ISSN: 1304-2947
e-ISSN: 1307-9948

TÜRK GERİATRİ DERNEĞİ
2003
TURKISH GERIATRICS SOCIETY

Turkish Journal of Geriatrics

20/4 2017

www.turkgeriatri.org

The Official Scientific Journal of Turkish Geriatrics Society

www.turkgeriatri.org

ISSN: 1304-2947 • e-ISSN: 1307-9948

The official scientific journal of Turkish Geriatrics Society

Member of IAGG

OWNER
On Behalf of Turkish Geriatrics Society
Yeşim **GÖKÇE-KUTSAL**

EDITORIAL MANAGER
Orhan **YILMAZ**

TECHNICAL ASSISTANCE
Selma **ÜNAL**

"Turkish Journal of Geriatrics" is indexed in: Science Citation Index Expanded (Sci Search), Journal Citation Reports/Science Edition, Social Sci Search, Journal Citation Reports/Social Sciences Edition, Index Copernicus Master List, EMBASE, SCOPUS, ELSEVIER, EBSCO and "Turkish Medical Index" of Turkish Academic Network and Information Center in The Scientific and Technological Research Council of Turkey (TÜBİTAK-ULAKBİM), Turk Medline and Turkey Citation Index.

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

CORRESPONDANCE
Turkish Geriatrics Society
www.turkgeriatri.org
info@geriatri.org
www.geriatri.dergisi.org
editor@geriatri.dergisi.org

Date of Publication: 15 December 2017

Turkish Journal of Geriatrics

2017
20/4

TURKISH JOURNAL OF GERIATRICS

Turkish Journal of Geriatrics is a peer-reviewed journal and is devoted to high standards of scientific rules and publication ethics. The Editors of the Journal accepts to follow 'Editorial Policy' of the 'Council of Science Editors' (www.councilscienceeditors.org/). Any article published in the journal is also published in electronic format and is shown at http://www.geriatri.org.

Instructions for authors are based on the report of International Committee of Medical Journal Editors [(Last Version)- (Uniform Requirements for manuscripts Submitted to Biomedical Journals, www.icmje.org].

INSTRUCTIONS FOR AUTHORS

www.geriatri.dergisi.org

Turkish Journal of Geriatrics is on official publication of Turkish Geriatrics Society and is published four times a year. Official languages of the journal are Turkish and English. Turkish Journal of Geriatrics invites submission of Original Articles based on clinical and laboratory studies, Review Articles including up to date published material, Original Case Reports, Letters to the Editor and News and Announcements of congress and meetings concerning all aspects of Geriatrics, Aging and Gerontology and related fields.

Manuscripts should be submitted online at www.turkgeriatri.org.

Adress for e-collitera author guide (communication to author's module, registration to system, entry into the system and sending a new article) is: www.geriatri.dergisi.org

Attention ! Last Control Before Submission
(Checklist for Submitted Articles)

1. Letter of submission written for editor.
2. E-mail address as well as postal address, official telephone and mobile phone number for corresponding author
3. Affiliations of all authors
4. Copyright Release Form (will be sent via mail with all of the authors' signature)
5. Copy of Ethical Committee Approval (will be sent via mail)
6. Signed "informed consent form" for the case reports
7. English language editing certificate
8. Turkish and English heading
9. Structured Abstract (Both in Turkish and English) (250 words at maximum)
10. Keywords in accordance with Medical Subjects Headings List (up to 6)
11. Article divided into appropriate sections (1500-3500 words)
12. All figures (with legends) and tables (with titles) cited
13. Complete and accurate references (all references cited in text by numbers in brackets; references should be 25 at maximum with the PMID numbers)

From The Editor In Chief

This journal contains a number of contributions from scientists and clinicians actively involved in research on aging, providing us with stimulating insights into and a new understanding of the multifaceted and complex issues of the aging population.

On this basis, we would cordially thank not only to our writers, but the below 2017 term reviewers of our journal who gave valuable constructive criticism to the authors and helped to improve the journal, as well.

Prof. Dr. Cengizhan AÇIKEL, Prof. Dr. Hamdi AKAN, Prof. Dr. Asena AKDEMİR, Assoc. Prof. Dr. Özlem ERDEN AKI, Prof. Dr. Emine AKSOYDAN, Assoc. Prof. Dr. Aslı ALTAYKAN HAPA, Assoc. Prof. Dr. Defne ALTINTAŞ, Prof. Dr. Ayşe ANIL KARABULUT, Assoc. Prof. Dr. Çoşkun ARAZ, Prof. Dr. Berna ARDA, Prof. Dr. Sadık ARDIÇ, Assoc. Prof. Dr. Didem ARSLANTAŞ, Prof. Dr. Dilek ASLAN, Prof. Dr. Vildan AVKAN OĞUZ, Prof. Dr. Pınar AYDIN O'DWYER , Assoc. Prof. Dr. Tolga Reşad AYDOS , Assoc. Prof. Dr. Demir BAJİN, Prof. Dr. Okay BAŞAK, Prof. Dr. Mehmet Murad BAŞAR, Assoc. Prof. Dr. Başak BAYRAM, Prof. Dr. Mehmet BEYAZOVA, Prof. Dr. Kutay BİBEROĞLU , Prof. Dr. Banu BOZKURT , Prof. Dr. Selçuk BÖLÜKBAŞI, Assoc. Prof. Dr. Deniz CANEL ÇINARBAŞ, Prof. Dr. Banu CANGÖZ, Prof. Dr. Murat CİVANER, Assoc. Prof. Dr. Didem DİNCER ROTA, Prof. Dr. Nurper ERBERK-ÖZEN, Prof. Dr. Erhan ESER, Prof. Dr. Sibel EYİGÖR, Prof. Dr. Ayşe GELAL, Prof. Dr. Gloria GUTMAN, Prof. Dr. Ayşe GÜL GÜVEN, Assoc. Prof. Dr. Ceyda GÜLTER KABAROĞLU, Prof. Dr. İlhan GÜNAY, Prof. Dr. Rezzan GÜNAYDIN, Assoc. Prof. Dr. Haldun GÜNDOĞDU, Prof. Dr. Rengin GÜZEL, Prof. Dr. Gülşen HASÇELİK, Prof. Dr. Nur HERSEK, Prof. Dr. Kenan HIZEL, Assoc. Prof. Dr. Müjgan İNÖZÜ, Prof. Dr. Fuat KALYONCU, Prof. Dr. Ergun KARAAĞAOĞLU, Prof. Dr. Erdem KARABULUT, Prof. Dr. Aysen KARADUMAN, Assoc. Prof. Dr. Sevilay KARAHAN, Prof. Dr. Ayşe KARS, Asst. Prof. Dr. Selda Pelin KARTAL, Prof. Dr. Pembe KESKİNOĞLU, Prof. Dr. Hakan KUMBASAR, Dr. Mahir KUNT, Prof. Dr. Haviye NAZLIEL ERVERDİ, Prof. Dr. Demet OFLUOĞLU, Prof. Dr. Dilek OĞUZ, Assoc. Prof. Dr. Kutay ORDU GÖKKAYA, Assoc. Prof. Dr. M. Tahir ORUÇ, Prof. Dr. Sinan ÖZALP, Prof. Dr. Murat ÖZBEK, Prof. Dr. Zeynep Alev ÖZÇETE, Assoc. Prof. Dr. Nurettin ÖZGÜR, Prof. Dr. Zerrin ÖZKÖSE, Prof. Dr. Şerefnur ÖZTÜRK, Dr. Sercan ÖZYURT, Prof. Dr. Neslişah RAKICIOĞLU, Prof. Dr. İskender SAYEK, Prof. Dr. Meral SAYGUN, Assoc. Prof. Dr. Fisun SÖZEN, Prof. Dr. Hülya SUNGURTEKİN, Dr. Meltem ŞENGELEN, Prof. Dr. Alpaslan ŞENKÖYLÜ, Prof. Dr. Ahmet TEMİZHAN, Prof. Dr. Füsun TORAMAN, Asst. Prof. Dr. ZAHİDE TUNA, Prof. Dr. Ali Rıza TÜMER, Prof. Dr. Reyhan UÇKU, Prof. Dr. Canan ULUOĞLU, Prof. Dr. Ömer Faruk ÜNAL, Doç. Dr. Oya ÜNAL ÖZDEMİR, Prof. Dr. Songül VAİZOĞLU, Assoc. Prof. Dr. İlker YAĞCI, Prof. Dr. Başak YALÇIN, Assoc. Prof. Dr. Orhan YILMAZ, Prof. Dr. Kaya YORGANCI, Prof. Dr. İrfan YORULMAZ, Assoc. Prof. Dr. Neslihan YÜCEL.

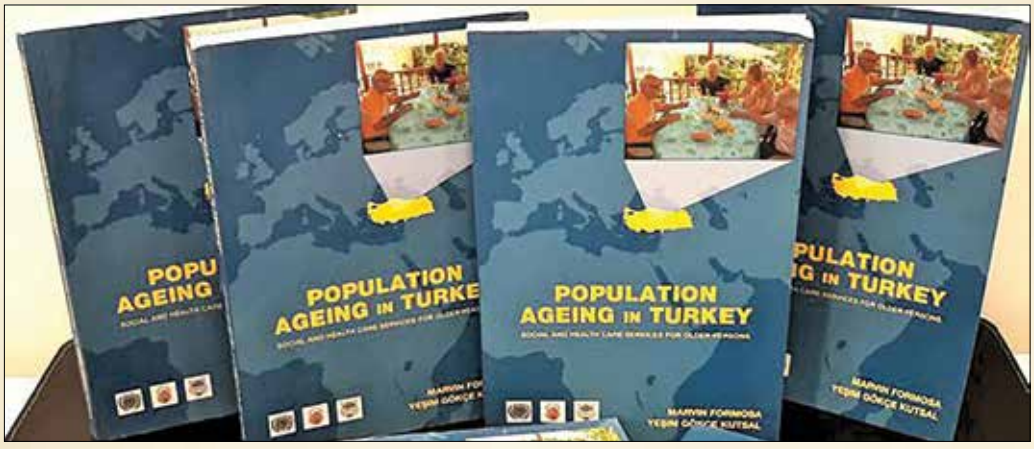
Prof. Dr. Yeşim GOKCE KUTSAL, M.D.
Editor in Chief

Turkish Journal of Geriatrics

Contents

2017; 20(4)

www.turkgeriatri.org



These books are prepared by the scientific board of Turkish Geriatrics Society. Visit the web site for details:

www.turkgeriatri.org

Turkish Journal of Geriatrics
2017;20 (4):254-263

- Hüseyin ELBİ[1]
- Adnan BİLGE[2]
- Halil İbrahim DAYANGAÇ[2]
- Onur DİKMEN[2]

RESEARCH

PREDICTING THE 28-DAY MORTALITY RATE IN ELDERLY PATIENTS WITH COMMUNITY-ACQUIRED PNEUMONIA: EVALUATION OF 11 RISK PREDICTION SCORES

Abstract

Introduction: Community-acquired pneumonia frequently causes infectious disease-related morbidity and mortality among patients. Elderly patients are at a higher risk of developing severe Community-acquired pneumonia due to underlying diseases and changes in health status. We evaluated the performance of existing risk scores for predicting the 28-day mortality rate in elderly patients presenting with Community-acquired pneumonia to Emergency Department.

Materials and Method: We evaluated 151 elderly patients [mean age, 76.6±7.8 years (range, 65–94 years); 65.6% men] with Community-acquired pneumonia. There were 30 deaths by day 28, with an all-cause mortality rate of 19.9%. All scores, except the CAP-PIRO, achieved an area under the receiver operating characteristic curve >0.700. Z-test was used to determine significant differences between the scores.

Results: We evaluated 151 elderly patients [mean age, 76.6±7.8 years (range, 65–94 years); 65.6% men] with Community-acquired pneumonia. There were 30 deaths by day 28, with an all-cause mortality rate of 19.9%. All scores, except the CAP-PIRO, achieved an area under the receiver operating characteristic curve >0.700. Z-test was used to determine significant differences between the scores.

Conclusion: Of the existing scores, 4 had good discriminatory power to predict the 28-day mortality rate. The best discrimination was demonstrated by CURB-age, a score designed for elderly patients with Community-acquired pneumonia. Additional research is necessary to determine the best risk score for predicting early mortality rates in elderly patients with Community-acquired pneumonia.

Key Words: Aged; Pneumonia; Mortality

Correspondance

Hüseyin ELBİ
Celal Bayar University, School of Medicine
Department of Family Medicine
MANİSA

Phone: 05055569911
e-mail: hsynelbi1@hotmail.com

Received: 11/09/2017
Accepted: 24/11/2017

[1] Department of Family Medicine
Celal Bayar University, Faculty of Medicine
MANİSA
[2] Department of Emergency Medicine
Celal Bayar University, Faculty of Medicine
MANİSA

This article was presented as a poster at the EUGMS Congress 2017, Nice (France).

ARAŞTIRMA

TOPLUM KÖKENLİ PNÖMONİLİ YAŞLI HASTALARDA 28 GÜNLÜK MORTALİTE ORANININ ÖNGÖRÜLMESİ: 11 RİSK TAHMİN SKORUNUN DEĞERLENDİRMESİ

Öz

Giriş: Toplum Kökenli Pnömoni sıklıkla bulaşıcı hastalığa bağlı morbidite ve mortaliteye neden olur. Yaşlı hastalarda, altta yatan hastalıklar ve sağlık durumundaki değişiklikler nedeniyle ciddi Toplum Kökenli Pnömoni gelişme riski yüksektir. Topluluk kökenli pnömoni ile acil servise başvuran yaşlı hastalarda 28 günlük mortaliteyi öngörmede mevcut risk skorlarının performansını değerlendirdik.

Gereç ve Yöntem: Manisa Celal Bayar Üniversitesi Hastanesi Acil Servis Ünitesine başvuran, Toplum Kökenli Pnömoni tanılı 65 yaş ve üzeri hastaların kayıtlarını retrospektif olarak incelendik. Tüm hastaların başvurularından 28 gün sonraki sonuçları değerlendirildi. Toplum Kökenli Pnömonili hastalar için 11 risk prediksiyon skorunun ayırt edici performansı alıcı işletim karakteristiği eğrisi altındaki alan kullanarak değerlendirildi.

Bulgular: Toplum kökenli pnömoni tanısı olan 151 [ortalama yaş, 76.6±7.8 yıl (aralık 65-94 yıl); % 65.6 erkek] yaşlı hastayı değerlendirdik. 28 günlük izlemler boyunca 30 ölüm vardı, tüm nedenlere bağlı ölüm yüzdesi 19.9 idi. CAP-PIRO hariç tüm puanlar makul bir ayırt edici performansı eğrisi altı alana ulaştı. Skorlar arasındaki anlamlı farkları belirlemek için Z-testi kullanıldı.

Sonuç: Mevcut skorların 4'ü 28 günlük mortaliteyi tahmin etmek için iyi bir ayırt edici performansı eğrisi altı alana sahipti. En iyi ayırt etme gücü yaşlı Toplum Kökenli Pnömonili hastalar için tasarlanmış bir puan olan CURB-age tarafından gösterildi. Toplum kökenli pnömonili yaşlı hastalarda erken mortaliteyi tahmin etmede en iyi risk skorunu belirlemek için ek araştırmalar gereklidir.

Anahtar Sözcükler: İleri yaş; Pnömoni; Mortalite

INTRODUCTION

Community-acquired pneumonia (CAP) is the most frequent cause of infectious disease-related hospitalization, morbidity, and mortality among patients of all ages (1). Elderly patients are at a higher risk of developing severe CAP due to underlying heart and respiratory disease, changes in mental status, and immunosuppression (2).

The first stage in the management of patients with CAP is to assess the severity of the disease and estimate the potential clinical course. This information helps in making critical decisions regarding therapeutic interventions, required laboratory tests, and site of care (3). Delayed transfer to the intensive care unit (ICU) or unnecessary admission to a hospital increases the risk of secondary complications, such as thromboembolic events and nosocomial superinfection, which further increase the risk of poor outcome (4).

The decision regarding the site of care is the first important point to consider in CAP management. Therefore, several clinical and prognostic scoring tools have been developed to safely and reliably predict the feasibility of treatment in an outpatient setting as well as the need for hospitalization or ICU admission and risk of death (4). The study aimed to evaluate 11 pneumonia severity scores to determine their effectiveness in predicting the 28-day mortality in elderly patients with CAP.

MATERIALS AND METHOD

Setting and design

This retrospective cross-sectional study was conducted at the emergency department (ED) of Celal Bayar University Hospital in Manisa, Turkey. Consecutive elderly patients with the diagnosis of CAP admitted to the ED between July 2013 and April 2015 were included. Data required for risk prediction scores were extracted from the hospital's electronic medical record and related electronic databases by 1 emergency medicine resident using a standardized data extraction form. The local ethic committee approval was obtained (reference no. 20.478.486-408).

Clinical scores

Due to the increasing costs associated with CAP, the Pneumonia Severity Index (PSI) was introduced to help predict which patients do not need hospitalization and those with lower risk of mortality (5). The PSI is based on evaluation of >20 clinical and laboratory parameters. Due to its complexity, the British Thoracic Society developed CURB-65 to simplify the evaluation of patients with pneumonia. Although both PSI and CURB-65 are good predictors of mortality and identifiers of lower-risk patients, a new scoring method was needed to identify patients requiring intensive care. Hence, the Infectious Disease Society of America and the American Thoracic Society developed the IDSA-ATS criteria for this purpose (6). CAP severity was graded baed on data extracted from the records according to the pneumonia severity scores: PSI (5), CURB-65 (7), IDSA-ATS (6), SMART-COP (8), CAP-PIRO (9), SCAP, CURXO-80 (10), ADROP (11), CRB-65, CORB-75 (12), and CURB-age (7).

Selection of participants

Patients who were aged ≥65 years of age and diagnosed with CAP were included. Exclusion criteria were readmission; diagnosis of hospital-acquired pneumonia (HAP), health care-associated pneumonia (HCAP), or aspiration pneumonia; the presence of active pulmonary tuberculosis; known human immunodeficiency virus positivity; or the presence of chronic immunosuppression.

Data collection

At the time of ED presentation, information regarding age, sex, whether living at home or in a nursing home, comorbid diseases, and medications were obtained from the patients. Additional parameters such as initial blood pressure, pulse rate, respiratory rate, peripheral oxygen saturation on room air, body temperature, and presence of mental confusion were recorded. Additionally, ED laboratory data, chest X-ray or chest computed tomography findings; ICU admission; requirement for mechanical ventilation; hospital length of stay (LOS); and death within 28 days were recorded.

The primary outcome was all-cause mortality within 28 days of presentation. Secondary outcomes were hospitalization, ICU admission, mechanical ventilation requirements, and hospital LOS. Local civil records were also reviewed for deaths occurring outside the hospital.

Statistical analysis

At the end of 28 days, Fisher's exact test was used to determine differences between survivors and non-survivors, and the Wilcoxon/Kruskal-Wallis rank sum tests were used for non-normally distributed data. Logistic regression was used for multivariate analyzes. The area under the curve (AUC) was calculated to compare the accuracy of each score for predicting 28-day mortality. AUC, Z-value, and 95% confidence interval of the receiver operating characteristic (ROC) curves were calculated for all severity scores. Statistical analyses were performed using the SPSS, version 15.0 and MedCalc, version 12.

RESULTS

Of 190 consecutive elderly patients presenting to the ED with pneumonia, 15 were diagnosed with HAP, and 11 with HCAP, 7 were immunocompromised, and 6 had recurrent pneumonia, leaving 151 participants. Their mean age (standard deviation) was 76.6 (7.8) years, and 99 (65.6%) were male. During the initial 28 days, a total of 30 patients died. The mean length of survival among patients who died during the follow-up period was 12 days (range: 1–28 days). Overall, 105 patients were hospitalized while 46 were discharged from the ED and followed as outpatients. For secondary outcomes, 23.2% were admitted to the ICU, 16.6% required mechanical ventilation, and mean hospital LOS was 6.1±7.2 days. Table 1 shows the comparison of baseline characteristics and patient status at the end of the 28-day follow-up period. The most frequent comorbid diseases were chronic heart disease (56.3%), chronic lung disease (49.7%), and neoplasm (18.5%). Additionally, a history of chronic lung disease, chronic renal failure, and dementia were associated with a high risk of death ($P = 0.005$, $P = 0.016$, and $P = 0.031$, respectively). In the analysis aimed at correcting age-related diseases affecting mortality; it was found that deaths were higher 3.04 times for those with dementia, 5.85 times for those with CBI, and 3.41 times for those without COPD. Significant differences were found between survivors and those who died in terms of blood urea nitrogen, creatinine levels, and mean platelet volume ($P < 0.001$, $P = 0.009$, and $p < 0.001$, respectively). Table 2 shows a comparison of the results of the 11 clinical scores for survivors and those who died.

The sensitivity and specificity of the scores were demonstrated using ROC curves (Fig. 1). With the exception of CAP-PIRO, all scores had an AUC ≥0.700, a threshold that designates fair discriminating ability. The CURB-age had the best performance with an AUC of 0.836 (Table 3). Three other scores that performed well were SCAP, IDSA-ATS, and CURXO-80 (AUC was 0.833, 0.822, 0.805, respectively). The Z-test did not show significant differences among the AUC values except for CURB-age versus CAP-PIRO. Z-test statistics and P values are shown in Table 4.

Table 1. Baseline characteristics of the 151 study subjects, categorized with respect to the center of origin.

Variables	Survivors (n = 121)	Nonsurvivors (n = 30)	p
Demographic data			
Age (y)	76.5±7.7	77.1±8.5	0.709
Women/Men (n)	42/79	10/20	0.887
Previous medical history			
Diabetes mellitus	21 (17.4)	5 (16.7)	0.929
Chronic heart disease	69 (57.0)	16 (53.3)	0.715
Chronic pulmonary disease	67 (55.4)	8 (26.7)	0.005
Chronic renal failure	4 (3.3)	5 (16.7)	0.016
Chronic liver failure	1 (0.8)	0 (0)	0.801
Cerebrovascular disease	11 (9.1)	7 (23.3)	0.548
Dementia	8 (7.3)	10 (24.4)	0.031
Neoplasm	21 (17.4)	7 (23.3)	0.451
Dyslipidemia	7 (5.8)	4 (13.3)	0.150
Hemodynamic parameters at presentation			
Systolic blood pressure (mm Hg)	139.9±26.8	122.4±37.2	0.020
Diastolic blood pressure (mm Hg)	77.0±16.8	68.9±18.9	0.023
Heart rate (beats/min)	101.1±19.9	106.9±23.5	0.175
Respiratory rate (breaths/min)	22.2±6.7	25.7±7.9	0.015
Oxygen saturation (SaO_2%)	89.0±11.7	87.6±5.5	0.526
Forehead temperature (^{0}C)	37.3±1.0	37.1±1.0	0.404
Labaratory results			
White blood cell count (x 10^3 /μL)	14.5±7.6	15.5±7.0	0.372
Platelet count (K/uL)	251.8±103.0	246.2±110.8	0.793
Haemoglobin (g/dL)	12.4±2.1	12.5±2.8	0.814
Hct (%)	37.9±6.1	38.1±8.0	0.903
MPV (fL)	9.2±1.3	8.0±0.8	<0.001
Glucose (g/dL)	142.5±50.5	170.4 ±100.9	0.180
Blood urea nitrogene (mg/dL)	27.9±19.9	57.4±55.6	<0.001
Urea (mg/dL)	59.3±40.1	117.1±119.5	0.002
Creatinine (mg/dL)	1.14±0.69	2.25±2.4	0.009

Table 1 (continued)... Baseline characteristics of the 151 study subjects, categorized with respect to the center of origin.

Sodium (mmol/L)	137.1±5.7	137.6±6.4	0.683
Potassium (mmol/L)	4.3±0.7	4.4±1.0	0.414
Chlorine (mmol/L)	101.0±7.6	101.5±7.4	0.724
Calcium (mmol/L)	8.8±0.6	8.8±1.1	0.977
Blood gas analysis (arterial)			
Ph (Ph units)	7.42±0.09	7.39±0.10	0.087
PaO_2 (mm Hg)	65.7±18.7	60.1±16.2	0.136
$PaCO_2$ (mm Hg)	39.2±11.6	39.2±17.6	0.130
HCO_3^- (mmol/L)	25.6±3.8	23.1±5.9	0.032
BE^{ecf} (mmol/L)	1.91±4.66	-1.24±7.35	0.031
Radiographic findings			
Bilateral lung involvement	39 (32.2)	16 (53.3)	0.032
>2 zones involvement	56 (46.3)	20 (66.7)	0.046
Pleural effusion	27 (22.3)	11 (36.7)	0.105
Secondary outcomes			
ICU admission	18 (14.9)	17 (56.7)	<0.001
Mechanical ventilation	10 (8.3)	15 (50.0)	<0.001
Hospital LOS (days)	5.1±8.0	8.0±8.7	0.081

Data are expressed as mean±SD or count (percentage of the 151 subjects) for categorical variables unless otherwise indicated. **Abbreviations:** Hct, Hematocrit; MPV, Mean platelet volumeRed cell distribution width; BE^{ecf}, Base Excess of extracellular fluid; ICU, Intensive Care Unite; LOS, length of stay.

Table 2. Comparisons of mortality prognostic scores, categorized with respect to the center of origin.

Variables	Survivors (n=121)	Nonsurvivors (n=30)	p
Clinical scores			
CURB-age	2 (1-5)	4 (1-6)	<0.001
SCAP	2 (0-6)	4 (1-6)	<0.001
IDSA-ATS	2 (0-6)	4 (0-7)	<0.001
CURXO-80	1 (0-5)	3 (0-5)	<0.001
ADROP	2 (0-4)	3 (0-4)	<0.001
PSI	106 (56-174)	141 (72-192)	<0.001
CRB-65	1 (1-4)	2.5 (1-4)	<0.001
CURB-65	2 (1-4)	3 (1-5)	<0.001
CORB-75	1 (0-5)	2 (0-5)	<0.001
SMART-COP	3 (0-8)	4 (0-9)	<0.001
CAP-PIRO	3 (1-6)	4 (1-6)	0.001

Data are expressed as median (min - max).

Table 3. Areas under the ROC curve in prediction of 28-day mortality.

Variables	p	sd	Areas	Lower bound 95 % CI	Upper bound
CURB-age	<0.001	0.045	0.836	0.747	0.925
SCAP	<0.001	0.039	0.833	0.756	0.909
IDSA-ATS	<0.001	0.046	0.822	0.731	0.912
CURXO-80	<0.001	0.045	0.805	0.717	0.893
ADROP	<0.001	0.050	0.786	0.687	0.885
PSI	<0.001	0.051	0.784	0.685	0.883
CRB-65	<0.001	0.050	0.775	0.677	0.873
CURB-65	<0.001	0.051	0.765	0.665	0.866
CORB-75	<0.001	0.054	0.734	0.628	0.840
SMART-COP	<0.001	0.055	0.712	0.604	0.820
CAP-PIRO	0.001	0.058	0.690	0.576	0.804

Abbreviations: sd, standard deviation; CI, confidence interval.

