aged 50–89 years, who were participating in the national longitudinal Health and Retirement Study.	There was no evidence of an association between community-level disaster exposure and individual-level changes in disability of risk of death.
Zhu and Sun (2017) (17)	China: Wenchuan Japan: Kobe	Descriptive study	To evaluate whether age has an impact on mortality rate, explores age groups with the greatest vulnerabilities of the earthquake.	2008–2010	Age groups from the 2008 Wenchuan and 1995 Kobe Earthquakes	There was greater significance in the relationship between people over 75 years of age and the mean mortality rate than that of children.
Howard et al. (2017) (21)	Australia: New South Wales	Qualitative study	To report experiences and expectations of vulnerable groups including older people.	2014	111 community members in 17 focus groups: Female (70%); male (30%); people over the age of 65 years (37%), people with disabilities (31%).	Three core themes emerged: trust, hope, and source credibility; preferred communicative technologies; and clarity and confusion during a crisis.



<p>Astill (2017) (24)</p>	<p>Australia: Queensland</p>	<p>Exploratory, mixed methodologies, phenomenological approaches</p>	<p>Focusing on the experience of more vulnerable older residents, the aim of this research was to explore how regional Australian coastal communities have coped with repeated natural disasters.</p>	<p>2014–2015</p>	<p>Senior respondents aged 65 years or older (N = 36, 17 men and 19 women); Emergency services officers (N = 10); community healthcarers (N = 7); local government disaster managers (N = 4).</p>	<p>Post-disaster political decisions have had a negative long-term impact on local economies, causing out-migration by those seeking employment and resulting in many elderly residents facing a future without family support.</p>
<p>Fatemi et al. (2017) (29)</p>	<p>Bibliographies, citation databases, and other available records</p>	<p>Systematic review</p>	<p>To review the social vulnerability indices and their validity in disasters within the period 1985–2015 and to develop a suitable classification to make sense of social vulnerability indices in the Iranian context.</p>	<p>2015</p>	<p>43 peer-reviewed English and Persian language journals. Excluding snowball material, all other sources of written material were obtained using the same search strategy.</p>	<p>The study highlights the indicators of social vulnerability in disasters. People aged 65 years and above are also likely to be more vulnerable to disasters and require special treatment by disaster response planners and operational officers.</p>

Table 2. Features and factors associated with disaster vulnerability of elderly people.

Features/factors associated with disaster vulnerability of the elderly
<p>Physical aspects</p> <ul style="list-style-type: none"> ✓ Physiologic changes leave an elderly body prone to more severe injuries. Older adults have less physiologic reserves when their body is stressed (7). ✓ Elderly victims who experienced disaster more frequently developed acute kidney injury and pneumonia than younger patients did (7). ✓ Elderly are at higher risk of nutritional deficiencies due to multiple physiological and psychological factors (8). ✓ There is marked decline in the health status among the elderly after disasters (27). ✓ The elderly has higher risk of mortality in disasters (7,17). ✓ Exposure to a disaster might worsen the disabilities among the elderly (13). ✓ Disasters may disrupt ongoing medical care for therapies (14).
<p>Psychosocial aspects</p> <ul style="list-style-type: none"> ✓ Many survivors of natural disasters experience psychosocial problems in their adjustment to the loss of resources or loved ones (10). ✓ Post-traumatic stress disorder is the most frequently reported psychiatric morbidity among victims of disasters (10,30-32). ✓ Psychological distress was associated with an increased risk of functional disability among elderly survivors of a natural disaster (12). ✓ Some research suggests that elderly disaster survivors are relatively resilient and tend to report fewer negative emotional effects and those prior experiences of disasters reduce adverse psychological effects (15,26). ✓ Older adults emphasized social preparedness, which highlighted the importance of social relationships and social support as important for maintaining wellbeing during the ongoing earthquake sequence (1). ✓ Perceived social support had a protective effect for all mental health outcomes, which also held for symptoms of depression and generalized anxiety disorder in multivariate models (2). ✓ Elderly people living alone depend on others and are likely to require protection, financial support, transportation, medical care, access to medication, and assistance with ordinary daily activities during disasters (29).
<ul style="list-style-type: none"> ✓ Relocation trauma ✓ Relocation of elderly inpatients increases their morbidity and mortality risk (9,11). ✓ Pneumonia was the most common cause of death, indicating the influence of poor living conditions (low temperature and poor nutrition) during relocation (9).
<p>Ethical aspects</p> <ul style="list-style-type: none"> ✓ The elderly may be exposed to more ethical problems as vulnerable populations during and after disasters (19). ✓ Ethical problems include financial abuse, most commonly theft in shelters and contractor fraud, neglect (primarily abandonment), and actual physical abuse (domestic violence) (19).