Table 4. Data for the different ROC curves followed by the result of pairwise comparison of all ROC curves.

Mortality prognostic scores	Z Statistics	p
CURB-age versus SCAP	0.0504	0.9598
CURB-age versus IDSA-ATS	0.2180	0.8278
CURB-age versus CURXO-80	0.4870	0.6262
CURB-age versus ADROP	0.7430	0.4573
CURB-age versus PSI	0.7650	0.4445
CURB-age versus CRB-65	0.9070	0.3645
CURB-age versus CURB-65	1.0440	0.2965
CURB-age versus CORB-75	1.4510	0.1468
CURB-age versus SMART-COP	1.7450	0.0810
CURB-age versus CAP-PIRO	1.9890	0.0467

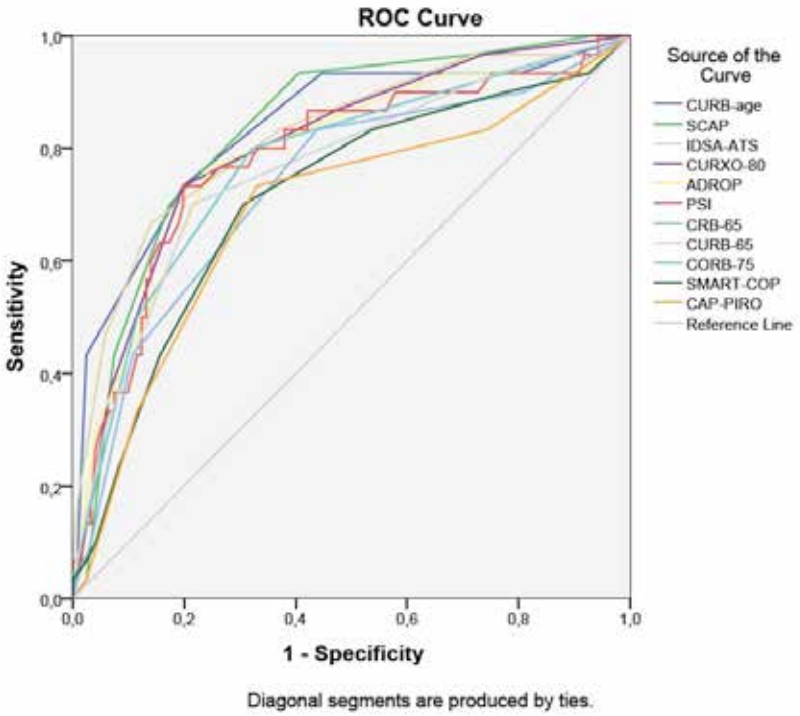


Figure 1. Areas under the ROC curves in prediction of 28-day mortality.

DISCUSSION

Despite important advances in treatment regimens, CAP is still associated with a high mortality rate (13). Because pneumonia can manifest with extrapulmonary signs (delirium, chronic confusion or falling) in elderly patients, it may be difficult to diagnose CAP in this age group (14). Few studies have evaluated the effectiveness of pneumonia severity assessment scores in predicting mortality rates exclusively in the elderly. This study compared the ability of the 11 most common pneumonia severity assessment scores to predict early mortality rates in 151 elderly patients diagnosed with CAP. Of these 11 scores, 10 had at least fair discriminative power (AUC>0.700). Of those 10 scores, 4 had good discriminative power (AUC>0.800). The CURB-age had the highest sensitivity and specificity (AUC, 0.836) followed by SCAP, IDSA-ATS, and CURXO-80 (Tables 2 and 3). Conversely, CAP-PIRO had the lowest AUC at 0.690, which demonstrated poor discriminative power. The performance of the CURB-age was not notably different from the other scores.

PSI and CURB-65 were the first 2 pneumonia severity assessment scores developed to predict mortality rates in the general population (15). Due to the complexity of PSI (consisting of 20 variables), CURB-65 was developed to evaluate of CAP in the general population (5). However, it was later claimed that both scores were insufficient for identifying patients with severe pneumonia who required admission to the ICU; thus, IDSA-ATS, SMART-COP, SCAP, and CAP-PIRO were developed with this purpose in mind (15–18).

Higher CURB-65 and IDSA/ATS scores were found to be correlated with a higher mortality. However, the AUC for CURB-65 was greater than for

IDSA/ATS (13). IDSA/ATS 2007 has been shown to perform better than CURB-65 (19), and one study found that IDSA-ATS was better than PSI and CURB-65 at predicting in-hospital mortality rates and ICU admission requirements (20).

SMART-COP was developed to prevent unnecessary ICU admissions and particularly to identify patients requiring intensive respiratory or vasopressor support. The latter requirement is better predicted by SMART-COP than PSI or CURB-65 (8). However, CAP-PIRO is better than IDSA-ATS for predicting the 28-day mortality rate in ICU patients (18).

The SCAP score was developed to better predict severe CAP (i.e., higher hospital mortality rate, need for mechanical ventilation, and risk for septic shock) in the ED (10). This score contains 8 variables and was found to have better discriminatory power for predicting severe CAP compared to IDSA-ATS, CURB-65, or PSI (21). CURXO-80 was developed prior to the introduction of SCAP score to evaluate patients with CAP in the ED (10).

ADROP was developed by The Japanese Respiratory Society (JRS) as a modification of CURB-65. The JRS assumed that CURB-65 was only good at predicting low mortality risk; therefore, they aimed to develop a score that could easily be applied by general practitioners and specialists. The ADROP score aims to facilitate the patient evaluation, recommending management of those with mild-to-moderate CAP as outpatients and admission of those with moderate-to-severe CAP to the ICU (11). One study involving ADROP found that it had similar sensitivity and specificity to CURB-65 for predicting the 28-day mortality rate in patients with CAP (22).

CURB-age was developed based on the assumption that CURB-65 was insufficient at predicting mortality rates in patients aged > 65 years of age (7). The design was based on CURB-65; but 2 evaluative criteria were added: age >85 years, and urea > 11 mmol/L. A study by Myint and colleagues showed that CURB-65 was useful for predicting mortality rates in patients with CAP among the general population, while CURB-age was less sensitive in this broad patient population, although both were better at predicting mortality rates for all ages than for patients aged ≥65 years of age (23). A recent study performed in the general population found that CURB-age had better AUC and higher sensitivity than either CURB-65 or CRB-65 for predicting the 28-day mortality rate (24).

In our study, the 28-day mortality rate was 19.9%, which was similar to the 11%-35% rate reported in previous studies in the ≥65 age group. Although 4 scores had good discriminative power (AUC > 0.800), in our study, 3 (SCAP, IDSA-ATS, and CURXO-80) were designed to identify patients requiring intensive respiratory or vasopressor support. It is notable and interesting that CURB-age had the highest AUC. Additionally, 2 scores developed to prevent unnecessary ICU admission (SMART-COP and CAP-PIRO) had the lowest discriminative power (AUC=0.712 and 0.690, respectively) for mortality, and scores particularly designed to be used in the general population had less discriminative power (AUC =0.7000–0.800) in our study compared with the results of previous studies (13,22,25).

Our results indicate that clinical scores are good for evaluating elderly patients diagnosed with CAP after ED admission. Nevertheless, our study has some limitations. First, because of its retrospective design, we could not gather all of the data in every patient diagnosed with CAP. Second, as patients were evaluated by their first radiological findings, new pulmonary infiltrates may not be present in the early stages of disease. As a result, possible patients with CAP, with normal or indeterminate findings on chest imaging have been excluded from this study. Finally, confounding variables that were not measured in this study, such as nutritional status, smoking, and vaccinations for pneumococcus and influenza may have influenced the results.

In conclusion, more studies are necessary to

determine the best score to accurately predict the short-term mortality rate in elderly patients with CAP. A reliable score for prediction of CAP-mortality rates in the ever-growing elderly population is necessary. In our evaluation of 11 existing prediction scores, the best discriminative power was demonstrated by CURB-age, which was specifically designed for elderly patients. However, we evaluated the independent risk of these 11 models over mortality and found that IDSA-ATS was 3.72 times more accurate than other risk prediction scores in estimating mortality. Therefore, more detailed prospective studies should be planned to assess the most appropriate risk score or to create a new risk score that can be used in ER.

Conflict of Interest

The authors have no conflicts of interest to declare.

REFERENCES

1. Heron M, Hoyert DL, Murphy SL, Xu J, Kochanek KD, Tejada-Vera B. National Vital Statistics Reports. U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES 2009 Apr 17;57(14):1-8. [Internet] Available from: https://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_14.pdf. Accessed: 26.8.2017.
2. Russo A, Falcone M, Venditti M. Early identification of severe community-onset pneumonia in frail elderly patient. Intern Emerg Med 2014 Mar;9(2):119-20. (PMID:24287575).
3. Wiemken T, Kelley R, Ramirez J. Clinical scoring tools: which is best to predict clinical response and long-term outcomes? Infect Dis Clin North Am 2013 Mar;27(1):33–48. (PMID:23398864).
4. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the management of community-acquired pneumonia in adults. 2007 Mar;44(2):27-72. (PMID:17278083).
5. Fine MJ, Medsger AR, Stone RA, et al. The hospital discharge decision for patients with community-acquired pneumonia. Results from the Pneumonia Patient Outcomes Research Team cohort study. Arch Intern Med 1997 Jan;157(1):47-56. (PMID:8996040).
6. American Thoracic Society; Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. Am J Respir Crit Care Med 2005 Feb;171(4):388-416. (PMID:15699079).
7. Myint PK, Kamath AV, Vowler S, Harrison BDW. Simple modification of CURB-65 better identifies patients including the elderly with severe CAP. Thorax 2007;62:1015-6. (PMID:17965081).
8. Charles PG, Wolfe R, Whitby M, et al. SMART-COP: A Tool for Predicting the Need for Intensive Respiratory or Vasopressor Support in Community Acquired Pneumonia. Clin Infect Dis 2008 Aug;47(3):375–84. (PMID:18558884).
9. Rello J, Rodriguez A, Lisboa T, Gallego M, Lujan M, Wunderink R. PIRO score for community-acquired pneumonia: a new prediction rule for assessment of severity in intensive care unit patients with community-acquired pneumonia. Crit Care Med 2009 Feb;37(2):456–62. (PMID:19114916).
10. España PP, Capelastegui A, Gorordo I, et al. Development and validation of a clinical prediction rule for severe community-acquired pneumonia. Am J Respir Crit Care Med 2006 Dec;174(11):1249–56. (PMID:16973986).
11. Kohno S, Seki M, Watanabe A, CAP Study Group. Evaluation of an assessment system for the JRS 2005: A-DROP for the management of CAP in adults. Intern Med 2011;50(11):1183-91. (PMID:21628933).
12. Ochoa-Gondar O, Vila-Corcoles A, Rodriguez-Blanco T, et al; EPIVAC Study Group. Validation of the CORB75 (confusion, oxygen saturation, respiratory rate, blood pressure, and age ≥ 75 years) as a simpler pneumonia severity rule. Infection 2014 Apr;42(2):371-8. (PMID:24293055).
13. Guo Q, Li HY, Zhou YP, et al. CURB-65 score predicted mortality in community-acquired pneumonia better than IDSA/ATS minor criteria in a low-mortality-rate setting. Eur J Clin Microbiol Infect Dis 2012 Dec;31(12):3281-6. (PMID:22806350).
14. Falcone M, Blasi F, Menichetti F, et al. Pneumonia in frail older patients: an up to date. Intern Emerg Med 2012;7:415-24. (PMID:22688530).

15. Huaman MA, Diaz-Kuan A, Hegab S, Brar I, Kaatz S. CURB-65 and SMRT-CO in the Prediction of Early transfers to the intensive care unit among patients with community-acquired pneumonia Initially admitted to a general ward. J Hosp Med 2011 Nov;6(9):513-8. (PMID:22042735).

16. Davis JS, Cross GB, Charles PG, Currie BJ, Anstey NM, Cheng AC. Pneumonia risk stratification in tropical Australia: does the SMART-COP score apply? Med J Aust 2010 Feb;192(3):133-6. (PMID:20121679).

17. Falcone M, Corrao S, Venditti M, Serra P, Licata G. Performance of PSI, CURB-65, and SCAP scores in predicting the outcome of patients with community-acquired and healthcare-associated pneumonia. Intern Emerg Med 2011 Oct;6(5):431-6. (PMID:21249471).

18. Rello J, Lisboa T, Wunderink R. Severe community-acquired pneumonia and PIRO: a new paradigm of management. Curr Infect Dis Rep 2009 Sep;11(5):343-8. (PMID:19698277).

19. Brown SM, Jones BE, Jephson AR et al. Validation of the Infectious Disease Society of America/American Thoracic Society 2007 Guidelines for Severe Community-Acquired Pneumonia. Crit Care Med 37(12):3010– (PMID:19789456).

20. Phua J, See KC, Chan YH, et al. Validation and clinical implications of the IDSA/ATS minor criteria for severe community-acquired pneumonia. Thorax 2009 Jul;64(7):598-603. (PMID:19386583).

21. Brown SM, Dean NC. Defining and Predicting Severe Community-Acquired Pneumonia (SCAP). Curr Opin Infect Dis 2010 April;23(2):158–164. (PMID:20051847).

22. Shindo Y, Sato S, Maruyama E, et al. Comparison of severity scoring systems A-DROP and CURB-65 for community-acquired pneumonia. Respirology 2008 Sep;13(5):731-5. (PMID:18713094).

23. Myint PK, Sankaran P, Musonda P, et al. Performance of CURB-65 and CURB-age in community-acquired pneumonia. Int J Clin Pract 2009 Sep;63(9):1345-50. (PMID:19691619).

24. Pflug MA, Tiutan T, Wesemann T, et al. Short-term mortality of adult inpatients with community-acquired pneumonia: external validation of a modified CURB-65 score. Postgrad Med J 2015 Feb;91(1072):77-82. (PMID:25618316).

25. Li HY, Guo Q, Song WD, et al. Modified IDSA/ATS Minor Criteria for Severe Community- Acquired Pneumonia Best Predicted Mortality. Medicine 2015 Sep;94(36):1-7. (PMID:26356705).

Turkish Journal of Geriatrics
2017;20 (4):264-270

- Güldem TURAN
- Arzu YILDIRIM AR
- Yıldız Yiğit KUPLAY
- Süheyla ABİTAĞAOĞLU
- Ceren ŞANLI KARİP
- Murat ÖKSÜZ

RESEARCH

WEANING IN GERIATRIC PATIENTS: A RETROSPECTIVE CLINICAL STUDY

Abstract

Introduction: With the growth of the geriatric population in the society, the number of geriatric patients followed up at intensive care units has also increased. Weaning in geriatric patients is a long and necessary process. In our study, we evaluated the weaning process in a geriatric patient group.

Materials and Method: The relationship between the weaning process and mortality rates in 814 patients aged>65 years who were hospitalised in our intensive care unit between 1 January 2015 and 31 December 2016 was retrospectively analysed. Our geriatric patients were divided into three age groups: young (65–74), middle (75–84) and advance (≥85).

Results: The mean Acute Physiology and Chronic Health Enquiry II score was 21.8±9.2 and Simplified Acute Physiology Score 2 was 43.2±20.9. Mechanical ventilation was provided to 615 patients. The mean duration of the weaning process onset was 6±13.4, 5.85±7.87 and 6.5±7.1 days in the three groups, respectively. Weaning was successful in 286 (46%) of the 615 geriatric patients, and 20 patients were discharged with a home ventilator.

Conclusion: The weaning process in geriatric patients may be extended with age-related pulmonary dysfunction. The number of weaning trials in this process also increased. Our results indicate that the mean number of weaning trials in successfully weaned patients is higher. We consider that given the increase in geriatric patient follow-up rates in intensive care units, it will be possible to ensure successful weaning and lower mortality rates, along with successful management of such patient groups, by increasing the number of weaning trials.

Key Words: Geriatrics; Respiratory insufficiency; Weaning; Critical care

Correspondance

Güldem TURAN
University of Health Sciences Fatih Sultan Mehmet Health Research and Application Center
Intensive Care Unit
İSTANBUL

Phone: 021655783030
e-mail: gturanmd@yahoo.com

Received: 02/08/2017
Accepted: 07/11/2017

[1] University of Health Sciences Fatih Sultan Mehmet Health Research and Application Center
Intensive Care Unit
İSTANBUL

This research was presented at the 21th International Intensive Care Symposium, İstanbul, 12-14 May, 2017.

ARAŞTIRMA

GERİATRİ YAŞ GRUBU HASTALARDA VENTİLATÖRDEN AYIRMA: RETROSPEKTİF KLİNİK ÇALIŞMA

Öz

Giriş: Toplumda yaşlı hasta sayısının artmasıyla birlikte yoğun bakımda takip edilen yaşlı hasta sayısı da artmaktadır. Yaşlı hastaların mekanik ventilatörden ayırma süreci uzun ve zorludur. Bu çalışmada yaşlı hasta grubunda ventilatörden ayırma süreci değerlendirilmiştir.

Gereç ve Yöntem: Yoğun Bakım Ünitesinde Ocak 2015-Aralık 2016 tarihleri arasında yatan 65 yaş üstü 814 hastanın ventilatörden ayırma süreçleri ve mortalite değerleri arasındaki ilişkileri retrospektif olarak incelendi. Yaşlı hastalar ile ilgili veriler genç yaşlı (65-74 yaş), orta yaşlı (75-84 yaş) ve ileri yaşlı (85 yaş ve üstü) olarak üç yaş grubunda yorumlandı.

Bulgular: Hastaların akut fizyoloji ve kronik sağlık değerlendirme II skor ortalaması; 21.8±9.2 idi. 615 hastaya mekanik ventilasyon uygulanmıştır. Ventilatörden ayrılma başlangıç zamanı ortalamaları gruplara göre sırasıyla; 6±13.4, 5.85±7.87 ve 6.5±7.1 gün olarak gözlenmiştir. 615 geriatrik hastadan 286'sı başarılı şekilde ventilatörden ayrılma uygulanmıştır (%46) ve 20 hasta eve homevent ile taburcu edilmiştir.

Sonuç: Yaşlı hasta grubunda ventilatörden ayrılma süreci yaşa bağlı pulmoner disfonksiyonun artmasına paralel olarak uzayabilmektedir. Bu süreç içinde ventilatörden ayrılma deneme sayısı da artmaktadır. Çalışma sonucu başarılı ventilatörden ayrılma gerçekleşen hastalarda deneme sayısı ortalamasının fazla olduğunu işaret etmektedir. Yoğun bakım ünitelerinde yaşlı hasta takip yüzdeleri gözönüne alındığında, bu hastaların başarılı bir şekilde yönetilmesiyle, deneme sayıları arttırılarak başarılı ventilatörden ayrılma ve daha düşük mortalite değerleri elde etmek mümkün olacaktır.

Anahtar Sözcükler: Yaşlılık; Solunum yetmezliği; Ventilatörden ayırma; Yoğun bakım

INTRODUCTION

An increase in life expectancy has led to an increase in the proportion of the geriatric population. Reductions in mortality rates among geriatric patients have also contributed to the growth of the geriatric population. In the last 50 years, the increase in life expectancy has reached 20 years, and 2050 is estimated to be the first year when the worldwide geriatric population will match that of the children (1,2). According to data from the Turkish Statistical Institute, the proportion of the geriatric population was 7.5% in 2012, which has increased to 8.3% in 2016. Males constitute 43.9% and females constitute 56.1% of the geriatric population (3).

The growth in the geriatric population is proportional to the increase in geriatric patients followed up in clinics and intensive care units (ICUs). The process of intensive care for the geriatric population differs from that for the young population in several aspects. Among the several problems faced by geriatric patients in ICUs, an extended duration of mechanical ventilation is one of the most significant. In geriatric patients who require mechanical ventilation for any reason, age-related impaired elasticity of the lungs, decreased muscle mass and reduced lung volume render weaning a difficult process (4-6). Furthermore, the frequent presence of comorbidities and malnutrition in this population hamper the treatment of respiratory insufficiency (7-9). However, with more experiences in ICU care and weaning in geriatric patients, an increase in treatment success is expected.

In our study, we retrospectively investigated the weaning process in geriatric patients aged >65 years who constitute a majority of our intensive care unit population.

MATERIALS AND METHOD

In the present study, we retrospectively investigated the data of 814 patients aged >65 years who were admitted to the ICU of the University of Health Sciences Fatih Sultan Mehmet Health Research and Application Center between 1 January 2015 and 31 December 2016. This study was approved by our hospital's scientific studies board (FSM SSB Ref. No: 2017/23). Our clinic is a tertiary ICU with a capacity for 20 beds; patients with clinical hospitalisation for >24 h were included in our study based on their initial admission times. Patients were provided intensive care admission and mechanical ventilation for primary and secondary respiratory insufficiencies and neurological, postoperative, post-CPR and post-traumatic causes. Demographical data of the patients, Acute Physiology and Chronic Health Evaluation (APACHE) II score, Simplified Acute Physiology Score (SAPS 2) averages, type of diagnosis, mean Glasgow coma scale (GCS) scores of the neurologic patient group and duration of mechanical ventilation were recorded. The time of weaning onset was considered as the time when patients with invasive mechanical ventilation were switched to a T-tube; the number of weaning trials and success rates were also recorded. The relationship between the weaning process from mechanical ventilation and mortality rates were investigated. Our geriatric patients were divided into three age groups: young (65–74 years), middle age (75–84) and advance (≥85); statistical analyses were conducted according to this classification.

Statistical analysis

IBM SPSS Statistics 22 (IBM SPSS, Turkey) programme was used for statistical analysis. Normal distribution of the parameters was evaluated using the Shapiro–Wilk test. In addition to descriptive statistical methods (mean, standard deviation and frequency), one-way analysis of variance was used for intergroup comparisons of parameters manifesting a normal distribution, and the Tukey's honest significant difference test was used to compare quantitative data to identify significant differences between groups. The Kruskal–Wallis test was used for intergroup comparisons of the parameters not manifesting a normal distribution, and the Mann–Whitney U test was used to identify

significant difference between the groups. Student's t test was used to compare parameters manifesting a normal distribution between two groups, and the Mann–Whitney U test was used to compare parameters not manifesting a normal distribution between two groups. The chi-square, Fisher's exact and correction for continuity (Yates) tests were used to compare qualitative data. Spearman's rho correlation analysis was used to examine the correlation between parameters not manifesting a normal distribution.

The optimal cut-off point was selected based on the receiver operating characteristic curve analysis. Statistical significance was set at $p < 0.05$.

RESULTS

Noninvasive mechanical ventilation was applied to 199 of 814 patients in the study. The mean patient age, duration of hospitalisation and APACHE II, SAPS 2 and GCS scores of 191 patients hospitalised for neurological causes as well as the duration of mechanical ventilation of 615 patients under invasive mechanical ventilation are listed in Table 1.

Successful weaning was achieved in 286 (46%) of 615 patients under invasive mechanical ventilation; 20 patients who were discharged with a home ventilator were also included in the successful weaning group. Weaning times of patients with successful weaning are listed in Table 2, and 75.9% of patients were weaned off in the first 48 h.

Table 1. Evaluation of study parameters.

Parameter	Min–Max	Mean ± sd
Age	65–101	79.14 ± 8.08
Duration of ICU stay	0–163	12.5 ± 20.31
SAPS 2 (n=790)	0–99	43.56 ± 20.91
APACHE II score (n=814)	2–80	21.85 ± 9.27
GCS score (n=191)	3–15	6.04 ± 2.75
Number of days under mechanical ventilation (n=623)	1–163	12.46 ± 20.34

Table 2. Weaning process according to successful weaning time.

Weaning time (in days)	Number of patients; n (%)
Before the second day	202 (75.9%)
Between 2 and 5 days	30 (11.2%)
Between 6 and 15 days	26 (9.7%)
After the 16th day	8 (3.0%)

The total mortality rate was 42.1%, and standard mortality rate (SMR) was 1.06%. Correlations of the duration of ICU stay, number of days under mechanical ventilation and number of weaning trials with the mortality rate are described in Table 3, according to the three age groups [young (65–74 years), middle (75–84 years) and advance (≥85 years)]. In surviving patients of all the three geriatric groups, the duration of ICU stay and mechanical ventilation was lower, whereas the number of weaning trials was higher.

Table 3. Characteristics of the weaning process in patients.

Age (years)	Characteristics	Mortality		p
		Exitus Mean ± sd	Alive Mean ± sd	
	Length of ICU stay (days)	13 ± 19.4	9.2 ± 20.8	0.141
65–74	Length of mechanical ventilation (days)	10.7 ± 17.5	7.5 ± 19.2	0.012*
	Number of weaning process	0.3 ± 0.8	1.7 ± 3.3	0.001*
	Length of ICU stay (days)	17.1 ± 21.7	10.5 ± 19.4	0.001*
75–84	Length of mechanical ventilation (days)	16.5 ± 21.7	10.6 ± 21.2	0.006*
	Number of weaning process	0.5 ± 1	1.3 ± 0.8	0.001*
	Length of ICU stay (days)	18.9 ± 23.1	7.1 ± 10.4	0.001*
≥85	Length of mechanical ventilation (days)	17.9 ± 22.3	6.7 ± 6.8	0.004*
	Number of weaning process	0.6 ± 1	1.6 ± 2	0.001*

DISCUSSION

In geriatric patients, age-related impairments of lung elasticity, decrease in muscle mass and reduction in lung volume render the weaning process more difficult. In addition, comorbidities and complications can cause weaning failure (10).

In a multicentre study across 20 countries with 5183 patients who were under mechanical ventilation for >12 h, Esteban et al (11) observed no difference in the duration of mechanical ventilation, weaning time and duration of ICU stay between the middle aged (43–70 years) and geriatric (>70 years) groups. However, they emphasised the effect of comorbidities, such as acute renal failure and shock, on mortality.

Some geriatric patients under mechanical ventilation for acute respiratory failure may have prolonged weaning periods of >2 or 3 weeks. These patients progress to chronic respiratory failure, and a tracheotomy becomes inevitable. In cases of prolonged respiratory failure, the increased use of opioids to prevent dyspnoea can result in a vicious cycle. There is a high rate of transition to chronic respiratory failure in the geriatric patient group. Tracheotomy in patients with expected long-term respiratory failure allows for the use of home ventilators, and families can also adapt to this treatment approach. Support given to home care and home ventilation enables the widespread use of this approach and the most efficient use of ICU beds. (12,13) In our study, 105 of 615 geriatric

patients underwent tracheotomy, and 20 patients were discharged with a home ventilator.

A 27-bed geriatric centre study (12) assessed the data of 89 geriatric patients who were followed for 22 months (mean age, 65 years) and reported that the major primary diagnosis was respiratory failure, followed by neurological diagnoses, sepsis-related conditions and metabolic causes. The centre boasted of health professionals and respiratory physiotherapists with specialised training in geriatric care. The weaning criteria were FiO_2 of <0.5, negative inspiratory pressure of −20 cm H_2O, respiratory rate of<35 and spontaneous tidal volume of >250 ml. A total of 22 patients were successfully weaned, and no correlation was observed between weaning failure and increased age. With increased experience with geriatric respiratory failure patients and considering physiological changes in this age group, it is important to uniquely evaluate weaning parameters for each patient.

In a 2-year prospective study, Lieberman et al (14) examined survival and weaning rates in geriatric patients aged>65 years with similar diagnoses as those of our patient groups. Their results revealed that 242 of 641 patients could be discharged after successful weaning; however, only 138 of the 242 discharged patients survived for >1 year; 63 patients died within 3 months and 85 within 6 months from discharge. From this perspective, it is appropriate to also consider the survival after discharge when defining successful weaning.

Among several factors responsible for unsuccessful weaning in geriatric patients, Epstein et al (15) have emphasised the importance of volume status. In their study on postoperative patients aged >60 years (n = 40), patients with successful weaning had a mean net cumulative fluid balance of 6.856 l and a daily fluid balance of −0.389 l, whereas in the group that could not be weaned, these values were 16.212 l and 1.904 l, respectively. Despite the small sample size, their results stress the importance of volume status in the weaning in geriatric patients.

A study comparing 2-h T-piece trials in young and geriatric patient groups reported more difficult weaning in the geriatric group; however, the use of a T-piece was shown to help in determining the respiratory capacity and in strengthening respiratory muscles of geriatric patients. (16) We also applied the 2-h T-piece trial in our clinic, particularly for geriatric patients.

Several studies have compared the weaning criteria for geriatric patients. Corbellini et al (17) have reported that the f/VT parameter, a standard weaning criterion, is highly sensitive in geriatric patients. Azeredo et al (18) used the integrative weaning index (IWI) parameter, which is calculated from static compliance values using logistic regression, in addition to the standard criteria for weaning in geriatric patients. They reported that IWI could be routinely used for predicting successful weaning in geriatric patients.

No studies in our country have evaluated the cost-effectiveness of prolonged mechanical ventilation in geriatric patients. However, Hamel et al (19) analysed 963 (of 1005) mechanically ventilated patients and determined a cost of $32,000 for patients aged <65 years and $46,000 for those aged >65 years. They have reported high costs for short survival periods in patients aged ≥75 years.

The results of our retrospective study revealed a high success rate of weaning in geriatric patients in our clinic. Our SMR rates are within ideal limits. We believe that our clinical experience has grown with the substantial increase in the number of geriatric patients we have treated in the recent years, and this is reflected in the successful weaning in our patients. We have observed that success in weaning can be achieved by performing T-piece trials as soon as possible, which should be repeated as necessary, before the already insufficient respiratory muscles can adapt to mechanical ventilation. We also emphasise the importance of closely monitoring patients' cardiac and volume statuses.

A limitation of our study was that in our mortality assessment, even 1-year mortality was not evaluated. Considering that our study is retrospective and all patients could not be contacted by telephone, we excluded the 1-year mortality parameter because it would not have yielded a reliable result.

In conclusion, despite the challenges in the successful weaning in geriatric patients, the ever increasing geriatric population in the ICU is an inevitable reality in the clinical setting. Therefore, we believe that weaning success can be increased with shared clinical experiences and prospective studies that enable the standardisation of clinical applications. Importantly, clinicians have to be aware of the different age-related physiology and pathology of the geriatric population and should accordingly revise their clinical practices. If "weaning is an art," then weaning in geriatric patients can be defined as "a polyphonic music piece or a colourful painting."

Conflict of interest

The authors declare that they have no competing interests.

Acknowledgements

We thank Nur Akgün, MD. (chief of the Department of ICU), for her support.

REFERENCES

1. United Nations, Department of Economic and Social Affairs Population Division: World Population Ageing 1950-2050. [Internet] Available from: http://www.un.org/esa/population/publications/worldageing19502050. Accessed: 01.11. 2009.
2. Mandıracıoğlu A. Demographic characteristics of the elderly population in Turkey and the World. Ege Journal of Medicine 2010;49(3):39-45. (in Turkish).
3. Press Releases of Turkish Statistical Institude; Elderly Statistic, 2016 [Internet] Available from: http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24644. Accessed:16.03.2017. (in Turkish).
4. Bozkurt Sutas AP, Çavuşoğlu P, et al. Effectiveness of scoring in outcome prediction of elderly patients in intensive care unit. Turkish Journal of Geriatrics 2016;9(3):133-8.
5. Coder SA, de Vale RGS, Castro JC, et al. Inspiratory muscle training improves maximal inspiratory pressure and may assist weaning in older intubated patients: a randomised trial. Journal of Physiotherapy 2010;56(3):171-7. (PMID:20795923).
6. Sanchez-Hurtado LA, Angeles-Velez A, Tejeda-Huezo BC, Garcia-Cruz JC, Juarez-Cedillo T. Validation of a prognostic score for mortality in elderly patients admitted to Intensive Care Unit. Indian Journal of Critical Care Medicine 2016;20(12):15-20. (PMID:28149026).
7. Lai CC, Ko SC, Chen CM, Weng SF, Tseng KL, Cheng KC. The outcomes and prognostic factors of the very elderly requiring prolonged mechanical ventilation in a single respiratory care center. Medicine 2016;95(2):1-5. (PMID:26765452).
8. Onal Ö, Ozgun G. Comparison of the course and prognosis of geriatric patients admitted to the intensive care unit according to BMI and albumin values. Anesthesiology Pain Medicine 2016;6(1):e32509.
9. Sevransky JE, Haponik EF. Respiratory failure in elderly patients. Clinics in Geriatric Medicine 2003;19(1):205-24.(PMID:12735123).
10. Pappa E, Pavlou H, Eforakopoulou M. Factors affecting mechanical ventilation in ICU elderly patients. Intensive Care Medicine Experimental 2015;3:A660.
11. Esteban A, Anzueto A, Frutos-Vivar F, et al. Outcome of older patients receiving mechanical ventilation. Intensive Care Medicine 2004;30(4):639-46.
12. Yang PH, Hung JY, Yang CJ, et al. Successful weaning predictors in a respiratory care center in Taiwan. Kaohsiung Journal of Medical Sciences 2008;24(2):85-91. (PMID:18281225).
13. Schroder MA, Poulsen JB, Perner A. Acceptable long-term outcome in elderly intensive care unit patients. Danish Medical Bulletin 2011;58(7):1-6. (PMID:19664523).

14. Lieberman D, Nachshon L, Miloslavsky O, Dvorkin V, Shimoni A, Lieberman D. How do older ventilated patients fare? A survival/functional analysis of 641 ventilations. Journal of Critical Care 2009;24(3):340-6.

15. Epstein DC, Peerless JR. Weaning readiness and fluid balance in older critically ill surgical patients. American Journal of Critical Care 2006;15(1):54-64. (PMID:16391315).

16. Su KC, Tsai CC, Chou KT, et al. Spontaneous breathing trial needs to be prolonged in critically ill and older patients requiring mechanical ventilation. Journal of Critical Care 2012;27(3):324e1-324e7. (PMID:21798702).

17. Corbellini C, Trevisan EBC, Villafane HJ, Costa DA, Veira SRR. Weaning from mechanical ventilation: a cross-sectional study of reference values and the discriminative validity of aging. Journal of Physical Therapy Science 2016;27:1945-50.

18. Azeredo LM, Nemer SN, Barbas CVS, et al. The integrative weaning index in elderly ICU subjects. Respiratory Care 2017;62(3):333-9. (PMID:27899533).

19. Hamel MB, Phillips RS, Davis RB, et al. Are aggressive treatment strategies less cost-effective for older patients? The case of ventilator support and aggressive car efor patients with acute respiratory failure. Journal of the American Geriatrics Society 2001;49(4):382-90. (PMID:11347780).

Turkish Journal of Geriatrics
2017;20 (4):271-279

- Birgül TUHANIOĞLU[1]
- Sanem Okşan ERKAN[1]
- Zehra DINIZ[2]
- Orhan GÖRGÜLÜ[1]
- Gökhan KURAN[1]

RESEARCH

RELATIONSHIP BETWEEN SEVERITY OF OBSTRUCTIVE SLEEP APNEA AND AGE AND INFLAMMATORY MEDIATORS IN GERIATRIC PATIENTS

Abstract

Introduction: There is a high prevalence of obstructive sleep apnea in the age group of ≥65 years. The neutrophil-lymphocyte ratio (NLR) and mean platelet volume (MPV) are used as systemic inflammatory markers. In this study, it was aimed to investigate the association between polysomnography data and inflammatory mediators as well as the association between age and severity of obstructive sleep apnea in patients ≥ 65 years.

Metarials and Method: This study included 154 patients with obstructive sleep apnea symptoms. Patients were divided into two groups: patients ≥65 years (study group) and those<65 years (control group). Polysomnography was performed in all patients. Neutrophil levels, lymphocyte counts, mean platelet volume and other hematological parameters were analyzed.

Results: There was no statistically significant difference between age groups in terms of body mass index (BMI), apnea-hypopnea index (AHI) and inflammatory mediator values ($p>0.05$). The severity of obstructive sleep apnea was not significantly different between patients in both groups ($p>0.05$). Mean platelet volume of patients with moderate apnea-hypopnea index in both groups was found to be significantly lower than that of those with severe apnea-hypopnea index ($p<0.05$).

Conclusion: According to the study results, the severity of obstructive sleep apnea and inflammatory mediator did not correlate with age.

Key Words: Sleep apnea syndrome; Geriatrics; Polysomnography

Correspondance

Birgül TUHANIOĞLU
Adana Numune Research and Training Hospital,
Otolaryngology Clinic
ADANA

Phone: 05434842329
e-mail: birgultuhanioglu@mynet.com

Received: 24/07/2017
Accepted: 02/11/2017

[1] Adana Numune Research and Training Hospital,
Otolaryngology Clinic
ADANA
[2] Adana Ceyhan State Hospital,
Chest Diseases Clinic
ADANA

ARAŞTIRMA

GERİATRİ YAŞ GRUBUNDAKİ HASTALARDA OBSTRÜKTİF UYKU APNESİ ŞİDDETİ İLE YAŞ VE İNFLAMATUAR MEDİATÖRLER ARASINDAKİ İLİŞKİ

Öz

Giriş: 65 yaş üstü grupta obstrüktif uyku apnesi oranı yüksektir. Nötrofil-lenfosit oranı ve mean platelet volümü sistemik inflamatuar marker olarak kullanılmaktadır. Bu çalışmada, 65 yaş üstü hastalarda polisomnografi verileri ile inflamatuar mediatörler arasındaki ilişki; yaş ve obstrüktif sleep apne şiddeti ilişkisi de irdelenerek araştırılmıştır.

Gereç ve Yöntem: Bu çalışma obstrüktif uyku apnesi semptomları olan 154 hastayı içermektedir. Hastalar 65 yaş ve üstü (çalışma grubu) ve 65 yaş altı (kontrol grubu) olmak üzere iki gruba ayrıldı. Tüm hastalara polisomnografi yapıldı ve obstrüktif sleep apne şiddetine göre hafif, orta, ağır olarak ayrıldı. Nötrofil sayısı, lenfosit sayısı , mean platelet volüm ve diğer hematolojik parametreler analiz edildi.

Bulgular: Gruplar arasında vücut kitle indexi, apne-hipopne indexi ve inflamatuar mediatör değerleri açısından, istatistiksel olarak farklılık izlenmedi($p>0.05$). Obstrüktif sleep apne şiddeti her iki grupta anlamlı derecede farklı bulunmadı ($p>0.05$). Her iki grupta mean platelet volüm, orta şiddetli obstrüktif sleep apne hastalarında ağır şiddetli obstrüktif sleep apne hastalarına göre anlamlı derecede düşüktü ($p<0.05$).

Sonuç: Araştırma sonuçlarına göre, obstrüktif sleep apne şiddeti ve inflamatuar mediatörler yaşla korele değildir.

Anahtar Sözcükler: Uyku apnesi sendromu; Geriatri; Polisomnografi

INTRODUCTION

In recent years, there has been an increase in the elderly population in Turkey and in the world. Although the proportion of the elderly population in Turkey (≥65 years) was 5.682.003 persons (7.5%) in 2012, this proportion has increased to 6.651.503 persons (8.3%) in 2016. Sleep disorders are common in the geriatric population, but the most important and life-threatening sleep disorder is obstructive sleep apnea (OSA) (1). OSA syndrome is a sleep-related respiratory disorder that presents with recurrent apnea and hypopnea episodes due to intermittent upper airway obstruction. Systemic and pulmonary pressure changes as well as nocturnal oxygen desaturation and hypercapnia are observed (2).

There are arguments that sleep disorders are independent of age (3,4). However, with an increase in age, important physiological and histological changes occur in the body. The airway becomes narrow depending on changes in the supporting connective tissue. Early airway closure due to altered elastin collagen ratio is observed. Residual volume and functional residual capacity increase in the lungs, leading to decreased vital capacity and inspiratory reserve volume (5). For these reasons, hypoxia and hypercapnia may be more common in the elderly population than in the younger population. But the basic mechanism is in fact not completely understood.

New systemic inflammatory markers including the neutrophil-lymphocyte ratio (NLR) and mean platelet volume (MPV) values that are already included in complete blood count (CBC) testing have been used to detect systemic inflammation levels in the human body. CBC is inexpensive, is easy and provides rapid results. NLR evaluates two important mediators of inflammation: neutrophils and lymphocytes, therefore their ratio gives more precise information about inflammation. Neutrophils act in most inflammatory processes by secreting mediators, while lymphocytes play roles in inflammation, such as inflammation regulation (6,7). There are studies that emphasize that there is a positive association between NLR and apnea-hypopnea index (AHI) (8). MPV is an indicator of platelet activation, and it has been reported to increase in patients with OSA. MPV shows us platelet size and larger platelets have greater thrombotic potential (9).

The incidence of systemic diseases, particularly diabetes mellitus, hypertension, and cardiovascular diseases, increases in the geriatric group. Previously, inflammatory mediators have been investigated in many systemic disease and OSA groups (2). The association of these mediators with age and OSA is not clear in the literature. In this study, we aimed to investigate the association between polysomnographic data and inflammatory mediators as well as the association between age and severity of OSA in patients with>65 years.

MATERIALS AND METHOD

Study population

The study has been carried out with institutional ethics committee clearance (2017/64). This study included 154 patients admitted to ENT clinic between January 2015 and September 2016 with complaints of snoring, congestion, and daytime sleepiness and had the indication of polysomnography. Patients were divided into two groups: patients ≥65 years (study group) and those<65 years (control group). After detailed ear, nose, and throat examination, polysomnography was performed in all patients. According to the polysomnography results, the severity of OSA was rated as mild, moderate, and severe. A total of 16 patients, 8 in the control group and 8 in the study group, were excluded because of AHI<5. BMI, AHI, NLR, MPV and Epworth sleepiness scale (ESS) were noted in all patients. In addition, systemic examination of the patients was performed and existing additional diseases were questioned.

Patients with sleep disorders, such as central sleep apnea, upper airway resistance syndrome, and narcolepsy; those with hematologic disorders; those with systemic diseases, such as diabetes mellitus (DM), hypertension, and cardiovascular diseases; and those receiving medical treatment, such as anticoagulants, anti-inflammatory, and systemic corticosteroids,were not included in the study.

Polysomnography

Devices of the ComMedics E and Somte series were used for the polysomnographic measures in our study. Apnea was defined as a cessation of airflow that lasts for at least 10 second, and hypopnea was defined as an airflow reduction of at least 50% for 10 second plus 3% decrease in oxygen saturation, and development of arousal that lasted ≥10 second. AHI is defined as the total number of episodes of apnea and hypopnea per hour of sleep. A decrease in capillary O_2 saturation by ≥3% is referred to as desaturation. OSAS was classified according to the AHI as mild (5≤AHI<15), moderate (15≤AHI<30), and severe (30≤AHI) (10).

Biochemical measurements

Blood samples were collected from the antecubital vein at 8–10 AM after a fasting period of approximately 12 h. WBC counts, neutrophil levels, lymphocyte counts, MPV, and other hematological parameters were analyzed using an XN-1000 (Sysmex) Hematology Analyzer. NLR was calculated for each patient.

Statistical analysis

Data obtained in this study were analyzed using the IBM SPSS Statistics Version 20 package program.

Shapiro Wilk's test was used because of the unit numbers while investigating the normal distribution of variables. While interpreting the results, the level of significance was considered to be 0.05. In the case of p <0,05, it is stated that the variables do not come from the normal distribution, whereas in the case of p> 0,05, the variables come from the normal distribution.

Mann Whitney U and Kruskal Wallis-H Tests were used while analysing the variance between the groups, because the variables were not from normal distribution.

In the case of significant differences in the Kruskal Wallis-H test, the groups that differed with the Post-Hoc Multiple Comparison Test were identified.

Chi-square analysis was applied when relations between groups of nominal variables were examined. Fisher's Exact Test was used when the expected values in the cells of 2x2 tables did not have sufficient volume and Pearson Chi-Square analysis was applied with the help of Monte Carlo Simulation in R × C tables. While interpreting the results, the level of significance was considered to be 0.05; it was determined that there was a significant association if p<0.05, whereas there was no significant association if p>0.05.

RESULTS

The age of the patients in the study group was between 65 and 82 (mean age, 71.20; 52.3% male) years and that of the patients in the control group was between 27 and 63 (mean age, 45.26; 81.4% male) years. In total, 11.43% of the patients in the control group and 9.52% of those in the study group were excluded from the study as their AHI was <5. The severity of OSA in both of study and control population were divided into three groups by the AHI score: mild OSAS (study 11.9%, control 17.14%), moderate OSAS (study 20.24%, control 22.86%), and severe OSAS (study 58.33%, control 48.57%) groups. The severity of OSA was not significantly different between patients in both groups (p>0.05) (Table 1).

There was no statistically significant difference between two age groups in terms of BMI, AHI and NLR values (p>0.05). O_2 saturation values were found to be significantly lower in patients in the study group than in those in the control group (p<0.05). The ESS score was significantly higher in the study group than the control group (p<0.05) (Table 2).

Table 1. Chi-square test results for the association between groups and demographic information.

Variable		Groups						Chi-square test	
		<65 years		≥65 years		Total			
		n	%	n	%	n	%	Chi-square	p
Gender	Female	13	18.57	40	47.62	53	34.42	14.273	0.001
	Male	57	81.43	44	52.38	101	65.58		
	Total	100.0	100	84	100	154	100		
Severity of OSA (AHI)	<5	8	11.43	8	9.52	16	10.39	1.664	0.645
	5≤AHI<15, mild	12	17.14	10	11.9	22	14.29		
	15≤AHI<30, moderate	16	22.86	17	20.24	33	21.43		
	30≤AHI, severe	34	48.57	49	58.33	83	53.9		
	Total	100.0	100	84	100	154	100.0		

Table 2. Mann–Whitney U test results for differences between groups by values.

Vaiable								Mann–Whitney U Test		
		n	Mean	Median	Min	Max	sd	Mean Rank	z	p
BMI	<65 years	62	31.87	30.95	23	46.8	5.51	73.05	−1.13	0.258
	≥65 years	76	34.62	31.95	24	175	16.67	81.21		
	Total	138	33.37	31.2	23	175	12.9			
AHI	<65 years	62	36.13	29.3	0.9	107.4	27.81	71.5	−1.524	0.128
	≥65 years	76	43.59	40.75	0.8	128.5	30.39	82.5		
	Total	138	40.2	32.2	0.8	128.5	29.38			
O_2 SAT	<65 years	62	91.09	92	76	99	3.65	87.79	−2.628	0.009
	≥65 years	76	88.19	90	57	95	7.53	68.92		
	Total	138	89.51	91	57	99	6.23			
ESS	<65 years	62	4.51	4	0	13	3.58	65.54	−3.055	0.002
	≥65 years	76	6.54	6	0	18	4.08	87.46		
	Total	138	5.62	6	0	18	3.98			
MPV	<65 years	62	9.38	9.5	6.23	12	1.56	84.25	−1.715	0.086
	≥65 years	76	9.06	8.36	6.15	14.5	1.93	71.88		
	Total	138	9.2	9.09	6.15	14.5	1.78			
NLR	<65 years	62	2.21	1.89	0.78	7.2	1.22	79.94	−0.621	0.535
	≥65 years	76	2,17	1.87	0.84	7.62	1.22	75.46		
	Total	138	2.19	1.88	0.78	7.62	1.22			

In both groups, BMI of those with severe AHI was significantly higher than that of those with mild and moderate AHI ($p<0.05$). In both groups, O_2 SAT values were also significantly lower in patients with severe OSA than in those with mild or moderate OSA ($p<0.05$). The ESS score of patients with mild and moderate AHI was significantly lower than that of those with severe AHI in both groups ($p<0.05$).

Table 3. Kruskal–Wallis H test results between AHI and other values in ≥65 years group.

Variable			AHI						Kruskal Wallis H test		
			n	Mean	Median	Min	Max	ss	Mean rank	H	p
≥65 years	AGE	Mild	10	71.2	67	66	82	6.46	34.15		
		Moderate	17	72.88	72	66	82	4.97	47.26		
		Severe	49	70.41	69	65	82	4.12	36.35	3.572	0.168
		Total	76	71.07	70	65	82	4.71			
	BMI	Mild	10	29.93	30.25	25.8	33.6	2.57	24.95		
		Moderate	17	30.65	29.1	24	44.5	5.45	26.76		
		Severe	49	38.01	34.5	25.8	175	20.95	45.34	13.271	0.001
		Total	76	35.3	32.95	24	175	17.37			1-3 2-3
	O_2 SAT	Mild	10	91.3	92	86	94	2.63	51.9		
		Moderate	17	91.82	92	88	93	1.42	55.71		
		Severe	49	85.41	88	57	94	8.74	29.8	21.814	0.001
		Total	76	87.62	90	57	94	7.69			3-1 3-2
	ESS	Mild	10	4.9	6	0	10	2.92	28.1		
		Moderate	17	5.06	4	0	12	3.73	28.24		
		Severe	49	7.84	8	0	18	4	44.18	9.249	0.01
		Total	76	6.83	6	0	18	4.01			2-3
	MPV	Mild	10	9.4	8.3	6.34	14.5	2.71	38.5		
		Moderate	17	8.1	7.9	6.15	11.7	1.43	27.12		
		Severe	49	9.43	9.48	6.32	14.3	1.94	42.45	6.085	0.048
		Total	76	9.13	8.54	6.15	14.5	2.01			2-3
	NLR	Mild	10	2.23	2	1.14	4.44	1.2	40.05		
		Moderate	17	2.53	2	0.86	5.06	1.35	44.62		
		Severe	49	2.08	1.82	0.84	7.62	1.26	36.06	1.952	0.377
		Total	76	2.2	1.91	0.84	7.62	1.27			

Table 4. Kruskal–Wallis H test results between AHI and other values in <65 years group.

Variable			AHI						Kruskal Wallis H test		
			n	Mean	Median	Min	Max	ss	Mean Rank	H	p
<65 years	AGE	Mild	12	45.75	49.5	30	59	10.92	31.54	1.047	0.593
		Moderate	16	43.5	41.5	28	61	8.91	27.69		
		Severe	34	46.85	46.5	27	63	10.18	33.28		
		Total	62	45.77	45.5	27	63	9.95			
	BMI	Mild	12	28.89	28.2	24.6	35.7	3.43	20.38	7.216	0.027
		Moderate	16	31.47	30.8	25.4	40.5	4.41	29.53		
		Severe	34	33.95	32.45	24.3	46.8	6.09	36.35		
		Total	62	32.33	31.1	24.3	46.8	5.56			1-3
	O_2 SAT	Mild	12	92.75	92	91	95	1.22	43.33	14.83	0.001
		Moderate	16	92.06	92.5	87	95	2.29	39.31		
		Severe	34	89.29	89.5	76	99	4.17	23.65		
		Total	62	90.68	91.5	76	99	3.66			3-2 3-1
	ESS	Mild	12	2.17	1	0	8	2.92	16.88	20.066	0.001
		Moderate	16	3.44	3	0	10	2.61	23.25		
		Severe	34	6.5	6	0	13	2.94	40.54		
		Total	62	4.87	4.5	0	13	3.37			1-3 2-3
	MPV	Mild	12	9.15	9.15	7.06	11	1.3	29.17	6.773	0.034
		Moderate	16	8.49	7.98	6.23	12	1.84	22.56		
		Severe	34	9.78	10.15	7.13	11.9	1.51	36.53		
		Total	62	9.33	9.43	6.23	12	1.63			2-3
	NLR	Mild	12	2.29	2.01	0.78	7.2	1.66	30.29	0.467	0.792
		Moderate	16	1.94	1.88	1.06	2.74	0.43	29.44		
		Severe	34	2.47	1.93	0.98	5.4	1.35	32.9		
		Total	62	2.3	1.92	0.78	7.2	1.25			

When we evaluated the association between MPV and AHI, MPV of patients with moderate AHI in both groups was found to be significantly lower than that of those with severe AHI ($p<0.05$) (Table 3 and 4).

DISCUSSION

Obstructive sleep apnea is a multisystem disease in terms of its clinical symptoms and etiology. It requires joint evaluation by many branches. Nasal

obstruction, oropharyngeal entry obstruction, retrognathia, micrognathia, and inflammation are important factors in the pathophysiology of OSA. Polysomnography (PSG) is the gold standard test in the investigation of OSAS (1,11). According to the polysomnographic data, OSA is divided into the three groups with the AHI score as mild, moderate and severe.

There is no routine laboratory test that helps the diagnosis and eveluates the severity of OSAS. NLR and MPV are important mediators of the diagnostic value in inflammation. In similar studies, it has been reported that NLR and MPV increase with the severity of OSA (11-13). Hypoxia periods that occur during the night are believed to activate inflammatory pathways. But there is no enough information about the details of inflammation in OSA patients yet (11).