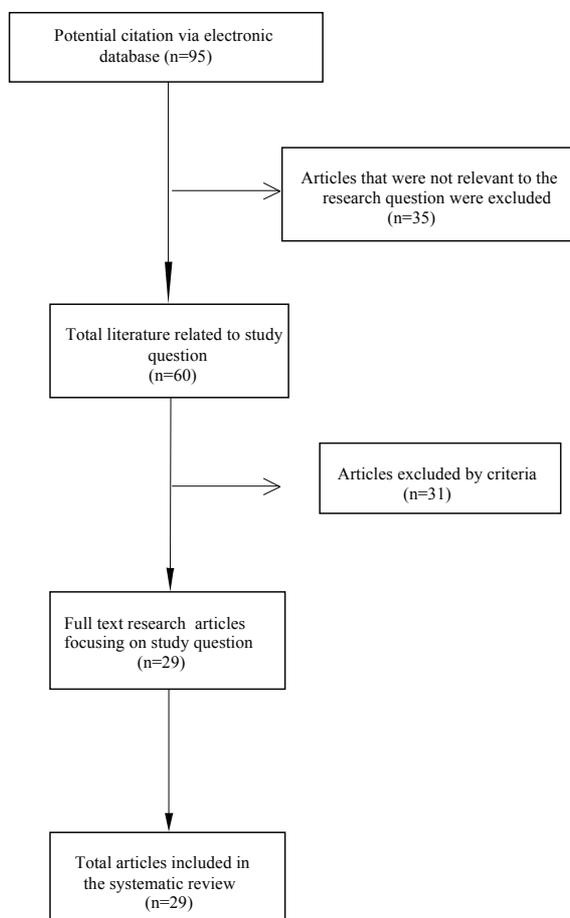


Figure 1. Flow diagram of the search and selection of papers.

DISCUSSION

The literature review revealed a number of researches concerning the vulnerability of elderly people in disasters. The older age group is more vulnerable to the negative impacts of disasters due to the biological, psychological, and social changes associated with aging. The present review encompasses studies focusing on the physical and psychosocial effects of disasters on the elderly; however, a study gap appears with regard to the ethical aspects of elderly vulnerability (2,3,5,7-32).

Physical factors such as having chronic illnesses that need specific treatment interventions, changes

in organ functions, weakened physical health, decreased sensory awareness, mobility issues, slower reaction times, nutritional deficiencies, and disability are the main contributing factors of vulnerability of elderly in disasters (7,8,13,14,27). Therefore, frequent assessment is needed by healthcare providers who can identify decompensating factors in older adults. Disaster plans should address nutritional, medical/medication, and care-giving needs of elderly people (8,27).

Elderly people experience psychological problems including PTSD and social problems regarding personal protection, practical preparedness, and social preparedness in disasters (10,30-32). Effective, sustainable, and culturally sensitive psychosocial

interventions and mental health services are required with particular attention directed to older adults after a disaster (10). Despite the vulnerability, elderly disaster survivors may be relatively resilient and tend to report fewer negative emotional effects (15,26). The knowledge and experience of older people can be considered while developing coping strategies in post-disaster settings. They should be involved in the development of disaster prevention, preparedness, and management programs and seriously recognized as valuable resources for communities (26).

Relocation of elderly people during disasters increases their vulnerability (9,11). Evacuation planning must consider the comprehensive needs of the elderly population, including biological, psychological, and social considerations including the wellbeing and HRQoL of older adults(9).

Ethical problems including financial abuse, neglect, and physical abuse among elderly people in disasters require careful consideration. Training and awareness programs for first responders are needed to raise their awareness so that they can better recognize seniors who might have come from abusive environments, thereby preventing abuse in emergency housing where seniors will be relocated (19).

The present systematic review has certain limitations. First, many types of study were included in this review. This led to heterogeneity among their methodologies, specifically variations in sample

size, chosen variables, and results. This may be interpreted as a limitation of the review in terms of difficulty in analysis and the comparisons of the methodologies, results and validities of the included studies. Second, the review was limited to English-language literature only with in a small number of databases and countries. Another limitation was the lack of generalization of the results obtained from qualitative studies.

In conclusion, this systematic review highlights studies on the vulnerability of elderly people in disasters, with the intent of helping establish appropriate disaster-management plans. Although this review has limitations, information gathered in the study may be significant for developing disaster-management strategies. With the expected increases in disasters and the aging of the population, the vulnerability of the elderly in disasters will become an important topic for further investigation. The health of this vulnerable population is frequently worsened by disasters, and there is a higher incidence of fatal consequences. Comprehensive disaster preparedness is important to improve outcomes for older adults during and after a disaster. Using the bio-psychosocial framework will allow administrators to adapt to the elderly populations' specific combinations of needs and risks. Governments, healthcare professionals, and epidemiologists must make efforts to diminish negative impacts on the elderly and improve elderly care.

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