In their study, Yenigün et al. reported that an increase in NLR is correlated with the severity of OSA, and after 3 months of CPAP therapy, a decrease in this ratio is observed (8). Elimination of the hypoxic condition through CPAP therapy may lead to this decrease. Over time, studies showing NLR as an important indicator of inflammation in both cardiac and non-cardiac pathologies have been reported (14-16). Altıntaş et al. reported that NLR significantly increased in patients with severe OSA, but there were no differences among patients with mild and moderate OSA and healthy patients (17). Similarly, Oyama et al. reported that NLR increased in patients with severe OSA and this value decreased after 3 months of CPAP therapy (18). However, there are contradictory views. Korkmaz et al. studied CRP, ESR, and NLR in patients with OSA, and they reported that an increase in the severity of OSA is not correlated with these values (19). In our study, we found that NLR did not have a significant difference in patients with mild, moderate, and severe OSA in both groups.

In studies investigating the association between OSA and inflammation, MPV, a platelet activator indicator has been reported in the literature. In the study conducted by Akyol et al., it was pointed out that MPV is an increasing mediator also in OSA beside cardiovascular diseases (20). In apnea episodes that occur during night, platelets become active because of the secretion of epinephrine and norepinephrine with increased sympathetic activity associated with hypoxia (21). Similarly, in the study conducted by Varol et al., MPV were reported to be elevated in severe OSA (9). Present study may support the results of this study; MPV of patients with moderate OSA in both groups was found to be significantly lower than that of those with severe OSA.

There are studies that suggest that OSA frequency increases with age in geriatric patients (22). In our study, we found that the severity of OSA seems higher in an elderly population, but this result was not statistically significant. Of polysomnographic data, O_2 saturation values were found to be significantly lower in patients in the older group than in those in the control group. The ESS score was also significantly higher in the study group than the control group. Furthermore, O_2 SAT values were significantly lower and the ESS score was also higher in patients with severe OSA in both groups, The severity of OSA seems more likely to be due to comorbid conditions, such as hypothyroidism, DM, and cardiovascular diseases, and conditions such as weight gain; decreased pharyngeal muscle response against negative pressure, leading to increased upper airway collapse; or decreased airway width due to pharyngeal fat deposition (4, 22). In both of our groups, BMI of those with severe OSA was significantly higher than that of those with mild and moderate OSA. We used such comorbid conditions as exclusion criteria to strengthen the accuracy of the association between age and the severity of OSA.

In summary, we found that the severity of OSA was not associated with aging. We also found that NLR was not found to be significance as an inflammatory mediator in patients with

OSA. MPV also did not change with increasing age, but MPV increased as the severity of OSA increased. To our knowledge, this is one of the first study try to clarify the relationship between OSAS, age and inflammatory markers in geriatric patients.

The most important limitations of our study were that it was not prospective and a single-centered study. This study, which we conducted with a limited number of patients in our clinic, may only be a prediction of the general population. Secondly, new prospective studies need to be performed in the future to check whether there is a change in inflammatory markers in the blood of these patients after CPAP therapy. In future, there is a need for multi-centered, randomized, prospective, controlled studies with more patients.

REFERENCES

1. Avidan AY. Sleep in the geriatric patient population. Semin Neurol 2005;25(1):52-63. (PMID:15798937).
2. McNicholas WT, Bonsigore MR. Sleep apnoea as an independent risk factor for cardiovascular disease: current evidence, basic mechanisms and research priorities. Eur Respir J 2007;29(1):156-78. (PMID:17197482).
3. Mellinger GD, Balter MB, Uhlenhuth EH. Insomnia and its treatment. Prevalence and correlates. Arch Gen Psychiatry 1985;42(3):225-32. (PMID:2858188).
4. Foley DJ, Monjan AA, Brown SL, et al. Sleep complaints among elderly persons: an epidemiologic study of three communities. Sleep 1995;18(6):425-32. (PMID:7481413).
5. Kaczmarczyk K, Wiszomirska I, Magiera A, et al. Changes in Lung Function and Anthropometric Parameters Post Training in Older Women. International Journal of Gerontology 2015;9(2):123-5.
6. Guthrie GJ, Charles KA, Roxburgh CS, et al. The systemic inflammation-based neutrophil-lymphocyte ratio: experience in patients with cancer. Crit Rev Oncol Hematol 2013;88(1):218-30. (PMID:23602134).
7. Gasparyan AY, Ayvazyan L, Mikhailidis DP, et al. Mean platelet volume: a link between thrombosis and inflammation? Curr Pharm Des 2011;17(1):47-58. (PMID:21247392).
8. Yenigun A, Karamanli H. Investigation of the relationship between neutrophil-to-lymphocyte ratio and obs tructive sleep apnoea syndrome. J Laryngol Otol 2015;129(9):887-92. (PMID:26235249).
9. Varol E, Ozturk O, Gonca T, et al. Mean platelet volume is increased in patients with severe obstructive sleep apnea. Scand J Clin Lab Invest 2010;70(7):497-502. (PMID:20849358).
10. Berry RB, Budhiraja R, Gottlieb DJ, et al. Rules for scoring respiratory events in sleep: update of the 2007 AASM manual for the scoring of sleep and associated events: deliberations of the sleep apnea definitions task Force of the American Academy of Sleep Medicine. J Clin Sleep Med 2012 15;8(5):597-619. (PMID:23066376).
11. Uygur F, Tanriverdi H, Aktop Z, et al. The neutrophil-to-lymphocyte ratio in patients with obstructive sleep apnoea syndrome and its relationship with cardiovascular disease. Heart Lung 2016;45(2):121-5. (PMID:26880371).
12. Kanbay A, Tutar N, Kaya E, et al. Mean platelet volume in patients with obstructive sleep apnea syndrome and its relationship with cardiovascular diseases. Blood Coagul Fibrinolysis 2013;24(5):532-6. (PMID:23811801).
13. Hui DS, Ko FW, Fok JP, et al. The effects of nasal continuous positive airway pressure on platelet activation in obstructive sleep apnea syndrome. Chest 2004;125(5):1768-75. (PMID: 15136389).
14. Tamhane UU, Aneja S, Montgomery D, et al. Association between admission neutrophil to lymphocyte ratio and outcomes in patients with acute coronary syndrome. Am J Cardiol 2008 15;102(6):653-7. (PMID:18773982).
15. Li MX, Liu XM, Zhang XF, et al. Prognostic role of neutrophil-to-lymphocyte ratio in colorectal cancer: a systematic review and meta-analysis. Int J Cancer 2014 May 15;134(10):2403-13. (PMID:24122750).
16. Turkmen K, Guney I, Yerlikaya FH, et al. The relationship between neutrophil-to-lymphocyte ratio and inflammation in end-stage renal disease patients. Ren Fail 2012;34(2):155-9. (PMID:22172001).

17. Altintas N, Çetinoğlu E, Yuceege M, et al. Neutrophil-to-lymphocyte ratio in obstructive sleep apnea; a multi center, retrospective study. Eur Rev Med Pharmacol Sci 2015;19(17):3234-40. (PMID:26400528).

18. Oyama J, Nagatomo D, Yoshioka G, et al. The relationship between neutrophil to lymphocyte ratio, endothelial function, and severity in patients with obstructive sleep apnea. J Cardiol 2016;67(3):295-302. (PMID:26343754).

19. Korkmaz M, Korkmaz H, Küçüker F, et al. Evaluation of the association of sleep apnea-related systemic inflammation with CRP, ESR, and neutrophil-to-lymphocyte ratio. Med Sci 2015;13(21):477-81. (PMID:25686632).

20. Akyol S, Çörtük M, Baykan AO, et al. Mean platelet volume is associated with disease severity in patients with obstructive sleep apnea syndrome. Clinics (Sao Paulo). 2015;70(7):481-5. (PMID:26222817).

21. Somers VK, Dyken ME, Clary MP, et al. Sympathetic neural mechanisms in obstructive sleep apnea. J Clin Invest 1995;96(4):1897-904. (PMID:7560081).

22. Okuro M, Morimoto S. Sleep apnea in elderly. Curr Opin Psychiatry. 2014;27(6):472-7. (PMID:25211498).

Turkish Journal of Geriatrics
2017;20 (4):280-288

- Hatice POLAT[1]
- Hasret YALÇINÖZ BAYSAL[1]
- Betül AKTAŞ[2]

RESEARCH

DETERMINATION OF AGEISM ATTITUDES OF ADULTS IN TWO DIFFERENT PROVINCES

Abstract

Introduction: This study aimed to investigate the attitudes of individuals that live in the eastern and western parts of Turkey towards ageism and aging.

Materials and Method: Participants of this descriptive study were convenience sampling method selected and the sample comprises 575 participants between the ages 18 and 50 (Erzurum 432, İzmir 143). The data were collected through Ageism Attitude Scale and demographic form. The data were evaluated in a statistics programme using t-test, mean and percentage calculations.

Results: Results showed that the mean total scale score of individuals for İzmir was 68.76±8.74, whereas that for Erzurum was 68.66±6.72. Moreover, the results suggested that both these cities have a positive attitude towards ageism. No significant difference was found between scale subscales and the total score averages ($p > 0.05$) between these two cities. Individuals living in Izmir stated that they have associated elderliness with compassion, illness and weakness; whereas, individuals living in Erzurum associated elderliness with illness, wisdom and commitment.

Conclusion: As a result of the research, it has been determined that there is no difference between the aged attitudes in the sample groups of eastern and western regions of Turkey. It has been determined that it is a positive attitude towards older persons.

Key words: Attitude; Aging; Ageism

Correspondance

Hasret YALÇINÖZ BAYSAL
Ataturk University Faculty of Nursing
Public Health Nursing Department
ERZURUM

Phone: 04422313021
e-mail: h.yalcinoz@hotmail.com

Received: 30/05/2017
Accepted: 05/10/2017

[1] Ataturk University, Faculty of Nursing, Public Health Nursing Department ERZURUM
[2] SANKO University, Faculty of Health Sciences, Nursing Department, GAZİANTEP

This study was presented at the 15th Nursing Congress (September 10-12, 2015; Erzurum/Turkey)

ARAŞTIRMA

İKİ FARKLI İLDE ERİŞKİNLERİN YAŞLI AYRIMCILIĞINA İLİŞKİN TUTUMLARININ BELİRLENMESİ

Öz

Giriş: Bu araştırmada Türkiye'nin doğu ve batı bölgesinde bulunan şehirlerde yaşayan bireylerin, yaşlılık ve yaşlı ayrımcılığına ilişkin tutumlarının belirlenmesi amaçlanmıştır.

Gereç ve Yöntem: Tanımlayıcı tipteki bu çalışmanın örneklemini gelişigüzel örnekleme yöntemi ile seçilmiş 18-50 yaş arası 575 kişi (Erzurum 432, İzmir 143) oluşturmuştur. Araştırmanın verileri, tanıtıcı form ve Yaşlı Ayrımcılığı Tutum Ölçeği kullanılarak toplanmıştır. Elde edilen veriler istatistik programında; t-testi, ortalama ve yüzdelik hesaplar kullanılarak değerlendirilmiştir.

Bulgular: Bu araştırmada bireylerin ölçek toplam puan ortalamasının İzmir için 68.76±8.74, Erzurum için 68.66±6.72 olduğu ve her iki ilde de bireylerin yaşlı ayrımcılığına ilişkin olumlu tutuma sahip oldukları saptanmıştır. İki il arasında ölçek alt boyutları ve toplam puan ortalamaları arasındaki fark istatistiksel olarak anlamlı değildir ($p>0.05$). İzmir'de yaşayan bireyler yaşlılıkla ilişkilendirdikleri kavramları şevkat, hastalık ve güçsüzlük olarak belirtirken, Erzurum'da yaşayan bireyler ise şevkat, hastalık, bilgelik ve bağlılık olarak belirtmişlerdir.

Sonuç: Araştırmanın sonucunda, Türkiye'nin doğu ve batı bölgelerindeki örneklem grubunda yaşlı tutumları arasında herhangi bir fark bulunmadığı saptanmıştır. Yaşlılara karşı olumlu tutum olduğu belirlenmiştir.

Anahtar Sözcükler: Tutum; Yaşlanma; Yaşlı ayrımcılığı

INTRODUCTION

Elderliness is a process that should be assessed through physical, psychological and social dimensions. Physiological elderliness indicates changes observed with age: an individual's adaptation capacity in terms of psychological ageing, perception, problem solving and personality traits. From the sociological perspective, elderliness is related to behaviours that are expected from a certain age group in a society and values that are attributed to this group by the society. (1-3).

Decreasing birth rates, increased life expectancies at all ages and improved living standards, as well as a decrease in infectious diseases, have resulted in an increase of the older persons' population throughout Turkey and the world. According to World Health Organization (WHO), 1.2 million people will be 65 years old and over in 2025, and this number will reach 2 million in 2050. When the proportion of the older persons' population of a country is 8%–10% of the total population, the population is considered to be 'old', and when this proportion is higher than 10%, the country's population is defined as 'very old'. It is estimated that the proportion of the older persons' population in Turkey will rise to 10.2% in 2023 and, hence, the population will be considered 'very old' (4,5).

This demographic change brings with it economic, social and health problems. In many developed countries, the period of elderliness is considered as a period of dependency. Older persons are defined as individuals who are dependent, deprived of social autonomy, rejected and a burden for the productive world (1).

The perception of old age differs from one society to another. In Western societies, life is divided into periods of 'childhood', 'youth', 'adulthood' and 'old age'. In this perspective, the meaning of old age is close to incapability, loneliness and indulgence. In the majority of non-Western societies, life is regarded as a whole from birth to death; therefore, the older persons are not seen in a separate group from society and are not perceived as individuals needing care (6).

Discrimination against the older persons is defined as prejudice towards the older persons through attitudes and behaviours. A person who has racial and gender prejudices knows that their race or gender is immutable. However, a person who has negative judgements and behaviours against old age knows that they will age as they go through their life cycle and that they will pass through all age groups, unless they die at a young age. Therefore, ageism differs from other types of discrimination (1,7).

Discrimination against the older persons is shaped by the expression of fear by the young and the middle-aged people, which is related to weakness, uselessness, illness and death (1). The older persons at work is not as flexible and as adequate as the younger workers. Hence, the employer chooses to not employ an older person or prefer a younger individual, who can be paid a lower wage, rather than an experienced and older person who is paid a higher wage. Moreover, health care providers may prefer to focus on the acute health problems of young patients rather dealing with older persons' chronic problems. Thus, the social stigma in this context also forms the basis of such discrimination (1,3,7).

The perception of elderliness, the perspective towards elderliness and the prejudices against it in a society must be known. The perception of elderliness affects the quality of the services offered to the older persons. Hence, it is important to know our societies' viewpoints on ageing. It has been reported that the older persons who experienced discrimination felt

that they are worthless, socially isolated and prone to depression. It has also been pointed out that discrimination has emerged when older persons are described as dependent and weak (8-9). In a previous survey, it was shown that older persons who are not exposed to discrimination live 7.5 years longer than those who have been discriminated. At the same time, it has been determined that older persons who are exposed to discrimination have difficulties in fighting with their diseases (8).

Beliefs and attitudes towards the older persons vary from culture to culture. Urbanisation, increased immigration and industrialisation, economic difficulties, the entry of women into working life, changes in social life and the transition from a patriarchal family structure to a core family structure cause significant changes in family structures, particularly in metropolitan cities. In Turkish culture, respect and obedience to the older persons is a traditional unchanging expectation of immutable quality. However, when the fact that 'the only thing that does not change is change itself' is considered, it is seen that the place of the older persons in a society, and their appreciation will be in a state of constant change (10).

There were other studies conducted on this topic in Turkey. Researchers sampled university students or health personnel. According to these studies, both students and health personnel have affirmative attitudes (3, 7, 11-14). Nevertheless, studies aimed at discovering the age discriminatory attitudes of individuals in society against the older people are limited in Turkey. Göçer found that individuals have affirmative attitudes related to ageism (15).

Consequently, it is important to determine the attitudes of individuals living in the eastern and western regions of Turkey, which have different levels of development, towards elderliness and older persons discrimination.

This study was carried out to determine the attitudes of the older persons living in the eastern and western parts of Turkey towards 'age discrimination'.

MATERIALS AND METHOD

Design and setting

Erzurum and İzmir were chosen as the population of the descriptive research. The reason for that was the following: both cities, one of which was located in the west and the other in the east of Turkey, have quite dense populations, and they both contain individuals from different socio-economic backgrounds and both make reaching to many people easier. The Erzurum part of the research was conducted in Dadaşkent and Kavakkapı Family Health Centres (FHC). The İzmir part was conducted in Çiğli Yenimahalle 10th FHC and Çiğli Dereiçi 4th FHC. In this research, convenience sampling method was used to generate the sample. It consisted of people who went to the above-mentioned FHCs between February 2015 and June 2015, who were aged between 18 and 50 and who volunteered to participate in this research. The total sample size was 575 people (432 from Erzurum and 143 from İzmir). The reason why the sample size in Erzurum was higher was that there were more people who were registered in FHCs and were consulting to the services of FHCs there. The limitation of this study is fewer individuals participated in the study from Izmir.

Data collection and analysis

Demographic Form and Ageism Attitude Scale (AAS) was used to collect the data. The data were collected by researchers through face-to-face interviews with participants. The overall procedure of data collection took 10–15 minutes. SPSS 23.00 package programme was used to analyse the data. The data were evaluated in a statistics programme using t-test, mean and percentage calculations.

Demographic form: It consists of questions which are created by the researchers and examined by the related literature. The form comprises questions that investigate the socio-demographic characteristics and the thoughts and experiences of the participants (11-14,16).

Ageism Attitude Scale (AAS): Studies of validity and reliability of the scale were conducted by Vefikulucay. The scale consists of 23 Likert-type items. The scale comprises three subscales: restricting the life of the older persons, positive discrimination against the older persons and negative discrimination against the older person. Positive attitudes on the scale were rated as follows: I agree totally, 5; I agree, 4; I do not know, 3; I do not agree, 2; I absolutely disagree, 1. Negative attitudes regarding ageism are rated as the opposite of the positive attitudes part. The highest score of the scale is '115', whereas the lowest score is '23'. Higher scores on the scale indicate greater positive attitude towards discrimination against the older persons (17-18). Cronbach's alpha value for the validity and reliability of the study scale is found to be 0.80 for the whole scale and 0.70 for the limited bottom dimension; 0.70 for the discrimination positive bottom dimension and 0.67 for the discrimination negative bottom dimension (17). In this research, Cronbach's alpha value was 0.69 for the whole scale, 0.49 for the limited bottom dimension, 0.80 for the discrimination positive bottom dimension and 0.52 for the discrimination negative bottom dimension.

Ethical consideration

The permissions to conduct this research were given by Atatürk University Health Sciences Faculty Ethical Commission and Public Health Departments. Participants were informed about the purpose and method of the research and their verbal and written consents were taken.

RESULTS

The socio-demographic characteristics of the participants are presented in Table 1. Of the participants living in Izmir, 65.7% are women, 51.7% are single and 37.1% are high school graduates; the mean age is 32.17±10.35. Of the participants, 55.2% defined their income as equal to their expenditures, 82.5% indicated that they have their core family, 53.1% of them spend time mostly in metropolitan cities, 57.3% are living with the older person (23.8% of which are grandparents), 47.6% of older persons in participants' families are living in their own homes and 60.3% of the participants want to live with the older persons in the future.

Of the participants living in Erzurum, 56.7% are female, 62.3% are single and 38.7% are university graduates; the mean age is 32.0 6±9.09. Of this group, 55.6% defined their income as equal to their expenditures, 72.5% indicated that they have their core family, 43.3% spend time mostly in metropole, 63.4% live with the older person, 25.2% of these older persons lived with are grandparents-in-law, 44.7% of the older persons in their families live with their first-degree relatives and 66.0% want to live with the older persons in the future.

When we analyzed distribution of the socio-demographic characteristics of the individuals in these two cities, we found that there were no statistically significant differences in terms of age, gender, educational background, income, type of family, whether they live with older people, their kinship relation to the older people they lived with, the place where the older people lived and willingness to live with older people. The groups were homogeneous in these respects. However, we also found that there were significant differences between the longest place of residence and marital status and that these two groups were not homogenous in these respects (Table 1).

Table 1. Distribution of socio-demographic characteristics of individuals.

Socio-demographic characteristics	Individuals living in Izmir		Individuals living in Erzurum		Significance test
	n	%	n	%	
Gender					
Female	94	65.7	245	56.7	X^2= 3.613
Male	49	34.3	187	43.3	p= 0.06
Marital status					
Married	69	48.3	163	37.7	X^2= 4.940
Single	74	51.7	269	62.3	p = 0.03
Educational status					
Literate	5	3.5	12	2.8	
Primary school	24	16.8	87	20.1	
Middle school	22	15.4	50	11.6	X^2= 9.758
High school	53	37.1	116	26.9	p = 0.05
University	39	27.3	167	38.7	
Levels of income					
More income than expenditure	15	10.5	53	12.3	X^2= 0.433
Equal income and expenditure	79	55.2	240	55.6	p = 0.81
Less income than expenditure	49	34.3	139	32.2	
Family type					
Core family	118	82.5	313	72.5	X^2= 5.837
Extended family	23	16.1	111	25.7	p = 0.05
Alone	2	1.4	8	1.9	
The longest living place					
Village	21	14.7	55	12.7	
Town	23	16.1	60	13.9	X^2= 40.518
City	23	16.1	187	43.3	p = 0.00
Metropolitan	76	53.1	130	30.1	
Status of living with older persons					
Living together	82	57.3	274	63.4	X^2= 1.686
Not living together	61	42.7	158	36.6	p = 0.19
Older persons who living together					
Grandparents	34	23,8	104	24,1	
Grandmother	18	12.6	51	11.8	X^2= 3.613
Grandfather	5	3.5	10	2.3	p = 0.06
Other	21	14.7	109	25.2	
Place where older people live in participants' families					
First degree relatives	56	39.2	193	44.7	X^2= 4.912
Their owns home	68	47.6	162	37.5	p = 0.19
They don't live	19	13.3	77	17.8	
Want to live with the older persons in the future					
Willing	38	60.3	105	66.0	X^2= 0.644
Unwilling	25	39.7	54	34.0	p = 0.42
Age	32.17±10.35		32.0 6± 9.09		t=0.126 p =0.90

The distribution of the concepts that participants relate to elderliness is presented in Table 2. While the individuals living in Izmir expressed the first three concepts as fondness, illness and weakness, the individuals living in Erzurum related elderliness to compassion, illness, wisdom and loyalty.

Table-2. Distribution of individuals' scores for associated concepts with the older persons*

Concepts	Individuals living in Izmir		Individuals living in Erzurum	
	n	%	n	%
Fondness	99	69.2	339	78.4
İllness	59	41.3	163	37.7
Weakness	51	35.7	148	34.2
Wisdom	45	31.5	160	37.0
Loneliness	43	30.1	134	31.9
Dependence	37	25.9	85	19.7
Happiness	29	20.3	138	31.9
Loyalty	19	13.3	160	37.0
Mental reduction	17	11.9	49	11.3
Abundance	12	8.4	67	15.5
Depression	4	2.8	27	6.3
Uselessness	4	2.8	11	2.5

* More than one answer

A comparison of the mean scores of the AAS of participants is presented in Table 3. The mean score of participants living in Izmir for the AAS subscale of 'Restricting Life of the older persons' was 20.80±4.66, for 'Positive Ageism' was 31.44±7.60 and for 'Negative Ageism' was 16.52±3.90.

The mean score of participants living in Erzurum for the ASS subscale of 'Restricting Life of the older persons' 21.01±4.74, for 'Positive Ageism' was 31.25±5.90 and for 'Negative Ageism' was 16.38±4.01.

The total score of the AAS was 68.76±8.74 for the individuals living in Izmir and 68.66±6.72 for the individuals living in Erzurum. Results showed that there was no significant difference between the two groups ($p > 0.05$).

DISCUSSION

In this study, the attitudes towards ageism of individuals living in the eastern and western regions of Turkey, which have different levels of development, were examined.

While the individuals living in Izmir mostly related favorability, illness and weakness with old age, those living in Erzurum had related oldness to affection, illness, wisdom and commitment (Table 2). These findings are consistent with previous studies.

In the study conducted by Ozdemir and Bilgili with nursing students, it was found that the older persons were mostly associated with diseases (74.9%), compassion (73.1%) and weakness (64.4%).

Moreover, 62.6% of the students associated the older persons with concepts of 'loneliness', 60% of students associated the older persons with 'commitment', 57% of them associated the older persons with 'dependency' and 44.6% of students related older persons with 'wisdom' (13). In a study by Gocer and Ceyhan, among the individuals, the concept of elderliness was related with 50.2% 'loneliness', 38.5% to 'disease', 38.1% to 'kindliness', 31.3% to 'weakness' and 16.2% to wisdom (15). In this study, it was considered that these older persons perceptions of individuals, such as kindness, disease, weakness, dependency and wisdom, originate from both the older persons' high frequencies of catching a disease and by traditional and immutable qualities of Turkish culture that include respecting the older persons, protecting them, listening to their opinions and using their knowledge and experience in life.

The result determined that individuals living in both regions had a positive attitude towards the older persons (Izmir, 68.76±8.74, Erzurum 68.66±6.72) (Table 3).

Table-3. Comparison of individuals' Ageism Attitude Scale (AAS) scores.

AAS and subdimensions	Individuals living in Izmir X ±sd	Individuals living in Erzurum X ±sd		Statistic
Restricting life of older persons	20.80±4.66	21.01±4.74	p =0.64	t=-0.457
Positive ageism	31.44±7.60	31.25±5.90	p =0.79	t= 0.261
Negative ageism	16.52±3.90	16.38 ±4.01	p=0.70	t=0.379
ASS Total Score	68.76±8.74	68.66±6.72	p=0.87	t=0.366

The type of discrimination can vary between societies. A survey was conducted in Burundi and Belgium, comparing the discrimination against the older persons in both places. The results showed that there is less discrimination against the older persons in Belgium (19).

In the study by McConatha et al., conducted with students in Turkey and the US, it was determined that students have a positive attitude towards growing old. In addition, it was determined in the same study that Turkish students expressed more pleasure in spending time, visiting and helping the older persons than the US students (20). In a survey conducted in Europe, 44% of participants evaluated ageism as a serious problem. In the same survey, 17% of Turkish participants stated that ageism is a serious problem (21).

It was also seen that studies on ageism in our country have generally been conducted with health personnel and university students (2,7,11,17). In the results of these studies, it is seen that health personnel and nursing students have a positive attitude towards ageing. Gocer and Ceyhan determined that the Turkish society has a positive attitude towards the older persons (15).

The AAS consists of three sub-dimensions: Restricting Life of the older persons, Positive Ageism and Negative Ageism. Restricting Life of the older persons means that the older persons' life is limited within the home, that buying a house, cars and other goods, as well as remarriage of those who lost their spouses, is unnecessary and that they should be placed in resting homes

or be payed less than the younger population. Positive Ageism means that the older persons are individuals who are more patient, compassionate, tolerant and experienced and that they should be given priority in places where they need to wait in line. Negative discrimination means that the older people are constantly ill, not preferred at work and unable to adapt to changes. In our study, the mean score for the Restricting Life of the older persons was 20.80±4.66, for Positive Ageism was 31.44±7.60 and for Negative Ageism was 16.52±3.90. The mean score of individuals living in Erzurum was 21.01±4.74 for Restricting Life of the older persons, 31.25±5.90 for Positive Ageism and 16.38±4.01 for Negative Ageism (See Table 3).

Guven et al., in their study conducted with university students, found that the mean score of Restricting Life of the older persons was 21.09±4.01, that of Positive Ageism was 30.94±5.63 and that of Negative Ageism was 19.51±3.5. These results are consistent with the present findings (3). Similarly, in the study by Soyuer et al., the total AAS score was 70.6±9.5. They found the mean score for Restricting Life of the older persons as 21.10±4.40, for Positive Ageism as 30.50±6.20 and for Negative Ageism as 18.90±3.80. Moreover, Unalan et al. found that the AAS total mean was 68.4±9.1. They found the mean score for Restricting Life of the older persons as 21.2±4.1, for Positive Ageism as 29.2±5.8 and for Negative Ageism as 17.9±4.1. Moreover, Yilmaz et al. found that the total mean score for AAS was 80.2±8.0. The mean score in their study for Restricting Life of the older persons was 32.2±4.3, for Positive Ageism it was 31.±74.9 and for Negative Ageism it was 16.4±3.8 (16).

When similar studies conducted in Turkey are examined, it is seen that positive attitudes towards the older persons are exhibited and the mean scores are similar to these findings. This study showed that individuals living in both regions had positive attitudes towards the older persons and that there was no significant difference between their attitudes (Table 3).

Consistent with many studies on different groups (12,14,15), the fact that individuals have a positive attitude towards the older persons' aligns with the traditional expectation of respect towards the older persons in Turkey. Moreover, even though the development levels of the two regions are different, it is important that individuals in Turkey have positive attitudes towards the older persons, and both regions have defined the concept which is most often associated with the older persons as 'kindness', and this fact is of a quality which supports the notion that these individuals do have a positive attitude towards the older persons.

In conclusion the study revealed that the attitudes are not different in the eastern and western regions, which have different levels of development. It is important to evaluate the perspective of the society on the older persons as the population is increasingly ageing throughout the world, just as it is in Turkey. Therefore, more extensive research should be conducted to determine the opinions of societies. It is important to change the negative prejudices and fight the discrimination against the older persons to provide a satisfactory life for the older persons, in peace with the self and the environment. We consider that the most important attempt in resolving discrimination against the older persons is to raise awareness throughout the society.

Acknowledgements

The authors thank all adults who participated in this research. There is no financial support for our research and there are no conflicts of interest between the authors.

REFERENCES

1. Cilingiroglu N, Demirel S. Aging and ageism. Turkish Journal of Geriatrics 2004;7(4):225-30. (in Turkish).
2. Ozdemir L, Akdemir N, Akyar I. Elderly evaluation form developed for nurses and geriatric problems. Turkish Journal of Geriatrics 2005;8(2):94-100. (in Turkish).
3. Guven SD, Muz GU, Ertürk NE. The attitudes of universıty students towards elderly discrimination and the relation of these attitudes with some variables. Journal of Anatolia Nursing and Health Sciences 2012;15(2) 99-105. (in Turkish).
4. Mandiracioglu A. Demographic characteristics of the elderly population in Turkey and the world. Ege Journal of Medicine 2010;49(3):39-45. (in Turkish).
5. Turkish Statistical Institute. Elders with statistics. [Internet] Available from: http://www.tuik.gov.tr/PreHaberBultenleri.do?id=16057. Accessed:01.03.2017. (in Turkish).
6. Beger T, Yavuzer H. Old age and old age epidemiology. Clinical Development 2012;25:1-3. (in Turkish).
7. Soyuer F, Unalan D, Guleser N, Elmali F. The Attitudes of health vocational school students towards ageism and the relation of these attitudes with some demographical variables. Mersin University Journal of Health Sciences 2010;3(2):20-5. (in Turkish).
8. Levy BR, Slade MD, Kunkel SR, Kasl SV. Longevity increased by positive self-perceptions of aging. Journal of Personality and Social Psychology 2002;83(2):261-70. (PMID:12150226).
9. World Health Organization. Ageing and life-course. [Internet] Available from: http://www.who.int/ageing/events/idop_rationale/en/. Accessed:13.04.2017.
10. Akdemir N, Cinar Fİ, Gorgulu U. Perception of ageing and ageism. Turkish Journal of Geriatrics 2007;10(4):215-22. (in Turkish).
11. Ogenler O, Yapici G, Tafidelen B, Akca1 T. Opinions of a group of medical doctors on elder discrimination in Mersin. Turkish Journal of Geriatrics 2012;15(4):409-15. (in Turkish).
12. Ozdemir O, Bilgili N. Attitudes of Turkish nursing students related to ageism. Journal of Nursing Research 2016;24(3):211–16.
13. Unalan D, Soyuer F, Elmali F. Evaluation of the attitudes of the geriatric care center workers towards elderly patients. Kafkas J Med Sci 2012;2(3):115-20. doi: 10.5505/kjms.2012.15870. (in Turkish).
14. Yilmaz E, Ozkan S. Attitudes of nursing students towards ageism. Maltepe University Journal of Nursing Sciences and Art 2010;3(2):35-53. (in Turkish).
15. Gocer S, Ceyhan O, Unalan D, Elmalı F. The ageism attitudes of older persons' relatives and their relations. HealthMED 2013;7(7):2229-37.
16. Yilmaz M, Altiok M, Polat B, Darici M, Sungur MA. Attitudes of young adults towards ageism. Turkish Journal of Geriatrics 2012;15(4):416-23.
17. Vefikulucay Yilmaz D, Tezioglu F. Development and psychometrıc evaluatıon of ageism attıtude scale among the unıversıty students. Turkish Journal of Geriatrics 2011;14(3):259-68. (in Turkish).
18. Yilmaz DV, Terzioglu F. Ageism and nursing: Review. Turkiye Klinikleri J Nurs Sci 2010;2(2):137-44. (in Turkish).
19. Marquet M, Missotten P, Schroyen S, Nindaba D, Adam S. Ageism in Belgium and Burundi: a comparative analysis. Clin Interv Aging 2016;11:1129-39. (PMID:27601889).
20. McConatha JT, Hayta V, Rieser-Danner L, McConatha D, Polat TS. Turkish and U.S. attitudes toward aging. Educational Gerontology 2004;30(3):169-83.
21. EUROAGE Ageism in Europe, 2011. [Internet] Available from: http://www.ageuk.org.uk/Documents/EN-GB/For-professionals/ageism_across_europe_report_interactive.pdf?dtrk=true. Accessed:13.03.2017.

Turkish Journal of Geriatrics
2017;20 (4):289-295

- Gökşen GÖKŞENOĞLU[1]
- Kürşat TOPAL[2]
- Nurdan PAKER[1]
- Derya BUĞDAYCI[1]
- Nur KESİKTAŞ[1]

RESEARCH

VITAMIN D DEFICIENCY AND RELATED FACTORS IN AMBULATORY PATIENTS WITH MILD TO MODERATE PARKINSON'S DISEASE

Abstract

Introduction: Vitamin D deficiency is a common problem in Parkinson's disease (PD). We investigated 25-hydroxyvitamin D [25(OH)D] values and related factors in ambulatory patients with PD.

Materials and Method: This descriptive study included 48 (25 women, 23 men) patients with idiopathic PD. Serum 25(OH)D and parathormone levels as well as falls within the previous six months were recorded. Disease severity was evaluated by Hoehn and Yahr Scale. Bone mineral density (BMD) was measured using dual-energy X-ray absorptiometry at the L1-L4 spine and femoral neck.

Results: Mean age was 64.4±10.2 years. Mean disease duration was 5.5±3.0 years. Median Hoehn and Yahr stage was 2 (Min-max: 1-3). Mean serum 25(OH)D level was 27.35±9.83 ng/mL. 54.1% of the patients with PD had vitamin D deficiency or insufficiency. The falling rate in the last six months was 41.7%. Median number of falls was 1.5 (Min-max: 1-5). There was a statistically significantly negative correlation between serum 25(OH)D level and disease duration, disease severity, number of falls, and serum parathormone level, whereas a significant positive correlation was found between serum 25(OH)D level and femoral neck BMD. Multiple linear regression analysis revealed that disease duration and number of falls were the predictors of the serum 25(OH)D level (Adjusted R^2=0.54, F=28.6, p<0.0001).

Conclusion: This study suggests that disease duration and number of falls are main predictors for low serum vitamin D level, and that serum parathormone level and femoral neck bone density may be affected by low serum vitamin D level in patients with PD.

Key Words: Parkinson disease; Bone density; Avitaminosis; 25-hydroxyvitamin D2; Osteoporosis

Correspondance

Göksen GÖKŞENOĞLU
İstanbul Physical Rehabilitation and Therapy Training and Research Hospital
İSTANBUL

Phone: 02124965000
e-mail: goksengoksenoglu@hotmail.com

Received: 12/07/2017
Accepted: 01/12/2017

[1] İstanbul Physical Rehabilitation and Therapy Training and Research Hospital
İSTANBUL
[2] Fizyotem Medical Center
TRABZON

This study was presented at WCO-IOF-ESCEO 2010.

ARAŞTIRMA

HAFİF-ORTA DÜZEYDEKİ AMBULATUAR PARKİNSON HASTALARINDA D VİTAMİNİ EKSİKLİĞİ VE İLİŞKİLİ FAKTÖRLER

Öz

Giriş: Parkinson hastalığında (PH) D vitamini eksikliği sık görülen bir problemdir. Biz, ambulatuvar PH olan hastalarda 25-hidroksivitamin D [25(OH)D] düzeylerini ve ilişkili faktörleri araştırdık.

Gereç ve Yöntem: Bu tanımlayıcı çalışmaya idiyopatik PH olan 48 hasta (25 kadın, 23 erkek) dahil edildi. Serum 25(OH)D ve parathormon seviyelerine ek olarak son altı aydaki düşmeler kaydedildi. Hastalık şiddeti Hoehn Yahr skalası ile değerlendirildi. Kemik mineral yoğunluğu (KMY) L1-4 vertebra ve femur boyun bölgelerinden Dual-enerji X-ray absorbsiyometri ile ölçüldü.

Bulgular: Ortalama yaş 64.4±10.2 yıldı. Ortalama hastalık süresi 5.5±3 yıldı. Hoehn Yahr evresi medyan 2 (min-mak: 2-3) idi. Ortalama serum 25(OH)D seviyesi 27,35±9,83 ng/mL idi. Hastaların %54.1'inde D vitamini eksikliği veya yetersizliği vardı. Son 6 aydaki düşme oranı ise %41.7 idi. Düşmeler için medyan değer 1.5 (min-maks: 1-5) idi. Serum 25(OH)D seviyesi ile hastalık süresi, hastalık şiddeti, düşme sayısı ve serum parathormon düzeyi arasında istatistiksel olarak anlamlı negatif korelasyon varken serum 25(OH)D seviyesi ile femur boyun KMY değeri arasında istatistiksel olarak anlamlı pozitif korelasyon bulundu. Çoklu doğrusal regresyon analizi, hastalık süresi ve düşme sayısının serum 25(OH)D düzeyinin önemli belirleyicisi olduğunu ortaya koymuştur. (Düzeltilmiş R2 = 0.54, F = 28.6, p<0,0001).

Sonuç: Bu çalışma, PH olan hastalarda hastalık süresi ve düşme sayısının düşük serum vitamin D düzeyi için temel belirleyiciler olduğunu , serum parathormon seviyesinin ve femur boyun kemik yoğunluğunun düşük serum D vitamini düzeyinden etkilenebileceğini düşündürmektedir.

Anahtar Sözcükler: Parkinson hastalığı; Kemik yoğunluğu; vitamin eksikliği; 25-hidroksivitamin D2; Osteoporoz

INTRODUCTION

Parkinson's disease (PD) is a progressive neurodegenerative disease, characterized mainly by tremor, rigidity, decreased mobility, and postural instability, and affected individuals may have physical activity levels lower than 29% (1). The lifelong incidence of PD is 1.3% and 2% in women and men, respectively (2). Prevalence increases with age, with the highest incidence in women aged 75–84 years (3).

In the last few decades serum vitamin D became important for the people with neurological diseases. Relation between PD and low serum vitamin D level is an interesting issue like the chicken or the egg causality. Lv et al. concluded that patients who had vitamin D deficiency had a two fold increased PD risk (4). Conversely, it is thought that high vitamin D values may protect against PD (5).

Serum 25-hydroxyvitamin D (25(OH)D) level and bone mineral density (BMD) are usually decreased in subjects with PD (6-11). Low BMD together with high fall risk frequently causes hip fractures in PD (11-14). Decreased muscle strength and physical activity, dietary factors, low body weight, vitamin D deficiency, and hyperhomocysteinaemia due to the drugs contain levodopa are the factors those responsible from the bone loss in PD (15,16). The aim of this study was to investigate the frequency and the factors related with the vitamin D deficiency in ambulatory PD patients.

MATERIALS AND METHOD

This descriptive study is performed compatible with the rules in "Helsinki Declaration" and approved by the hospital Ethics Committee. Forty-eight (25 women, 23 men) patients with idiopathic PD who were admitted to the outpatient clinic of the Istanbul Physical Medicine and Rehabilitation Training Hospital between 1 November 2008 and 31 May 2009 were included in this study. Inclusion criteria were being ambulatory, >18 years, and Hoehn and Yahr Stage I–III.

Patients on corticosteroid treatment; those with a rheumatic disease with possible secondary osteoporosis, kidney disease, cardiac disease, thyroid disease, Paget's disease, diseases of the endocrine system such as primary hyperparathyroidism or diabetes mellitus, disorders of the gonads or ovaries, or cancer; and those with a previous diagnosis of osteoporosis or who had been previously treated for osteoporosis were excluded from the study.

Disease severity was evaluated by Hoehn and Yahr Scale in the present study. The Hoehn and Yahr scale is a widely used clinical staging scale, which defines categories of motor function in PD. A decrease in the functional capacity is seen as Hoehn-Yahr Stages increase (17). Hoehn and Yahr Scale contains five stages of disease severity. Stage 1 shows unilateral involvement without functional impairment or with minimal functional decline. Stage II indicates midline or bilateral involvement without balance problem. In stage III righting reflexes are impaired associated with balance problem. Stage IV shows higher disease severity in which hard to walk, whereas in stage V the patient becomes bedridden.

BMD measurements of the lumbar spine (L1–L4) and femoral neck region were performed with a dual-energy x-ray absorptiometry (DXA) (GE/Lunar DPX Pro, Madison, WI) device. According to the World Health Organization criteria, the BMD T-score is derived from comparison of the BMD values of young adults of the same gender, and osteopenia is defined as a lumbar spine or femoral neck T-score of between -1.0 and -2.5 and osteoporosis as a T-score of -2.5 or less.

Serum 25(OH)D and intact parathormone (PTH) levels were measured using an immunoassay method. The laboratory reference range for PTH was 16–68 pg/mL. Serum 25(OH)D level of <20 ng/mL was considered as vitamin D deficiency and the values between 20-30 ng/mL was classified as vitamin D insufficiency (18).

Statistical analysis was performed using an SPSS 16 package program. All data were analyzed for normality of distribution using the Kolmogorov–Smirnov test. Continuous variables were summarized as mean±standard deviation (SD). Non-continuous variables were summarized as median (range). Spearman's test was used to analyze the correlations. A correlation coefficient (R) of more than 0.30 and a P-value<0.05 were considered statistically significant. Multiple linear regression (MLR) analysis was performed to detect independent predictors of vitamin D and to determine confounding effects between potentially independent predictors. A stepwise method was used to construct multiple linear regression models. P value <0.05 was considered statistically significant.

RESULTS

The mean age of patients was 64.15±10.28 years. The mean body mass index (BMI) was 29.45±4.21 kg/m². The mean disease duration was 5.54±3.01 (range 1-14) years. Clinical distribution according to disease severity was as follows: 17 patients with Hoehn Yahr stage I, 22 stage II, and nine stage III patients. Median Hoehn Yahr score was 2 (range 1 to 3).

Table 1. Bone mineral density and laboratory findings.

L1–L4 BMD (g/cm²)	1.015±0.170
Femoral neck BMD (g/cm²)	0.814±0.124
Serum 25(OH)D (ng/mL)	27.35±9.83
Serum PTH (pg/mL)	66.73±19.43
Serum calcium (mg/dL)	9.6±0.984
Serum phosphorus (mg/dL)	3.02±0.421

Data were given as arithmetic mean±standard deviation

Mean BMD values, T-scores, and laboratory data are shown in Table 1. Osteopenia was present in 30 (62%) and osteoporosis in six patients (12%). 25(OH) D deficiency was found in 18 patients (37.5%), whereas 8 (16.6%) had vitamin D insufficiency. Mean serum calcium and phosphorus levels were in the normal range. On the other hand, mean serum PTH level was in the upper limit. There was hyperparathyroidism in 22 patients (45.8%). Falls in the previous six months were reported in 20 patients (41.7%). Median number of falls was 1.5 (range 1-5).

Spearman correlation test revealed a statistically negative correlation between serum 25(OH)D level and disease duration, disease severity, number of falls and serum PTH level. On the other hand, a significant positive correlation was found between serum 25(OH)D and femoral neck BMD. There was no significant correlation between serum 25(OH)D and lumbar BMD (Table 2). Multiple liner regression analysis revealed that disease duration and number of falls, were important predictors of the serum 25(OH)D level (Adjusted R^2=0.54, F=28.6, p<0.0001).

However, age, gender, disease severity, and BMI were not significant predictors. The disease duration and number of falls explain only 54% of the variance in serum 25(OH)D level. The negative standardized regression coefficient (Beta) showed an inverse correlation between serum 25(OH)D level and disease duration and number of falls (Table 3).

Table 2. Significant correlations between Serum 25(OH)D and other variables.

		Disease duration	Disease severity	Number of Falls	PTH	Neck BMD
Serum 25(OH)D	R	-0.575	-0.421	-0.700	-0.816	0.402
	P	0.0001	0.004	0.0001	0.0001	0.005

Spearman correlation test, R: correlation coefficient

Table 3. Multiple linear regression analysis for low serum vitamin D level.

	Standardized Coefficients	t	P	Collinearity Statistics	Autocorrelation Statistics
	Beta			VIF	Durbin - Watson
(Constant)		18.3	<0.001		
Number of falls	-0.506	-4.5	<0.001	1.252	1.93
Disease duration	-0.369	-3.3	0.002	1.252	

VIF: variation inflation factor

DISCUSSION

In this study, 54.1% of the patients with PD had vitamin D deficiency or insufficiency. Serum vitamin D levels are usually decreased in PD (4,7,16,19). Patients with PD were suggested to prone as much as two fold increased vitamin D deficiency risk in a previous study (OR: 2.2, 95 % CI: 1.5-3.4) (4). The mean 25(OH)D value in this study was 27.35±9.83 ng/mL, and this result was compatible with that of the previous study in which serum 25(OH)D value was reported as 20.6±6.5 ng/mL (16).

The important finding of the present study was the inverse relation between serum vitamin D level and disease duration, disease severity, number of falls, serum PTH level. A significant positive correlation was also found between serum vitamin D level and femoral neck BMD. Correlation is a bivariate analysis that measures the strengths of association between two variables and the direction of the relationship but not provide which factor is cause or effect (20). Therefore, vitamin D deficiency and related factors in ambulatory patients with PD can be evaluated in two different perspective. One of them is to define predictive factors for low vitamin D level. Another of them is to define factors affected by low vitamin D level.

Predictive factors for low vitamin D level

We considered that age, gender, body weight or body mass index, disease duration, disease severity, number of falls may be potential predictive factors for the low vitamin D level. The MLR analysis showed that predictors for the low serum vitamin D level were only disease duration and number of falls.

A decreased serum 25(OH)D level accompanied to the patients with higher disease severity and longer disease duration in this study. These results are in accordance with that of the previous studies' (8,21,22). However, MLR analysis showed that disease duration but not disease severity was

a predictive factor for the low vitamin D level in patients with PD. Severe, non-ambulatory patients were not included in this study. For this reason, it can be stated that effects of the disease severity on the low vitamin D level could not be determined in patients with PD.

This study revealed that the fall rate in the previous year was 41.7% in PD. Abou-Raya et al. reported a fall rate of 46% in the last year in a group of patients with PD (7). Falls are common in patients with PD, and falls in the previous year were found as the strongest predictor of future falls in a meta-analysis (23). Therefore, fear of falling may be more prominent in patients with longer disease duration. Because of fear of falling, the outdoors activities may be limited. PD is characterized by decreased mobility, and postural instability (1). Both decreased mobility and postural instability may also limit the outdoor activities. So, the fear of falling, decreased mobility and postural instability lead to decreased sunlight exposure in PD. Finally decreased conversion of vitamin D3 in the skin and decreased renal hydroxylation besides the nutritional problems as in the elderly may result in vitamin D insufficiency or deficiency in PD (24). On the other hand, vitamin D insufficiency may cause increased fall risk because of balance impairment and decreased muscle strength (25). As a result, a vicious circle may develop between vitamin D deficiency and the fear of falling, the decrease in functional capacity.

Factors affected by low vitamin D level

In the present study, BMD and serum PTH levels were also measured. We considered that BMD and serum PTH levels may be factors affected by low vitamin D level.

We did not considered as serum PTH level as a predictor for low serum vitamin D level because primary hyperparathyroidism was not included in this study. So, an inverse relationship between serum vitamin D and PTH levels may be explained by secondary hyperparathyroidism due to serum vitamin D level in our patients.

Low serum vitamin D level associated with the low hip BMD in PD patients in this study. Particularly lower hip BMD values were reported in patients with PD (26-29). In a previous study positive relationship was found between the femoral neck BMD and 25(OH)D values in older women whose serum 25(OH) D levels were <30 ng/mL, and it was suggested that the risk of secondary hyperparathyroidism, and consequently the risk of high bone turnover, were prominent in older women with a serum 25(OH)D level of <30 ng/mL (30). In this context, it can be expected a lumbar bone loss induced by secondary hyperparathyroidism and a correlation between 25(OH)D and lumbar BMD. However, no correlation was found between vitamin D and lumbar BMD in the present study.

How can the discrepancy of association between serum vitamin D level and different sites BMD be explained? In some studies lower BMD values for both lumbar spine and hip were declared (8, 22,31,32). It is well known, that the problems as degenerative disease of lumbar spine or abdominal aorta calcification may cause false high BMD values in lumbar region in the elder people. So hip BMD measurement is more important in the older patients with PD as in all the elder people (7,17,33).

Another explanation for discrepancy of association between serum vitamin D level and different sites BMD may be the disease severity. The disease severity was evaluated by using Hoehn and Yahr Scale in the present study. As the mobility decreases, hip BMD reduces as well. Because of the mechanical load of upper body by which the lumbar spine is exposed during sitting, the lumbar BMD may be relatively less affected by the reduction of mobility. Similar results have been noted for the spinal cord injury and multiple sclerosis patients (34-36).

Falls and low femoral neck BMD are both risk factors for the development of fractures, and particularly hip fracture risk is increased in patients with PD (8,27,32,33). Therefore, falling history and

BMD should be evaluated in patients with PD to prevent the fractures.

This study have some limitations. First, the number of subjects included in the study was

relatively small for MLR analysis. A substantial case to predictor ratio should be at least 10 to 1. Second, this is a descriptive study. A longitudinal study can more definitely reveal the predictive factors for low vitamin D level and the factors affected by low vitamin D level.

As a conclusion, more than half of the patients with PD had vitamin D deficiency or insufficiency. This study suggests that disease duration and number of falls are main predictors for low serum vitamin D level, and that serum PTH level and femoral neck BMD may be affected by low serum vitamin D level.

Conflict of interest

The authors declare no conflict of interest in respect to this study.

REFERENCES

1. van Nimwegen M, Speelman AD, Hofman-van Rossum EJM, et al. Physical inactivity in Parkinson's disease. J Neurol 2011;258:2214-21. (PMID:21614433).
2. Elbaz A, Bower JA, Maraganore DM, et al. Risk tables for parkinsonism and Parkinson's disease. J Clin Epidemiol 2002;55(1):25-31. (PMID:11781119).
3. van de Vijver DAMC, Roos RAC, Jansen PAF, Porsius AJ, de Boer A. Estimation of incidence and prevalence of Parkinson's disease in the elderly using pharmacy records. Pharmacoepidemiol Drug Saf 2001;10(6):549-54. (PMID:11828838).
4. Lv Z, Qi H, Wang L, et al. Vitamin D status and Parkinson's disease: a systematic review and meta-analysis. Neurol Sci 2014;35(11):1723-30. (PMID:24847960).
5. Knekt P, Kilkkinen A, Rissanen H, Marniemi J, Sääksjärvi K, Heliövaara M. Serum vitamin D and the risk of Parkinson disease. Arch Neurol 2010;67(7):808-11. (PMID:20625085).
6. van den Bos F, Speelman AD, Samson M, Munneke M, Bloem BR, Verhaar HJ. Parkinson's disease and osteoporosis. Age Ageing 2013;42(2):156-62. (PMID:23132148).
7. Abou-Raya S, Helmii M, Abou-Raya A. Bone and mineral metabolism in older adults with Parkinson's disease. Age Aging 2009;38(6):675-80. (PMID:19684354).
8. Zhao Y, Shen L, Ji HF. Osteoporosis risk and bone mineral density levels in patients with Parkinson's disease: a meta-analysis. Bone 2013;52(1):498-505. (PMID:23000281).
9. Song IU, Kim JS, Lee SB, et al. The relationship with low bone mineral density and Parkinson's disease in a Korean population. J Clin Neurosci 2009;16(6):807-9. (PMID:19297167).
10. Wood B, Walker R. Osteoporosis in Parkinson's disease. Mov Disord 2005;20(12):1636-40. (PMID:16108011).
11. Gnadinger M, Mellinghoff HU, Kaelin-Lang A. Parkinson's disease and bones. Swiss Med Wkly 2011;141:w13154. (PMID:21328097).
12. Critchley RJ, Khan SK, Yarnall AJ, Parker MJ, Deehan DJ. Occurrence, management and outcomes of hip fractures in patients with Parkinson's disease. Br Med Bull 2015;115(1):135-42. (PMID:26130734).
13. Dobson R, Yarnall A, Noyce AJ, Giovannoni G. Bone health in chronic neurological diseases: a focus on multiple sclerosis and parkinsonian syndromes. Pract Neurol 2013,13(2):70-9. (PMID:23468558).
14. Sato Y, Kaji M, Tsuru T, Oizumi K. Risk factors for hip fracture among elderly patients with Parkinson's disease. J Neurol Sci 2001;182(2):89-93. (PMID:11137512).
15. Malochet-Guinamand S, Durif F, Thomas T. Parkinson's disease: a risk factor for osteoporosis. Joint Bone Spine 2015;82(6):406-10. (PMID:26453100).
16. Wang J, Yang D, Yu Y, Shao G, Wang Q. Vitamin D and sunlight exposure in newly-diagnosed Parkinson's Disease. Nutrients 2016;8(3):142. (PMID:26959053).
17. Hoehn MM, Yahr MD. Parkinsonism: onset, progression, and mortality. Neurology 1967;17(5):427–42. (PMID:6067254).

18. Sozen T, Gogas Yavuz D, Almaca A, et al. Metabolic Bone Disease Diagnosis and Treatment Guidelines. 1st ed. İstanbul, Turkey: Galenos, 2014 (in Turkish).
19. Peterson AL. A review of vitamin D and Parkinson's disease. Maturitas 2014;78(1):40-4. (PMID:24685289).
20. Hayran M, Hayran M. Sağlık Araştırmaları için Temel İstatistik. Art Ofset Matbaacılık Yayıncılık Organizasyon Ltd Şti Ankara 2011.
21. Daniel SK, Lansang MC, Okun MS. Bone mineral density (BMD) in male patients with Parkinson's disease. Int J Neurosci 2012;122(9):523-7. (PMID:22510054).
22. Bezza A, Ouzzif Z, Naji H, et al. Prevalence and risk factors of osteoporosis in patients with Parkinson's disease. Rheum Int 2008;28(12):1205-9. (PMID:18592245).
23. Pickering RM, Grimbergen YA, Rigney U, et al. A meta-analysis of six prospective studies of falling in Parkinson's disease. Mov Disord 2007;22(13):1892-900. (PMID:17588236).
24. Gennari C. Calcium and vitamin D nutrition and bone disease of the elderly. Public Health Nutr 2001;4(2B):547-59. (PMID:11683549).
25. Shimizu Y, Kim H, Yoshida H, Shimada H, Suzuki T. Serum 25-hydroxyvitamin D level and risk of falls in Japanese community-dwelling elderly women: a 1-year follow-up study. Osteoporos Int 2015;26(8):2185-92. (PMID:25910748).
26. Cooper C, Mclaren M, Wood PJ, Coultan L, Kanis JA. Indices of calcium metabolism in women with hip fracture. Bone Miner 1989;5(2):193-200. (PMID:2784069).
27. Lam K, Li M, Mok V, Hui A, Woo J. A case control study on bone mineral density in Chinese patients with Parkinson's disease. Parkinsonism Relat Disord 2010;16(7):471-4. (PMID:20547468).
28. Schneider JL, Fink HA, Ewing SK, Ensrud KE, Cummings SR. Study of Osteoporotic Fractures (SOF) Research Group. The association of Parkinson's disease with bone mineral density and fracture in older women. Osteoporos Int 2008;19(7):1093-7. (PMID:18301855).
29. Kamanli A, Ardicoglu O, Ozgocmen S, Yoldas TK. Bone mineral density in patients with Parkinson's Disease. Aging Clin Exp Res 2008;20(3):277-9. (PMID:18594197).
30. Sato Y, Kikuyama M, Oizumi K. High prevalence of vitamin D deficiency and reduced bone mass in Parkinson's disease. Neurology 1997;49(5):1273-8. (PMID:9371907).
31. Di Monaco M, Vallero F, Di Monaco R, Tappero R, Cavanna A. Bone mineral density in hip-fracture patients with Parkinson's disease: a case-control study. Arch Phys Med Rehabil 2006;87(11):1459-62. (PMID:17084120).
32. Lorefält B, Toss G, Granérus AK. Bone mass in elderly patients with Parkinson's disease. Acta Neurol Scand 2007;116(4):248-54. (PMID:17824904).
33. Fink HA, Kuskowski MA, Orwoll ES, Cauley JA, Ensrud KE. Osteoporotic fractures in men (MrOS) study group. Association between Parkinson's disease and low bone density and falls in older men: the osteoporotic fractures in men study. J Am Geriatr Soc 2005;53(9):1559-64. (PMID:16137287).
34. Leslie WD, Nance PW. Dissociated hip and spine demineralization: a specific finding in spinal cord injury. Arch Phys Med Rehabil 1993; 74(9):960-4. (PMID 8379843).
35. Tuzun S, Altintas A, Karacan I, Tangurek S, Saip S, Siva A. Bone status in multiple sclerosis: beyond corticosteroids. Mult Scler 2003;9(6):600-4. (PMID:14664473).
36. Can A, Dosoglu MS, Karacan I, Karamehmetoglu SS. Effect of axial loading on bone mineral density in patients with traumatic spinal cord injury. Ulusal Travma Acil Cerrahi Derg 2007;13(2):101-5. (PMID:17682951).

Turkish Journal of Geriatrics
2017;20 (4):296-305

■ Güzin Zeren ÖZTÜRK[1]
■ Cüneyt ARDIÇ[2]
■ Dilek TOPRAK[1]

RESEARCH

FREQUENCY OF POLYPHARMACY AND USE OF POTENTIALLY INAPPROPRIATE MEDICATIONS IN THE ELDERLY

Abstract

Introduction: Increased rates of increase in the elderly population, chronic illnesses and drugs usage are inevitable, making polypharmacy more frequent in older adults. Our study aimed to investigate the frequency of polypharmacy in the elderly and to examine their medication use.

Materials and Method: Three hundred elderly individuals (aged >65 years) who visited our family medicine polyclinic were included in the study. In addition to collecting socio-demographic information, a questionnaire about current drug use was administered. Currently used drugs were listed by doctors and screened using screening tools. Data were analysed using the chi-square and Student's t-tests; $p < 0.05$ was considered significant.

Results: A total of 1,650 drugs were used by study participants. The mean number of drugs per patient was 5.50±2.84 (range, 1–14). Polypharmacy (≥5 drugs) was present in 187 (62.3%) participants; 5–9 drugs were used by 158 (52.7%). Hyperpolypharmacy (≥10 drugs) was present in 29 (9.7%) participants. In total, 317 (19.2%) drugs were on the list of the European Union Potentially Inappropriate Medications, and 195 (65%) patients were using at least one potentially inappropriate medication. A total of 124 (7.5%) medications were stopped due to unnecessary usage. Patients were referred to branch doctors because of 108 (6.5%) drugs.

Conclusion: Polypharmacy and potentially inappropriate medication usage were both very frequent in this elderly population sample. Polypharmacy was positively related only to chronic diseases, negatively related to closely controlled therapy. For this reason, evaluation of drug use in the elderly is an important step.

Key Words: Aging; Inappropriate prescriptions; Polypharmacy; Drug therapy; Drug prescription; Chronic disease

Correspondance

Güzin Zeren ÖZTÜRK
Sisli Hamidiye Etfal Training and Research Hospital
Family Medicine Clinic
İSTANBUL

Phone: 05322930395
e-mail: guzin_zeren@hotmail.com

Received: 16/10/2017
Accepted: 27/11/2017

[1] Sisli Hamidiye Etfal Training and Research Hospital
Family Medicine Clinic
İSTANBUL
[2] Recep Tayyip Erdoğan University
Family Medicine
RİZE

ARAŞTIRMA

YAŞLILARDA POLİFARMASİNİN SIKLIĞI VE POTANSİYEL UYGUNSUZ İLAÇ KULLANIMI

Öz

Giriş: Yaşlanma, kronik hastalıklar ve ilaç kullanımını artırması polifarmasi görülme sıklığını artırmaktadır. Çalışmamızda, yaşlı bireylerde polifarmasi sıklığını, neden olan risk faktörlerinin ve ilaç kullanımının incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Aile hekimliği polikliniğine başvuran 300 (65 yaş üzeri) birey alındı. Sosyodemografik verilerin yanı sıra, mevcut ilaç kullanımı ile ilgili sorulardan oluşan bir anket uygulanmıştır. Halen kullanılan ilaçlar doktorlar tarafından listelenmiştir. Avrupa Birliği Potansiyel Uygun Olmayan İlaçlar listesine göre taranmıştır. Veriler ki-kare ve Student-t testleri kullanılarak analiz edildi; $p <0.05$ anlamlı kabul edildi.

Bulgular: Çalışmada katılımcıların toplam 1.650 ilaç kullandıkları tespit edildi. Hasta başına düşen ortalama ilaç sayısı 5.50±2.84 (aralık 1-14) idi. Polifarmasi (≥5 ilaç) 187 (% 62.3) katılımcıda varken; Hiper polifarmasi (≥10 ilaç) ise 29 (%9.7) katılımcıda mevcuttu. Avrupa Birliği Potansiyel Uygun Olmayan İlaçlar listesinde olan 317 (% 19.2) ilaç vardı. 195 (% 65) hasta en az bir potansiyel olarak uygun olmayan ilaç kullanıyordu. Gereksiz kullanım nedeniyle toplam 124 (% 7.5) ilaç durduruldu. Hastalar için 108 (% 6.5) kullandığı ilaçlar nedeniyle dal doktorlar sevk edildi.

Sonuç: Polifarmasi ve uygun olmayan ilaç kullanımı yaşlı bireylerde sık görülmektedir. Polifarmasi kronik hastalıklarla artarken; yakın doktor kontrolü ile azalmaktadır. Bu nedenle yaşlıda ilaç kullanımını değerlendirme önemli bir basamaktır.

Anahtar Sözcükler: Yaşlanma; Uygunsuz reçeteleme; İlaç reçeteleme; Polifarmasi; İlaç tedavisi, Kronik hastalık

INTRODUCTION

According to the Turkish Statistical Institute, there were 6,651,503 elderly individuals in Turkey in 2016, representing 8.3% of the national population (1). Due to advancements in the health sector, human life expectancy is increasing worldwide. The increases in the number of elderly individuals, chronic illnesses and number of drug used by patients are inevitable. As such, polypharmacy is becoming more frequenct in older adults. The word 'poly' is derived from a Greek word meaning 'more than one', and 'pharmacy' refers to the Greek word for drug 'pharmacon' (2). There is no consensus about the definition of polypharmacy, but it is most commonly defined in healthcare literature as taking five or more medications. Hyperpolypharmacy has been described as taking 10 or more medications (3).

Polypharmacy can be problematic. It can increase the risk of the use of potentially inappropriate medications (PIMs), medication non-adherence, drug duplication, drug–drug interactions, higher health care costs and adverse drug reactions (4). Treatment for medication errors and adverse drug events in the older adult population is estimated to cost more than $880 million United States of America per year (5).

Several screening tools have been developed to identify sub-optimal prescribing practices in the elderly (6). In 2008, the Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) and Screening Tool to Alert Doctors to the Right Treatment (START) criteria were introduced (7). The European Union PIM [EU(7)-PIM] list made by experts from seven European countries was introduced in 2015 (8). Our study aimed to investigate the frequency of polypharmacy in the elderly and to examine their medicine use based on these screening tools.

MATERIALS AND METHOD

A prospective cross-sectional study was performed involving 300 elderly participants.

Study population

A total of 4,725 patients aged over 65 years visited our clinic according to records from the previous year. Approximately 1,181 patients visited our clinic every 3 months. Sample size for this study was calculated from 1,181 patients with a 5% confidence interval (CI) using a sample size calculator, which revealed that a sample of at least 291 patients was required. Therefore, 300 participants were recruited for our study from the Sisli Hamidiye Etfal Training and Research Hospital Family Medicine Polyclinic using random sampling between July and September 2017.The CI was 4.88%. Inclusion criteria included age more than 65 years, having no communication barriers and wishing to participate in the study.

Procedures

The study was approved by the ethics committee of the Sisli Hamidiye Etfal Training and Research Hospital on 13 June 2017 (no. 1583). Verbal permission was obtained from all participants.

Measures

We composed and administered a questionnaire with 10 items (age, gender, economical status, marital status, education status, taking drugs according to the doctor's prescription, time of the last control and from which branch, missed medicine dose) collecting data on socio-demographic factors and drug use patterns and asked the participants to collect and check all the medicines they use. All drug types were listed according to systems and diseases for each patient. Drugs were classified as polypharmacy (≥5 drugs) or hyperpolypharmacy (≥10 drugs). Data were collected by conducting face-to-face interviews with participants. All listed medications were verified using the EU(7)-PIM list as a screening tool. Patients using incorrect drugs or who unnecessarily recorded some drugs were referred to branch doctors (internal medicine expert, endocrinologist or cardiologist).

The EU(7)-PIM list

The EU(7)-PIM list is an expert-consensus list of PIMs for older people which takes into consideration the medications appearing in six country-specific PIM lists, as well as medications used in seven European countries (Estonia, Finland, France, Germany, the Netherlands, Spain and Sweden).The development of the EU(7)-PIM list took several international PIM lists [i.e. the German PRISCUS, American Beers, Canadian and French lists] into consideration, as well as further drugs suggested by experts on geriatrics prescribed from seven European countries who specialised in various professions. In this list, there are 282 PIMs, 29 'questionable PIMs' and 3 'non-PIMs' (8).

Statistical analysis

Statistical analyses were performed using SPSS software version 20 (IBM SPSS, Chicago, IL, USA). Variables were investigated using visual (histograms, probability plots) and analytical (Kolmogorov–Smirnov) methods to determine data normality; data were abnormally distributed. Frequencies were calculated for variables related to demographic and clinical patient characteristics. Data were analysed using the chi-square and Student's t-tests, and values of $p<0.05$ were considered statistically significant.

RESULTS

In total, 1,650 drugs (114 types) were used by study participants. The mean number of drugs per patient was 5.50±2.84 (range, 1–14). Polypharmacy (≥5 drugs) was present in 187 (62.3%) patients; 5–9 drugs were used by 158 (52.7%). Hyperpolypharmacy (≥10 drugs) was found in 29 (9.7%) patients.

A total of 300 patients [mean age, 76.27±8.6 (range 65–99)] were included in our study; 48.3% (145) of patients were aged 65–74 years. As shown in Table 1, 170 (56.7%) patients were females, 171 (57%) were married, 107 (35.7%) had an education level below high school, 131 (43.7%) had no income and 181 (60.3%) were retired. There were no statistical associations between polypharmacy and gender, marital status, education, economic status or retirement status (P=0.636, 0.106, 0.309, 0.156 or 0.769, respectively).

As shown in Figure 1, the most frequent bodily system treated by medication was the cardiovascular system. The three most frequent drugs were beta blocking agents, angiotensin receptor blockers (ARBs) and thrombolytics. The three most common chronic diseases treated were hypertension (HT), diabetes mellitus (DM) and cancer. As shown in Table 2, DM and HT were significantly related to polypharmacy according to the chi-square test (p=0.01 and 0.001, respectively), whereas cancers were not (p=0.327). A total of 118 participants used 212 oral anti-diabetic drugs (11 types). Most participants (61; 61.6%) used two or more drugs for DM. In addition, 143 participants used a total of 475 HT drugs (24 types). Approximately three drugs were used for HT per patient. Beta blocking agents (108, 36%) and ARBs (96, 32%) were mainly used for HT. Seventy-two participants had both DM and HT; these participants used an average of 6.85±2.81 drugs.

Our results indicated that 267 (89%) participants took drugs according to their doctors' prescriptions, whereas 33 (11%) occasionally changed their drugs on their own. Polypharmacy and changing drugs on one's own were not significantly related (p=0.828). A total of 102 participants (34%) had their medicines controlled ≤1 month ago, and 100 (33%) had them controlled by an internal medicine doctor. Polypharmacy was related with the monitoring times by doctors (P=0.00), but not with the type of doctor (P=0.532). Close monitoring decreased polypharmacy. In terms of missing medicine doses, 58 (19.3%) participants occasionally forgot to take their medications. Polypharmacy and missing medicine doses were related; patients forgot to take their medications with increasing number of drugs used (p=0.018).

Table 1. Distribution of socio-demographic factors and drug use patterns in elderly study participants.

Factor	n	%
Age (years)		
64–74	145	49
75–84	94	31
≥85	61	20
Gender		
Women	170	56.7
Men	130	43.3
Marital Status		
Married	171	57
Single	129	43
Education Status		
Uneducated	2	0.7
Literate	91	30.3
Under high school	107	35.7
High school and above	79	26.3
Economic Status		
No income	131	43.7
Minimum wage (≤1300 TL)*	50	16.7
Middle income (1300–3000)*	109	36.3
High income (≥3000)*	10	3.3
Retired		
Yes	181	60.3
No	119	39.7
Taking drugs according to doctors' prescription		
Yes	267	89.0
No	33	11.0
Prescription given by		
Family physicians	75	25.0
Internal medicine	100	33.0
Cardiologist	39	13.0
Neurologist	32	10.7
Other	54	18.0

*1300 TL (350 USD); 3000 TL(815 USD)

Table 2. The relationship between study parameters and polypharmacy in elderly study participants.

Parameter	Total		Polypharmacy				
			Positive		Negative		
	n	%	n	%	n	%	p
Gender							
Women	170	56.7	104	55.6	66	58.4	
Men	130	48.3	83	44.4	47	41.6	0.636
Age (years)							
64–74	145	49	89	48	56	50	
75–84	94	31	61	32	33	29	
≥85	61	20	37	20	24	21	0.822
DM							
Positive	118	39	91	49	27	24	
Negative	182	61	96	51	86	76	0.00
HT							
Positive	157	52	103	55	40	35	
Negative	143	48	84	45	73	65	0.001
Cancer							
Positive	96	32	56	30	40	35	
Negative	204	68	131	70	73	65	0.327
Time of verification							
≤1 month	102	34.0	54	32	48	43	
1–6 months	61	20.3	29	17	32	28	
6–12 months	39	13.0	31	19	8	7	
1–5 years	42	14.0	12	7	10	9	
≥5 years	56	18.7	41	25	15	13	0.000
Missed drugs							
Yes	58	19	44	23.5	14	12	
No	242	81	143	76.5	99	88	0.018

DM, diabetes mellitus; HT, hypertension

PIMs used by study participants according to EU(7)-PIM are shown in Table 3. A total of 317 (19.2%) drugs were listed in EU(7)-PIM, and 195 (65%) patients took a minimum of one PIM. According to EU(7)-PIM, some oral anti-diabetics such as glimepiride, sitagliptin and glibenclamide were PIMs. All (51) were referred to their branch doctors by our team. Twenty-three (7.7%) participants used warfarin. The mean number of drugs in patients who used warfarin was 5.08±2.77 (range, 1–10). We referred these patients to a cardiologist and encouraged them to maintain close control of their medication within the international normalised ratio.

Table 3. List of PIMs among drugs taken by patients according to EU(7)-PIM list.

Drug	n	%
Oral anti-diabetics		
Glimepiride	6	2
Insulin	41	13
Sitagliptin	4	1
Cardiovascular drugs		
Trimetazidine	15	5
Spironolactone	9	3
Nifedipine	11	3
Verapamil	4	1
Diltiazem	18	6
Digoxin	5	2
PPI	84	26
Iron	17	5
Trimetazidine	15	5
Doxazosin (both for BPH and CVD)	16	5
NSAID	43	14
Tramadol	2	0.5
Ginkgobiloba	9	3
Clozapine	4	1
Risperidone	4	1
Diazepam	2	0.5
Theophylline	8	3
Total	**317**	**100**

BPH, benign prostatic hyperplasia; CVD, cardiovascular disease; EU(7)-PIM list, European Union Potentially Inappropriate Medication list; NSAID, non-steroid anti-inflammatory drug; PIM, potentially inappropriate medication; PPI, proton pump inhibitor

A total of 84 (38%) participants used proton pump inhibitors. Lansoprazole was the most commonly used PPI (34 participants, 40.5%). A long-term (>8 weeks), high-dose PPI therapy is associated with an increased risk of *C. difficile* infection and hip fracture according to EU(7)-PIM. Therefore, we controlled for indication of use, and drugs were referred or stopped if unnecessary; 59.5% (50) were stopped and others were referred.

Potassium-sparing agents (e.g. spironolactone) were listed as PIMs in EU(7)-PIM when used in excess of the recommended dose (>25 mg/dL). However, all nine study participants who used these drugs took 25 mg for heart failure.

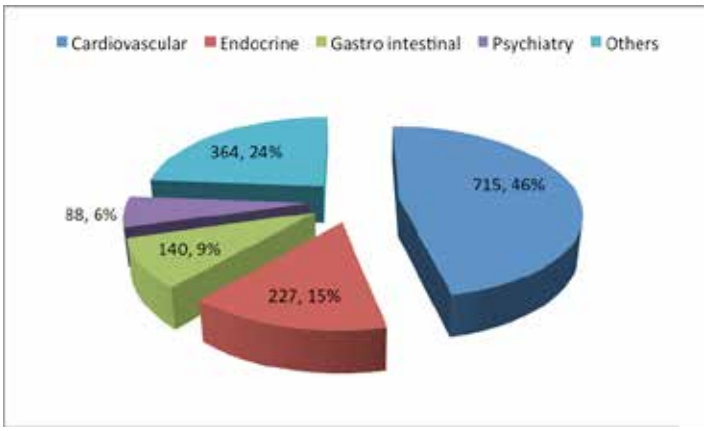


Figure 1. Drug types used by elderly study participants (listed as number of patients, percentage).

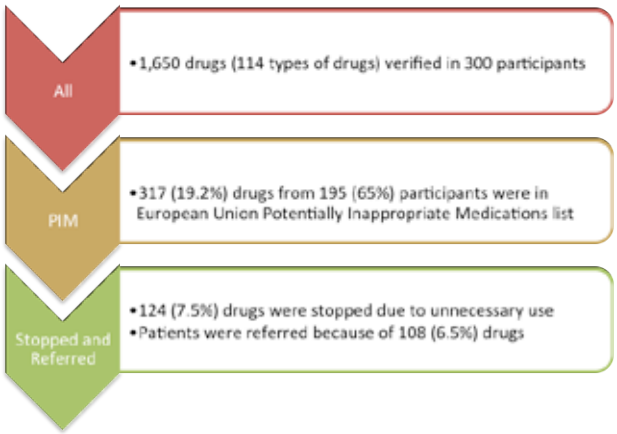


Figure 2. Overall study results regarding drug use in elderly study participants.

Fifteen participants used trimetazidine at a normal dose and indication for ischemic heart diseases.

In total, 43 (14.3%) participants used non-steroid anti-inflammatory drugs (NSAIDs); all these were stopped because of unnecessary use. Twenty-two (7.3%) participants used muscle relaxants; all these were self-medications, and were thus stopped due to unnecessary use.

Vitamins and mineral use was also verified; 43 (14.3%) participants used vitamin B12, 17 (5.6%) used iron and 11 (3.6%) used calcium with vitamin D. We also verified participants' early laboratory data and diagnoses and found no unnecessary use.

Lastly, 19 (6.3%) participants used steroid creams (e.g. desoximetasone) for itching without their doctors' prescription. We therefore stopped these medications and referred the patients to a dermatologist.

In total, 124 (7.5%) drugs were stopped due to unnecessary use (Figure 2). The most commonly used self-medication drugs were NSAIDs (43; 14.3%). Patients were referred because of 108 (6.5%) drugs.

DISCUSSION

During the 20th century, significant changes were observed worldwide in terms of demographic, morbidity and mortality rates, although at different magnitudes. According to the World Health Organization, the average global life expectancy at birth is 71.4 years (males, 69.1 years; females, 73.7 years) (9). According to Turkish national statistics, the number of elderly individuals was 6,651,503 in 2016 and accounted for 8.3% of the Turkish population (males, 43.9%; females, 56.1%), and the life expectancy at birth was 66.2 years (10). Accordingly, 56.7% of our sample population was female, which is likely the result of the longer life expectancy of females.

Due to the growing elderly population, certain issues such as polypharmacy are becoming more frequent due to the increased prevalence of chronic diseases in the elderly. In a study conducted in the USA, it was observed that 57% of females over 65 years of age used five or more drugs and 12% used 10 or more drugs (11). According to another study (12), the frequency of polypharmacy in the elderly was 36%. In our sample population including males and females aged more than 65 years, the frequency of polypharmacy (5 or more drugs) was 62.3% and that of hyperpolypharmacy (10 or more drugs) was 9.7%. These results revealed that polypharmacy affected approximately half of the elderly population under study.

There are many factors driving polypharmacy. Some studies have shown a relationship between polypharmacy and both female sex and age over 80 years (13,14). In our study, there was no relationship between socio-demographic factors and polypharmacy. We believe this was due to characteristics of the study group.

In our study, chronic diseases were related to polypharmacy. According to previous studies (15, 16), the most frequent chronic disease in the elderly was hypertension, and the most commonly used drugs were cardiovascular drugs (17), as observed in our study. Also, consistent with our findings, HT (18) and DM (19) were both related to polypharmacy in previous studies. This finding indicates that polypharmacy may be partly due to the increasing number of elderly individuals with chronic diseases and complications.

In a previous study, the frequency of polypharmacy specifically in the cancer outpatient setting was 41% (20). According to a review, chemotherapy treatment itself presents an increased risk for polypharmacy, with 96% of patients taking prescription drugs and 69% taking vitamins, herbs, or supplements within 3 days of chemotherapy administration (21). In our study, there was no relationship between cancer and polypharmacy because not all cancer patients were undergoing chemotherapy, and after treatment, cancer patients were afraid to use drugs and asked doctors before use because they learned about the drug side effects and reactions.

In our study, polypharmacy decreased with close control by a doctor; therefore, to prevent polypharmacy, healthcare professionals should be aware of the risks and fully evaluate all medications at each patient visit (22). Taking too many drugs leads not only to pharmacological outcomes (e.g. inappropriate drug, adverse drug events, adherence) but also certain clinical outcomes (e.g. morbidity, functionality). In our study, polypharmacy also led to some patients missing their medications and thus uncontrolled therapy.

Use of PIMs has been analysed by several authors and ranges from 20% to 79% depending on the population studied, setting or country and specific tools used (23). In our study, the EU(7)-PIM list was used as a screening tool. The frequency of PIMs in previous studies were 57.2% (28) and 66.7% (24) according to the EU(7)-PIM list. Similar to our study, the frequency of PIMs was 65%, and the most commonly used self-medication drugs were NSAIDs (43; 14.3%), as observed in a study from Brazil (13). Our study highlights the importance of ensuring that drugs are controlled by doctors, and that more

than half of elderly individuals have a high risk (e.g. medication non-adherence, drug duplication, drug–drug interactions and adverse drug reactions) because of PIMs. PIM was not only problematic for the elderly but also affected the overall population, as PIMs increased hospitalisation and incurred heavy costs in the health sector.

It is known that drug–drug interactions in warfarin-treated patients on multiple medications are common and are associated with increased bleeding risks (25), similar to the findings of our study. Twelve (52.2%) warfarin-treated patients in our study had polypharmacy. Therefore, we must pay attention to warfarin-treated patients about using other drugs because of their increased risk of drug–drug interactions.

As shown in Figure 2, 1,650 drugs (114 types) were verified in 300 patients. Frequency of polypharmacy (5 or more drugs) was 187 (62.3%); 158 (52.7%) participants used 5–9 drugs, and 29 (9.7%) had hyperpolypharmacy (10 or more drugs). In total, 317 (19.2%) drugs were on the European Union PIM list, and 195 (65%) patients used a minimum of one PIM. A total of 124 (7.5%) medications were stopped due to unnecessary use. Patients were referred because of 108 (6.5%) drugs.

In conclusion, polypharmacy and PIM use were both very frequent in the elderly population in our study. According to our study, polypharmacy was positively related only to chronic diseases, negatively related to closely controlled therapy and led to missing of medication dose in some participants. Given these findings, we suggest that doctors verify all medications taken by elderly patients. Branch physicians do not always have time to examine all medications used by patients due to their heavy workload. Family physicians are well positioned to encourage appropriate use of medications in older adults. Introducing a program related to PIMs into clinical practice would be useful. However, just as we require evidence-based, age-specific, pharmacological information for efficient clinical decision making, we also require solid evidence for strategies that consistently improve the quality of pharmacological treatments at the health system to shape 'age-attuned' health and drug policies. There is a great need for interventions to improve pharmacotherapy in elderly populations. Therefore, we suggest planned educational programmes at post-secondary education level and medical schools to promote increased knowledge and prevent the use of polypharmacy and PIMs.

REFERENCES

1. Health Statistics 2015; Turkey Statistical Institute; 2016. [Internet] Available from: http://www.tuik.gov.tr/PreTablo.do?alt_id=1095. Accessed: 23.9.2017.
2. Merriam Webster Medical Dictionary. [Internet] Available from: https://www.merriam-webster.com/dictionary/polypharmacy. Accessed: 23.9.2017.
3. Gnjidic D, Hilmer SN, Blyth FM, et al. High-risk prescribing and incidence of frailty among older community-dwelling men. Clin Pharmacol Ther 2012;91(3):521-8. (PMID:22297385).
4. Kojima T, Akishita M, Nakamura T, et al. Polypharmacy as a risk for fall occurrence in geriatric outpatients. Geriatr Gerontl Int 2012;12(3):425-30. (PMID:22212467).
5. Institute of Medicine. Preventing medication errors. 2006. [Internet] Available from: http://www.Nationalacademies.org/hmd/w/media/Files/Report%20Files/2006/PreventingMedication-Errors-Quality-Chasm-Series/medicationerrorsnew.ashx. Accessed: 23.9.2017.
6. Levy HB, Marcus EL, Christen C. Beyond the Beers criteria: a comparative overview of explicit criteria. Ann Pharmacother 2010;44(12):1968-75. (PMID:21081709).
7. Gallagher P, Ryan C, Byrne S, Kennedy J, Mahony D. STOPP (Screening Tool of Older Persons Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment). Consensus validation. Int J Clin Pharmacol Ther 2008;46(2):72-83. (PMID:18218287).

8. Renom-Guiteras A, Meyer G, Petra AT. The EU(7)-PIM list: a list of potentially inappropriate medications for older people consented by experts from seven European countries. Eur J Clin Pharmacol. 2015;71(7):861-75. (PMID:25967540).

9. World Health Organisation (2017) Global Health Observatory (GHO) data. [Internet] Available from: http://www.who.int/gho/mortality_burden_disease/life_tables/situation_trends/en/.Accessed: 22.09.2017.

10. Turkey Statistical Institute (2016) Health statistics 2015. [Internet] Available from: http://www.turkstat.gov.tr/Start.do;jsessionid=JrzZZ3gKQsMntZM2Qsb8KyfvyfHmkvshyBGNCcl6T55hRXkH6sMc!560081250. Accessed: 22.9.2017.

11. Kaufman DW, Kelly JP, Rosenberg L, et al. Recent patterns of medication use in the ambulatory adult population of the United States: The Slone survey. JAMA 2002;287(3):337-44.(PMID:11790213).

12. Qato DM, Alexander GC, Conti RM, et al. Changes in prescription and over-the-counter medication and dietary supplement use among older adults in the United States, 2005 vs. 2011. JAMA Intern Med 2016;176:475-82. (PMID:19109115).

13-Santos TRA, Lima DM, Nakatani AYK, et al.Medicine use by the elderly in Goiania, Midwestern Brazil 2013;47(1):94-103. (PMID:23703135).

14. Pereira KG, Peres MA, Iop D, et al. Rev Bras Epidemiol 2017;20(2):335-44.(PMID:28832855).

15. Unsal A, Demir G. The prevalence of chronic disease and drug use in the elderly in central Kırsehir. Turkish Journal of Geriatrics 2010;13(4):244-51[Internet] Available from: http://geriatri.dergisi.org/pdf/pdf_TJG_523.pdf. Accessed: 22.09.2017.

16. Park EJ, Sohn HS, Lee EK, Kwon JW. Living arrangements, chronic diseases, and prescription drug expenditures among Korean elderly: vulnerability to potential medication under use. BMC Public Health 2014;14(1):1284. (PMID:25516064).

17. Jyrkkä J, Enlund H, Korhonen MJ, Sulkava R, Hartikainen S. Patterns of drug use and factors associated with polypharmacy and excessive polypharmacy in elderly persons: results of the Kuopio 75+ study: a cross-sectional analysis. Drugs Aging 2009;26(6):493-503. (PMID:19591524).

18. McCracken R, McCormack J, McGregor MJ, Wong ST, Garrison S. Associations between polypharmacy and treatment intensity for hypertension and diabetes: a cross-sectional study of nursing home patients in British Columbia, Canada. BMJ Open 2017;7(8):7-8 doi: 10.1136/bmjopen-2017-017430 [Internet] Available from:http://bmjopen.bmj.com/content/bmjopen/7/10/e017928.full.pdf. Accessed: 22.09.2017.

19. Badedi M, Solan Y, Darraj H, et al.Factors associated with long-term control of type 2 diabetes mellitus. J Diabetes Res 2016;2016:2109542. (PMID:28090538).

20. Hersh LR, Beldowski K, Hajjar ER. Polypharmacy in the geriatric oncology population. Curr Oncol Rep 2017;23;19(11):73. (PMID:28942563).

21. Hanigan MH, Dela Cruz BL, Thompson DM, Farmer KC, Medina PJ. Use of prescription and non-prescription medications and supplements by cancer patients during chemotherapy: questionnaire validation. J Oncol Pharm Pract 2008;14(3):123-30. (PMID:18719067).

22. Hajjar ER, Cafiero AC, Hanlon JT. Polypharmacy in elderly patients. Am J Geriatr Pharmacother 2007;5(4):345-51. (PMID:18179993).

23. Grina D, Briedis V. The use of potentially inappropriate medications among the Lithuanian elderly according to Beers and EU(7)-PIM list - a nationwide cross-sectional study on reimbursement claims data. J Clin Pharm Ther 2017;42(2):195-200. (PMID:28155237).

24. Mucalo I, Hadžiabdić MO, Brajković A, et al. Potentially inappropriate medicines in elderly hospitalised patients according to the EU(7)-PIM list, STOPP version 2 criteria and comprehensive protocol. Eur J Clin Pharmacol 2017;73(8):991-9. (PMID:28405697).

25. Teklay G, Shiferaw N, Legesse B, Bekele ML. Drug-drug interactions and risk of bleeding among inpatients on warfarin therapy: a prospective observational study. Thromb J 2014;12(1):20. (PMID:25249791).

Turkish Journal of Geriatrics
2017;20 (4):306-314

■ Sevgisun KAPUCU[1]
■ Gamze ÜNVER[2]

RESEARCH

PAIN AND FRAILTY IN ELDERLY FEMALES WITH OSTEOPOROSIS

Abstract

Introduction: Most adults who live to an advanced age become frail. Although not a disease, frailty is a combination of age-related changes and associated medical problems. This descriptive study aimed to determine the pain level and frailty status of elderly females with osteoporosis.

Materials and Method: The present study sample consisted of 105 elderly females with osteoporosis who were admitted to the geriatric outpatient units of two university hospitals. Data were collected using the questionnaire prepared by the author on the basis of a literature review, the Geriatric Pain Scale and the Edmonton Frail Scale. Data were analysed using descriptive statistics, the Mann–Whitney U test, the Kruskal–Wallis H test and correlation analysis.

Results: In total, 6.7% of the elderly females with osteoporosis reported a slight level of pain, 67.3% reported mild pain and 26% reported severe pain. Edmonton Frail Scale mean scores indicated that 16.3% of the subjects had moderate frailty and that 44.2% had severe frailty. Elderly females with osteoporosis who were sad and depressed during the past seven days due to pain were found to be more fragile ($p<0.05$). In addition, weight loss, depressive symptoms and urinary incontinence were related to frailty ($p<0.05$). A poor positive significant relationship was found between the mean scores of the Geriatric Pain Scale and the Edmonton Frail Scale.

Conclusion: Nurses and people involved in health care should assess the frailty status of elderly females with osteoporosis, particularly those reporting pain, and be aware of the characteristics, possible symptoms and affecting factors.

Key Words: Aged; Female; Frail Elderly; Geriatrics; Osteoporosis; Pain

Correspondance

Sevgisun KAPUCU
Hacettepe University,
Faculty of Nursing
ANKARA

Phone: 03123051580
e-mail: sevgisunkapucu@gmail.com

Received: 09/05/2017
Accepted: 19/10/2017

[1] Hacettepe University,
Faculty of Nursing
ANKARA
[2] Eskisehir Osman Gazi University,
Faculty of Health Sciences- Nursing Department
ESKİŞEHİR

ARAŞTIRMA

YAŞLI OSTEOPOROZLU KADINLARDA AĞRI VE KIRILGANLIK

Öz

Giriş: Çoğu yaşlı birey ileri yaş döneminde kırılgan olacaktır. Aslında kırılganlık bir hastalık değil yaşın ilerlemesine bağlı değişimler ve hastalıkların birleşimidir. Bu tanımlayıcı çalışma, osteoporozlu yaşlı kadınlarda ağrı ve kırılganlığın incelenmesi amacıyla yapılmıştır.

Gereç ve Yöntem: Araştırmanın örneklemini iki üniversite hastanesinin geriatri ünitesine başvuran 105 yaşlı kadın oluşturmuştur. Çalışmanın verileri araştırmacı tarafından literatür incelenerek geliştirilen tanıtıcı bilgiler formu, Geriatrik Ağrı Ölçeği ve Edmonton Kırılganlık Ölçeği kullanılarak toplanmıştır. Verilerin değerlendirilmesinde, tanımlayıcı istatistikler, Mann-Whitney U Testi, Kruskal-Wallis H Test ve korelasyon analizi kullanılmıştır.

Bulgular: Çalışmanın sonucunda araştırma kapsamına alınan osteoporozlu yaşlı kadınların %6.7'sinin hafif ağrı, %67.3'unun orta ağrı ve %26'sının şiddetli ağrı yaşadığı belirlenmiştir. Edmonton Kırılganlık ölçeği ortalama puanlarına göre %16.3'ünün orta kırılgan ve %44.1'inin şiddetli kırılgan olduğu saptanmıştır. Ağrı nedeniyle son yedi gün içerisinde üzgün ve depresif olduğunu ifade eden osteoporozlu yaşlı kadınların daha kırılgan oldukları saptanmıştır ($p<0.05$). Ayrıca kilo kaybı, depresif semptomlar ve üriner inkontinansın kırılganlık ile ilişkili olduğu belirlenmiştir ($p<0.05$). Ayrıca Geriatrik Ağrı Ölçeği ile Edmonton Kırılganlık Ölçeği puan ortalamaları arasında zayıf derecede pozitif anlamlı bir ilişki olduğu belirlenmiştir.

Sonuç: Araştırma sonuçlarına göre hemşirelerin özellikle ağrı yakınması olan osteoporozlu yaşlı kadınları kırılganlık açısından değerlendirmeleri, kırılgan yaşlı özelliklerini, görülebilecek semptomları ve risk faktörlerini bilmeleri önerilmektedir.

Anahtar Sözcükler: Yaşlı; Kadın; Kırılgan yaşlı; Geriatri; Osteoporoz; Ağrı

INTRODUCTION

Osteoarthritis is characterized by joint pain, stiffness and limited range of motion and has been designated an international health burden by the World Health Organization (1). Osteoporosis has become a significant health problem affecting approximately 200 million people worldwide (2) and it is an increasing problem because of the increased number of active aging adults. The most common joint sites reported were the hands and knees of women over the age of 50, estimated as high as 26.2% (3). Osteoporosis is associated with an increased risk of bone fractures and mortality among the middle-aged to older-aged individuals (2). Osteoporosis and frailty, which together greatly increase the risk of fracture, are of particular concern (4). Osteoporotic fractures, particularly those of the hip and vertebrae, can cause pain and functional disability and reduce the health-related quality of life, and they are associated with an increased mortality risk (2). Hip fractures are the most serious osteoporotic fractures, with high risk of mortality. A large proportion of patients (more than 50%) admitted to hospital with hip fracture are over 80 years old (4). Osteoporosis is clear that the risk in men is not negligible and ageing men have a greater risk of mortality and morbidity following hip fracture than do women (5).

An increase in the elderly population is accompanied by an increase in the frequency of ageing-specific problems; additionally, an increase in the very elderly population emphasises frailty as a social issue (6,7). Frailty is defined as a multi-dimensional geriatric syndrome characterised by decreased physiological reserve and loss of homeostatic capacity (8). Ageing, low educational level, insufficient nutrition, dependency, prolonged bed rest, pressure ulcers, gait disorders, general weakness, weight loss, anorexia, fear of falling, dementia, femur fractures, delirium, confusion, going out less often, multiple drug usage and depression are all related to frailty (9). Frailty is observed in 20%-30% of individuals aged 75 years or older. Despite some common risk factors and biological pathways, the relationship between frailty and osteoporosis is unclear (10). Osteoporosis is among the leading diseases that cause pain, and it is the natural course of a prolonged lifetime. It is a systematic skeletal disease characterised by bone fractures and increased fracture susceptibility due to reduced bone weight and disruption of the microarchitectural structure of the bone tissue (11). Pain has been found to negatively affect the activities of daily living (ADL) and reduce the quality of life in postmenopausal women with osteoporosis. Back pain is the most frequent complaint in patients with advanced osteoporosis. Movement, lifting loads or staying in the same posture for a long time are known factors that trigger pain (10). There are no investigations exploring the potential link between frailty and pain in older adults, but pain intensity may be an important factor in assessing the risk of frailty in this population (12). Therefore, this study aimed to determine the pain and frailty levels of elderly females diagnosed with osteoporosis.

MATERIALS AND METHOD

Study design

This study is a descriptive study.

Participants

In total, 105 participants were enrolled, and the study power [*P* (Statistical Power)] was calculated as 80%. Of 106 elderly females with osteoporosis approached, one did not agree to participate.

Inclusion criteria

- 65 years of age and older
- having a diagnosis of osteoporosis
- not having a diagnosis of dementia
- being literate
- not having severely hearing or visual impairment
- being able to verbally communicate
- agreeing to participate
- no fracture

Data collection

The following data collection tools were used:

- Data sheet
- Edmonton Frail Scale Turkish (EFS-TR)
- Geriatric Pain Scale

Data sheet

The data sheet had 19 questions on sociodemographic characteristics (age, gender, marital status, education level, profession, social security, income-expense level, household people, caregivers and need for support), the effect of disease and chronic pain on ADL and exercise habits.

Edmonton Frail Scale (EFS-TR)

The EFS was developed by Rolfson et al. (13) to define frailty in the elderly. This scale consists of 11 questions on cognitive status, general health status, functional independence, social support, medication, nutrition, mood, continence and functional performance. Cronbach's alpha coefficient of the original scale was 0.62. In Turkey, Aygor (14) found the scale to be reliable, have internal consistency for all values and Cronbach's alpha coefficient of 0.75. The total score of the scale ranges between 0 and 20. Scores between 0 and 4 reflect the state of 'not being frail', 5 and 6 reflect the state of 'being vulnerable', 7 and 8 reflect 'slight frailty', 9 and 10 reflect 'moderate frailty' and over 11 reflect 'severe frailty'.

Geriatric Pain Scale

The Geriatric Pain Scale was developed by Ferrell (15) to define patients' pain and to determine physical, emotional, cognitive and behavioural responses to pain. The scale has many components addressing the effects of pain on patients' professional, social, marital and physical lives and defining the location, severity and nature of pain. Dursun (16) found Cronbach's alpha coefficient of the scale to be 0.85 and of the subscales to be between 0.67 and 0.93.

Data collection procedure

Data were collected in an interview room in two geriatrics outpatient clinics between 1 February and 1 June 2015 by the authors. Data for the study were collected using a data collection form developed by reviewing the related literature (9,17), Geriatric Pain Scale and EFS. Females who had been diagnosed with osteoporosis and agreed to participate were included.

Ethical considerations

Ethical approval of the study was obtained from our university's Clinical Trials Ethics Committee (no. 99950669/326). The study aimed was explained to the participants, and their written and verbal consent was obtained by asking them to sign an informed consent form.

RESULTS

Table 1 shows the sociodemographic characteristics of the participants. Their mean age was 74.3±7.5 years; 51.4% of them had a body mass index (BMI) between 25 and 29.9 kg/m^2, 95.2% had a comorbid chronic disease and 44.8% had at least one fall in the last one year.

The Geriatric Pain Scale and EFS scores are given in Table 2. Among the participants, 67.3% reported mild pain and 26% reported severe pain. EFS indicated that 29.8% of the participants had moderate frailty and 44.2% had severe frailty. The difference between the mean scores of scales and sociodemographic characteristics (age, marital status, educational level, BMI, chronic comorbid disease and fall) was not statistically significant ($p>0.05$). The mean score of the elderly females with osteoporosis in the category having a BMI of ≥30 kg/m^2 on the Geriatric Pain Scale was higher (63.37±16.80) than that in the other BMI groups (55.22±18.76 and 57.29±15.05, respectively). Furthermore, a medium-level, positive and significant relationship was found between the EFS score, weight loss and frailty (r=0.458,

p=0.000); a poor, positive and significant relationship was found between the EFS score, urinary incontinence (r=0.301, p=0.002) and mood (r=0.256, p=0.009) (Table 3) in elderly females with osteoporosis.

Table 4 compares the Geriatric Pain Scale and EFS scores of elderly females with osteoporosis. Participants with mild and severe pain were more frail. Severe frailty was noticed in 26.9% of the participants with mild pain and 17.3% of the participants with severe pain (x^2=17.188, p=0.028). A poor, positive and significant difference was found between the two scales (r=0.271, p=0.000) (Fig. 1).

Table 1. Sociodemographic characteristics of elderly women with osteoporosis (n=105).

Sociodemographic characteristics	Number	%
Age		
70 and below	44	41.9
71–80	36	34.3
81 and over	25	23.8
Marital status		
Married	60	57.1
Single	45	42.9
Education level		
Literate	49	46.7
Primary school	24	22.8
Secondary school	17	16.2
High school	7	6.7
University	8	7.6
Body-Mass Index		
18.5–24.9	27	25.7
25–29.9	54	51.4
≥30	24	22.9
Comorbid chronic disease*		
Yes	100	95.2
No	5	4.8
Fall in the last one year		
Yes	47	44.8
No	58	55.2

*81% hypertension, 51% diabetes and cardiovascular disease

Table 2. Geriatric Pain Scale and Edmonton Frail Scale scores elderly women with osteoporosis.

Geriatric Pain Scale	**Pain Levels (n=104*)**		
		n	**%**
=57.6±17.5	Slight Pain (0–30)	7	6.7
Min=16.6	Mild Pain (30–69)	70	67.3
Max=92.8	Severe Pain (70–100)	27	26.0
	Frailty Levels (n=104*)		
		n	**%**
Edmonton Frail Scale	Not Frail (0–4)	1	1.0
9.8±2.2	Seems Vulnerable (5–6)	9	8.7
Min=4.0	Slightly Frail (7–8)	17	16.3
Max=14.0	Medium-Level Frail (9–10)	31	29.8
	Severely Frail (11 and more)	46	44.2

*one person no frail (105-1=104)

Table 3. Relationship between weight loss, mood, incontinence, and frailty scores.

	Edmonton Frail Scale
Weight loss	r=0.458 p=0.000
Mood	r=0.256 p=0.009
Incontinence	r=0.301 p=0.002

DISCUSSION

Osteoarthritis, a degenerative disease that commonly affects older people, is manifested by pain and disability (18). The general prevalence of pain is known to be between 40 and 80% (19,20). Joint pain and stiffness are generally most severe in the earlier part of the day, with improvement as the day progresses in OA (21). Among our participants, 67.3% had mild pain and 26% had severe pain, and their mean age was 74.3±7.5 years (Table 1). Clark et

al. (22) found when studying men that 85% reported pain and stiffness most of the day (measured with a modified version of WOMAC). Dursun (16) reported that 43% of patients had mild pain and 8.2% had severe pain. Yung et al. (23) reported that their study participants' average number of pain sites was 2.9 and most participants (70%) suffered moderate to severe worst pain.

Table 4. Geriatric Pain Scale and Edmonton Frail Scale Score comparison.

Geriatric Pain Scale	Edmonton Frail Scale					Total
	Not Frail	Seems Vulnerable	Slightly Frail	Medium-Level Frail	Severely Frail	
Slight pain %	- (0-0%)	2 (1.9%)	3 (2.9%)	2 (1.9%)	- (0-0%)	7 (6.7%)
Mild pain %	1 (1.0%)	7 (6.7%)	12 (11.5%)	22 (21.2%)	28 (26.9%)	70 (67.3%)
Severe pain %	- (0-0%)	- (0-0%)	2 (1.9%)	7 (6.7%)	18 (17.3%)	27 (26.0%)
Total **%**	1 (1.0%)	9 (8.7%)	17 (16.3%)	31 (29.8%)	46 (44.2%)	104 (100.0%)

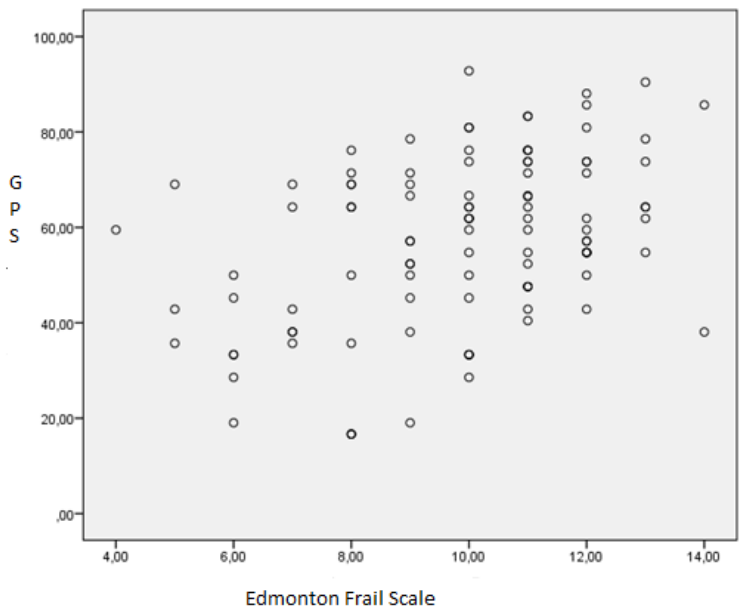


Figure 1. Correlation of Geriatric Pain Scale and Edmonton Frail Scale scores.

In our study, 29.8% of the participants had moderate frailty and 44.2% had severe frailty. The present study analysed the relationship between geriatric pain and frailty in elderly females with osteoporosis and found that almost half of the participants had severe frailty. Furthermore, the participants having mild and severe pain were found to be more frail. A poor positive relationship was found between pain and frailty (r=0.271, p=0.000) (Fig. 1). One in 10 people aged over 65 years and between one-fourth and a half of those aged over 85 years are frail (24). In his study, Aygor (14) found that among patients aged 65 years and older, 13.1% had mild frailty, 10% had moderate frailty and 13.1% had severe frailty. In studies in Canada, approximately 16% of non-frail participants, 34% of pre-frail participants and 50% of frail participants reported moderate or high pain (25,26). In the CHAMP study, approximately 17% of non-frail participants reported intrusive pain compared to over 40% of frail participants with intrusive pain (27,28). Overall, the frailty status was significantly associated with pain.

Our study shows that weight loss, incontinence problems and worse mood associate with increased frailty. In their study, Theou et al. (28) found that 10% of patients without any disability or chronic disease were still frail. Chen et al. (29) determined that frailty was related to chronic disease, depressive symptoms and other geriatric syndromes. Tse et al. (30) suggested that apart from improving mobility and reducing pain, loneliness was a target of psychosocial interventions to reduce frailty and improve the quality of life. The frailty rate in their population was higher than that in other studies. Shega et al. (25) showed that in elderly people with depression, the adjusted odds of being frail to not being frail were higher by a factor of 4.13. Lin et al. (31) showed that there are significantly more participants with depression in frail and pre-frail elderly groups than in the non-frail groups. Mood can impact pain, and elderly people with frailty experience more anxiety and depression than non-frail people. Anxiety may contribute to pain in frail people, and it is associated with a subjective feeling of apprehension about impending or anticipated harm, increased heart rate and avoidance behaviour. The relationship between depression and pain is complex. Pain is an antecedent and a consequence of depression.

There were no previous studies that analysed geriatric pain and frailty in elderly females with osteoporosis (32). Considering the negative effects of pain due to osteoporosis and other chronic diseases on ADL, quality of life and functional independence in the elderly, pain is likely to negatively affect frailty.

In conclusion, a significant relationship was found between pain and frailty in elderly females with osteoporosis. It should be noted that elderly females with osteoporosis are at a high risk of developing frailty; so, nursing care plan should be included precautions for frailty. In addition, weight loss, depressive symptoms and urinary incontinence were found to be possibly related to frailty. Nurses should know the characteristics of elderly frail patients, possible symptoms and risk factors (for example, weight loss, incontinence and deterioration of mood). Evidence-based nursing practices specific to nursing care should be studied and applied.

Acknowledgments

The authors are grateful to the nurses and patients in geriatric units and wards.

REFERENCES

1. World Health Organization Scientific Group. The burden of musculoskeletal conditions at the start of the new millennium: Report of a WHO Scientific Group. World Health Organ Tech Rep Ser 2003;919:1-218. (PMID:14679827).
2. Roy B. Biomolecular basis of the role of diabetes mellitus in osteoporosis and bone fractures. World J Diabetes 2013;4(4):101-13. (PMID:23961320).
3. Lawrence R, Felson D, Helmick C, et al. and National Arthritis Data Group. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. Arthritis and Rheumatology 2008;58(1):26-35. (PMID:18163497).
4. Chevalley T, Guilley E, Herrmann FR, Hoffmeyer P, Rapin CH, Rizzoli R. Incidence of hip fracture over a 10-year period (1991-2000):Reversal of a secular trend. Bone 2007;40:1284-1289. (PMID:17292683).
5. Abrahamsen B, Van Staa T, Ariely R, Olson M, Cooper C. Excess mortality following hip fracture: A systematic epidemiological review. Osteoporos Int 2009;20:1633-50.
6. Langdahl BL, Ljunggren O, Benhamou CL, et al. Fracture rate, quality of life and back pain in patients with osteoporosis treated with teriparatide: 24-month results from the Extended Forsteo Observational Study (ExFOS). Calcif Tissue Int 2016;99(3):259-71. (PMID:27137783).
7. Aras S, Varlı M, Atlı T. Understanding or fraility. 2011 [Internet] Available from: http://www.akadgeriatri.org/managete/fu_folder/2011-3-3-130-137.html;Accessed 7.10.2015.
8. Jurschik P, Nunin C, Botigue T, Escobar M, Lavedan A. Prevalence of frailty and factors assosciated with frailty in the elderly population of Lleida, Spain: the FRALLE survey. ARCH Gerontol Geriat 2012;55:625-31. (PMID:22857807).
9. Chang C, Chan DC, Kuo KN, Hsuing CA, Chen CY. Prevalence and correlates of geriatric frailty in a Northern Taiwan Community. J Formos Med Assoc 2011;110:247-57. (PMID:21540007).
10. Sternberg SA, Levin R, Dkaidek S, Edelman S, Resnick T, Menczel J. Frailty and osteoporosis in older women a prospective study. Osteoporos Int 2014;25:763-8. (PMID:24002542).
11. Anna J, Peter L, Peter V, Stig A. Clinical risk factors for osteoporosis are common among elderly people in Nuuk, Greenland. Int J Circumpolar Health 2012;72:19596. (PMID:23326764).
12. Coyle PC, Sions JM, Velasco T, Hicks GE. Older adults with chronic low back pain: A clinical population vulnerable to frailty? J Frailty Aging 2015;4(4):188-90. (PMID:27031017).
13. Rolfson DB, Majumdar SR, Tsuyuki RT, Tahir A, Rockwood K. Validity and reliability of the Edmonton Frail Scale. Age Ageing 2006;35(5):526-9. (PMID:16757522).
14. Aygor HE, Fadıloglu Ç, Şenuzun Aykar F, Akçiçek F. Testing the reliability and validity of the "Edmonton Frail Scale" in Turkish population. European Geriatric Medicine 2013;4(1):76.
15. Ferrell BA, Stein WM, Beck JC. The geriatric pain measure: validity, reliability and factor analysis. Journal of the American Geriatrics Society 2015;48(12):1669-73. (PMID:11129760).
16. Dursun G, Bektaş H, Cultural validation and reliability of the Turkish version of the Geriatric Pain Measure in elderly, PAIN Practice, 2016,2:1-9. (PMID:27370573).
17. Jurschik P, Nunin C, Botigue T, Escobar M, Lavedan A. Prevalence of frailty and factors assosciated with frailty in the elderly population of Lleida, Spain: the FRALLE survey. ARCH Gerontol Geriat 2012;55:625-31. (PMID:22857807).
18. Wilcox S, Brenes GA, Levine D, Sevick MA, Shumaker SA, Craven T. Factors related to sleep disturbance in older adults experiencing knee pain or knee pain with radiographic evidence of knee osteoarthritis. Journal of the American Geriatrics Society 2000;48:1241-51. (PMID:11037011).
19. Andrade DC, Faria JWV, Caramelli P, Alvarenga L, Galhardoni R. The assessment and management of pain in the demented and non-demented elderly patient. Arq Neuropsiquiatr 2011;69:387-94. (PMID:21625771).
20. Rizzoli R, Branco J, Brandi ML, et al. Management of osteoporosis of the oldest old. Osteoporos Int 2014;25:2507-29. (PMID:25023900).
21. Altman RD. Osteoarthritis: Differentiation from rheumatoid arthritis, causes of pain, treatment. Postgraduate Medicine 1990;87(3):66-78. (PMID:12100689).

22. Clark JA, Spiro A, Finke G, Miller DR, Kazis LE. Symptom severity of osteoarthritis of the knee: A patient-based measure developed in the veterans health study. Journal of Gerontology: Medical Science 1998;53(5):351-60. (PMID:63910210).

23. Yun-Fang T, Tsung-Lan C, Yeur-Hur L, Wen-Jen C. Pain experiences, control beliefs and coping strategies in Chinese elders with osteoarthritis. Journal of Clinical Nursing 2008;17:2596-603. **(**PMID:18808625).

24. Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet 2013;381:208-16. (PMID:23395245).

25. Shega JW, Dale W, Andrew M, Paice J, Rockwood K, Weiner DK. Persintent pain and frailty: A case for homeostenosis. J Am Geriatrics Soc 2012;60:113-17. (PMID: 22150394).

26. Wiech K, Ploner M, Tracey I. Neurocognitive aspects of pain perception. Trends Cog Sci 2008;12:306-13. (PMID:18606561).

27. Blyth FM, Cumming RG, Nicholas MK, et al. Intrusive pain and worry about health in older men: The CHAMP study. Pain 2011;152:447-52. (PMID:21168971).

28. Blyth FM, Rochat S, Cumming RG, et al. Pain frailty and comorbidity on older men: The CHAMP study. Pain 2008;140:224-30. (PMID:18835100).

28. Theou O, Rockwood MRH, Mitnitski A, Rockwood K. Disability and comorbidity in relation to frailty: How much do they overlap? ARCH Gerontol Geriat 2012;55:1-8. (PMID:22459318).

29. Chen LK, Chen YM, Lin MH. Care of elderly patients with diabetes mellitus: A focus on frailty. Agesing Research Reviews 2010;9:18-22. (PMID:20849981).

30. Tse MM, Lai C, Lui JY, Kwong E, Yeung SY. Frailty, pain and psychological variables among older adults living in Hong Kong nursing homes: Can we do better to address multimorbidities? J Psychiatr Ment Health Nurs 2016;23(5):303-11. (PMID:27307261).

31. Lin CC, Li CI, Chang CK, et al. Reduced healht-related guality of life in elderly with fraility: A cross-sectional study of community- dwelling elders in Taiwan. PLos one 2011;6:21841. (PMID:21747961).

32. Jakobsson U, Hallberg IR. Pain and quality of life among older people with rheumatoid arthritis and/or osteoarthritis: A literature review. Journal of Clinical Nursing 2002;11:430-43. (PMID:12100639).

Turkish Journal of Geriatrics
2017;20 (4):315-322

■ Youngsook BAE[1]

RESEARCH

ASSOCIATION OF UNILATERAL CHEWING HABIT WITH FORWARD HEAD POSTURE AND DIZZINESS IN COMMUNITY-DWELLING ELDERLY

Abstract

Introduction: The present study aimed to compare the prevalence of forward head posture and dizziness in elderly community dwellers stratified by chewing habit (unilateral vs. bilateral), as well as to examine the correlation of unilateral chewing with forward head posture and dizziness.

Materials and Method: One-hundred one elderly persons were compared forward head angle, range of motion of the temporomandibular joint, mandibular deviation, and dizziness in unilateral chewing and bilateral chewing.

Results: Unilateral chewing showed significantly more prevalent dizziness handicap ($p<0.05$), greater mandibular deviation ($p<0.01$), and smaller forward head angle ($p<0.01$) than bilateral chewing. Unilateral chewing was significantly correlated with age ($r=0.246$; $p=0.13$; effect size, 0.507), mandibular deviation ($r=0.381$; $p<0.001$; effect size, 0.824), FHA ($r=0.360$; $p < 0.001$; effect size, 0.771), and dizziness handicap ($r=0.309$; $p=0.002$; effect size, 0.649). Risk factors for unilateral chewing included dizziness handicap ($p=0.012$; odds ratio, 1.053) and mandibular deviation ($p=0.001$; odds ratio, 1.451).

Conclusion: The present findings that forward head posture, dizziness, and mandibular deviation are associated with unilateral chewing highlight the importance of good head posture and chewing habit with aging.

Key Words: Posture; Mastication; Dizziness; Aged; Aging

Correspondance

Youngsook BAE
Gachon University
Physical Therapy
Incheon
SOUTH KOREA

Phone: 09082328204324
e-mail: baeys@gachon.ac.kr

Received: 09/05/2017
Accepted: 01/11/2017

[1] Youngsook BAE
Gachon University
Physical Therapy
Incheon
SOUTH KOREA

ARAŞTIRMA

TOPLUMDA YAŞLILARDA UNİLATERAL ÇİĞNEME ALIŞKANLIĞI İLE ÖNE DOĞRU KAFA POZİSYONU VE BAŞ DÖNMESİ ARASINDAKİ İLİŞKİ

Öz

Giriş: Bu çalışma, unilateral ya da bilateral çiğneme alışkanlığına göre tabakalandırılmış olan yaşlı bireyler arasında öne doğru kafa pozisyonu ile baş dönmesi sıklığını karşılaştırmayı ve unilateral çiğneme davranışı ile her iki durum arasındaki korelasyonu incelemeyi amaçlamıştır.

Gereç ve Yöntem: Çalışmada, 101 yaşlı birey unilateral ya da bilateral çiğneme durumlarında öne doğru kafa açısı, temporomandibular eklem hareket açıklığı, mandibular sapma ve baş dönmesi açısından karşılaştırılmıştır.

Bulgular: Unliateral pozisyon bilateral çiğnemeyle karşılaştırıldığında önemli ölçüde daha yüksek sıklıkta baş dönmesi sorunu ($p<0.05$), daha yüksek mandibular sapma ($p<0.01$) ve daha küçük öne doğru kafa açısı ($p<0.01$) görülmüştür. Tek yönlü çiğnemenin yaş ($r=0.246$; $p=0.13$; etki büyüklüğü, 0.507), mandibular sapma ($r=0.381$; $p<0.001$; etki büyüklüğü, 0.824), öne doğru kafa açısı ($r=0.360$; $p<0.001$; etki büyüklüğü, 0.771) ve baş dönmesi sorunu ($r=0.309$; $p=0.002$; etki büyüklüğü, 0.649) ile daha fazla ilişkili olduğu bulunmuştur. Unilateral çiğnemenin risk faktörleri arasında baş dönmesi sorunu ($p=0.012$; odds oranı, 1.053) ve mandibular sapma ($p=0.001$; odds oranı, 1.451) bulunmuştur.

Sonuç: Öne doğru kafa pozisyonu, baş dönmesi ve mandibular sapmanın ilerlemesinin unilateral çiğneme ile ilişkili olduğuna dikkat çeken araştırma bulguları doğru kafa pozisyonu ve çiğneme davranışının yaşın ilerlemesiyle önem kazandığına dikkat çekmektedir.

Anahtar Sözcükler: Duruş; Çiğneme; Baş dönmesi; Yaş; Yaşlanma

INTRODUCTION

The head, neck, and jaw are biomechanically, neurologically, and functionally linked (1). Additionally, there is a neural connection between the masticatory muscle and the neck sensory and motor system (2). Indeed, the masticatory and neck muscles are co-activated during chewing (3), suggesting that a functional relationship exists between mandibular and head movements during chewing (3).

Muscle contraction decrements are influenced by aging-related loss of muscle fibers, axons, and motor neurons (4). Indeed, the cross-sectional areas of the masticatory muscle (masseters and medial pterygoid) were shown to diminish in the elderly (5). The aging process induces characteristic alterations in the normal postural alignment, frequently leading to forward head posture (FHP) in the elderly. A previous study reported that masseter muscle activity is reduced in FHP (6), indicating that masticatory muscle weakness may affect head posture in the elderly.

Asymmetrical bite involving unilateral clenching may induce asymmetrical masticatory performance, eventually leading to unilateral chewing (UC) (7). UC refers to the habit of chewing predominantly on one side. In individuals with UC, the masticatory muscles on the dominant side are activated to a higher extent (8). Compared to bilateral clenching, unilateral clenching was observed to be associated with significantly lower activity in the masticatory muscles (9). This previous report suggested that UC may result in increased masticatory muscle activity on the chewing side, but with decreased muscle power during chewing. Therefore, the authors argued that, in older individuals, weakness of the masticatory muscles may be induced by the UC habit.

In the elderly, dizziness and imbalance are among the most common complaints, and most studies in this population concluded that peripheral vestibular dysfunction is the first or second most frequent cause of dizziness (10). A previous animal study reported a link between the vestibular system and trigeminal nerve that innervates masticatory muscles (11), and a recent study suggested that the vestibular system may regulate the trigeminal system in humans (12). Dizziness is related to vestibular dysfunction and results from a loss of body balance (13), which is commonly observed in many diseases as well as in old age. In this sense, poor head posture may cause an abnormal functional relationship between UC and vestibular function, suggesting that UC may affect head posture in the elderly. Thus, chewing habits such as UC may contribute to inducing dizziness.

The present study aimed to analyze the influence of chewing habit (unilateral vs. bilateral) in terms of FHP, dizziness handicap (DH), range of motion (ROM) of the temporomandibular joint (TMJ), and mandibular deviation in community-dwelling elderly, as well as to identify risk factors affecting UC and DH. The research hypothesis was as follows: first, that FHP and DH would be more prevalent in the UC group; second, that FHP, TMJ ROM, and mandibular deviation would be risk factors for UC.

MATERIALS AND METHOD

This was a cross-sectional observational study and the study design. The local ethics committee approval was obtained.

Participants and procedures

A total of 101 elderly individuals (60–86 years) were recruited at a community center using advertising means such as posters. The inclusion criteria were: (1) living independently and actively; and (2) no history of vestibular disease. The exclusion criteria were: (1) temporomandibular joint (TMJ) pain during chewing; (2) difficulty chewing; (3) total denture; (4) contraindication to any of the measurement procedures.

General characteristics, chewing habit, and self-perceived dizziness were evaluated in all participants prior to initiating the measurements. TMJ ROM and

mandibular deviation in the frontal plane, as well as head posture in the sagittal plane were measured with the participants sitting on a stool. According to chewing habit, participants were stratified into a UC group and a bilateral chewing (BC) group. The groups were compared in terms of DH, FHA, TMJ ROM, and mandibular deviation. The participants provided written consent for undergoing the measurements.

Outcome measures

UC assessment*:* UC was considered to be present when mastication was consistently or predominantly performed on the same side. Visual observation, which represents a direct method of UC evaluation, was used to assess the presence of UC (14). The investigator observed the participants chewing gum. Participants who chewed predominantly on one side were assessed to have a preferred chewing side.

DH assessment*:* DH was measured using the Korean version of the Dizziness Handicap Inventory (DHI) questionnaire, which represents a global self-assessment tool for self-perceived handicaps (15). In this study, the participants' subjective perception of dizziness was assessed in relation to activities of daily life. DHI is a 25-item questionnaire quantifying self-perceived handicaps in terms of the functional, emotional, and physical aspects of dizziness, with the total score ranging from 0 (no DH) to 100 (maximum DH). Based on the DHI scores, the severity of DH is classified as minimal (1–14 points), mild (16–34 points), moderate (36–52 points), and severe (over 54 points) (15). In this study, DH was considered present when the DHI score was 16 or higher.

TMJ ROM and mandibular deviation*:* While seated, the participants were instructed to open their mouth as wide as possible, but not beyond a point causing pain or discomfort. Using a digital camera, the mouth of each participant was photographed, and the images were analyzed using the Global Posture Analysis System (Chinesport, Udine, Italy). The ROM of the TMJ was determined based on the distance between the upper and lower teeth (Figure 1a). Unit is mm. The deviation of the mandible was measured in terms of the angle between the upper and lower teeth midlines, defined as the lines passing through the midpoints of the front upper and lower teeth, respectively (Figure 1b). Unit is angle.

FHP assessment*:* FHP was measured in terms of the forward head angle (FHA). After the C7 spinous process was landmarked, the participants were comfortably seated on a chair. Head posture in the sagittal plane measured as the angle between the horizontal line and the line from the tragus to the C7. This angle, were analyzed using the Global Posture Analysis System (Chinesport, Udine, Italy) (Figure 2) (16). Previous studies have indicated that FHA measurements have good test-retest reliability was high (intraclass correlation coefficient, 0.98) and stability reliability was also high (intraclass correlation coefficient, 0.92-0.95) (16). According to the research of the Nmmers et al, normative FHP means were identified that 49 -36 degree for 65 - 85+ years in community – dwelling elderly (17). This study set the criterion of FHP as < 49 degree in terms of the FHA.

Statistical analysis

All statistical analyses were conducted using SPSS version 23 (IBM Corp., Armonk, NY, USA). Analysis of frequency and descriptive statistics were used to describe the participants' general characteristics. Between-group comparisons were performed using the Student's t-test. Results of correlation analyses were expressed in terms of Pearson's correlation coefficient (r), p-value, and effect size (ES). ES correlation was calculated using the Cohen's d coefficient. Multivariable logistic regression analysis was performed to identify risk factors for UC, and the results were expressed in terms of p-value and odds ratio (OR) with 95% confidence interval (CI). Outcome variables are presented as the mean ± standard deviation. The significance level was set at $p < 0.05$.

Table 1. General characteristics of the subjects.

Variables (unit)	BC[a] group (n=54)	UC[b] group (n=47)
Age (year)	70.981 ± 5.70	73.89 ± 5.87[c*]
Sex	Male: 20 (37)[d] Female : 34 (63)	Male: 17 (36.2) Female : 30 (63.8)
Weight (cm)	60.39 ± 8.51	61.74 ± 10.30
Height (kg)	158.06 ± 7.56	156.65 ± 7.27
BMI[e] (kg/m^2)	24.35 ± 3.32	23.84 ± 3.92

abilateral chewing, bunilateral chewing , cmean ± standard deviation, dnumber of person (%), ebody mass index, *p < 0.05

Table 2. Comparison of DHI score, and TMJ ROM, mandibular deviation and FHA.

Variables (unit)	BC group (n=54)	UC group (n=47)	p	Difference (95% CI)
DHI[a]score	< 16 score: 0.68 ± 2.09 47 (87) > 16 score: 21.14 ± 9.16 16 (17.4)	< 16 score: 0.65 ± 1.87 31(66)[b] >16 score: 35.75 ± 16.49 16 (34)	0.012[e]	
TMJ[c] ROM[d] (mm)	41.24 ± 7.91	40.89 ± 8.12	0.820[f]	0.035 (-0.268~0.337)
mandibular deviation (°)	3.22 ± 2.06	5.07 ± 2.45	0.000[f]	-1.840 (-2.730 ~ -0.949)
Forward head angle (°)	50.37 ± 5.06	45.75 ± 6.04	0.000[f]	4.620 (-14.950~-3.575)

a dizziness handicap inventory, bnumber of person (%), c temporomandibular joint, drange of motion, ex2 test, fStudent's t-test

Table 3. Pearson correlation coefficients between age, UC, DHI score, TMJ ROM, mandibular deviation and FHA.

	Pearson correlation coefficient	p	Effect size
UC vs. age	.248	.012	0.507
UC vs. mandible deviation	.381	.000	0.824
UC vs. FHA	-.360	.000	0.771
UC vs. DHI score	.309	.002	0.649

Values are shown correlation coefficients

Table 4. Factors affecting preferred chewing side.

Variables	p	Odds ratio	95% CI
Age			
Dizziness handicap	0.012	1.053	1.012 ~ 1.097
TMJ ROM	0.817	1.081	0.561 ~ 2.081
mandibular deviation	0.001	1.451	1.159 ~ 1.815
FHP	0.007	0.897	0.829 ~ 0.971

Figure 1. TMJ ROM and mandibular deviation measurement. The ROM of the TMJ was measured distance between the upper and lower teeth (a). The deviation of the mandible was measured in terms of the angle between the upper and lower dental midlines (b).

Figure 2. FHP measurement. FHP was measured angle between the lines from the tragus to the C7.

RESULTS

The mean age of the participants was 72.33 years (UC group; 73.8 year, BC group; 70.89). Table 1 provides an overview of the participants' general characteristics. Compared to the BC group, the UC group had significantly more prevalent DH ($p < 0.05$) significantly greater mandibular deviation ($p < 0.01$), significantly smaller FHA ($p < 0.01$) (Table 2). Significant correlation was noted between UC and age (r=0.246, p=0.13, ES=0.507), mandibular deviation (r=0.381, p=0.000, ES=0.824), FHA (r=-0.360, p=0.000, ES=0.771), and DHI score (r=0.309, p=0.002, ES=0.649) (Table 3). On multivariable analysis, risk factors for UC included DH (p=0.012, OR=1.053), mandibular deviation (p=0.001, OR=1.451) and FHP (p=0.007, OR=0.897) (Table 4).

DISCUSSION

The present study compared DH, TMJ ROM, mandibular deviation, and FHP measured as FHA between groups of community-dwelling older adults stratified by chewing habit (unilateral vs. bilateral). The prevalence of FHP and DH was found to be higher in the UC group than in the BC group. Risk factors for UC were identified.

In the elderly, aging-related changes in masticatory and skeletal muscle function share common mechanistic pathways (18). Bite force is directly related to chewing ability and habit. In older adults, chewing habit is substantially affected by the loss of muscle mass and has an important role in the physical performance (18). Moreover, cervical muscles play a role in the exertion of bite force in adults (19). Importantly, masticatory muscle activities were significantly lower during unilateral clenching than during bilateral clenching (9). In individuals with UC, the masticatory muscles of the dominant side are activated to a higher extent (8). In individuals with FHP, masticatory muscle weakness may be observed (20). Previous studies indicated that FHP increased masticatory muscle activity on the preferred chewing side but decreased muscle power during chewing. In present study, FHP was more severe in the UC group than in the BC group, with a negative correlation between UC and FHP. These findings reinforce the evidence that not only the masticatory muscles but also the neck muscles and cervical spine are activated during chewing, and that masseter muscle activity is reduced in FHP (6). Therefore, the author suggests that FHP may predict UC in the elderly.

Indeed, mandibular deviation is reportedly associated with imbalance between the right and left masticatory muscles, and is believed to play a compensatory role in postural control of the cervical spine (21). Present results that mandibular

deviation was greater in the UC group than in the BC group corroborate the finding that UC causes imbalance of the masticatory muscles because of elevated masseter and temporalis activity on the preferred side (8). Moreover, author argued that the asymmetrical action of the masticatory muscles may increase mandible deviation.

UC increases masticatory activity on one side (8), inducing asymmetric trigeminal stimulation and subsequent vestibular action (22). Thus, UC stimulates the trigeminal nerve of the chewing side more frequently, and such asymmetrical vestibular stimulation results in vestibular asymmetry, which in turn may engender other problems, including falls (23). The present study found that participants with UC had a mean DHI of 36 points, which indicates moderate self-perceived DH (15). Such findings reinforce the conclusions of a previous report that unilateral vestibular hypofunction leads to central vestibular asymmetry, which in turn induces dizziness (24). In addition, 0.6–0.8 ES of the correlation is known to have a large ES (25). In the present study, UC showed correlation with DHI score, mandible deviation, and FHA, all with large ES, but risk factors for UC included DH and mandibular deviation. Therefore, the author suggests that FHA, DH and mandibular deviation were the influence factor for UC in older adults.

Although this study achieved the aims, the present study has several limitations. First, the author used self-reported information on DH instead of measuring the performance of vestibular function. Second, the study did not consider how the occlusal force of functional tooth units relates to the participants' chewing habits. Third, this study had a cross-sectional design. Therefore, further cohort studies of the association between UC and dizziness in older adults are warranted to confirm the present findings. Despite the aforementioned limitations, there are also important strengths to this study. This study found that FHP increases with aging, and that FHP and mandible deviation significantly correlate with the presence of UC. These findings suggest that head posture is a significant contributor to chewing habit, and that maintaining good head posture and effective management of chewing habits are essential as people age. Also, this study raises questions about the relationship between DH and UC.

Based on the present study, further studies should be performed in consideration of masticatory muscle tone and TMJ dysfunction. Moreover, the author plans to investigate the correlation between UC and postural stability.

Acknowledgments

The author thanks Professor Hee-Eun Kim of the Department of Dental Hygiene, as well as Jin-Sil Kim and all personnel at the Geriatric Health Care Laboratory at Gachon University.

Conflict of Interest

The author declares no conflict of interest.

REFERENCES

1. Eriksson PO, Häggman-Henrikson B, Nordh E, et al. Co-ordinated mandibular and head-neck movements during rhythmic jaw activities in man. J Dent Res 2000;79(6):1378-84. (PMID:10890716).
2. Zafar H, Eriksson PO, Nordh E, Haggman-Henrikson B. Wireless optoelectronic recordings of mandibular and associated head-neck movements in man: a methodological study. J Oral rehabili 2000;27(3): 227-38. (PMID:10784335).
3. Giannakopoulos NN, Schindler HJ, Rammelsberg P, Eberhard L, Schmitter M, Hellmann D. Co-activation of jaw and neck muscles during submaximum clenching in the supine position. Arch Oral Biol 2013;58(12):1751-60. (PMID:24200301).
4. Benassi G, D'Alessandro R, Gallassi R, Morreale A, Lugaresi E. Neurological examination in subjects over 65 years: an epidemiological survey. Neuroepidemiology 1990;9(1):27-38. (PMID:2330069).

5. Newton J, Abel E, Robertson E, Yemm, R. Changes in human masseter and medial pterygoid muscles with age: a study by computed tomography. Gerodontics 1987;3(4):151-4. (PMID:3481602).
6. Winnberg A, Pancherz H. Head posture and masticatory muscle function. Eur J Orthod 1983 August 5;(3):209-17. (PMID:6578043).
7. Nissan J, Gross M, Shifman A, Tzadok L, Assif D. Chewing side preference as a type of hemispheric laterality. J Oral Rehabili 2004;31(5):412-6. (PMID:15140165).
8. Kimoto K, Fushima K, Tamaki K, Toyoda M, Sato S, Uchimura N. Asymmetry of masticatory muscle activity during the closing phase of mastication. Cranio 2000;18(4):257-63. (PMID:11202845).
9. Van Der Bilt A, Abbink J, FONTIJN-TEKAMP F, Bosman F. Maximal bite force and EMG during bilateral and unilateral clenching. J Oral Rehabili 2002;29:878-79.
10. Neuhauser H, Leopold M, von Brevern M, et al. The interrelations of migraine, vertigo, and migrainous vertigo. Neurology 2001; 56(4): 436-41. (PMID:11222783).
11. Cuccurazzu B, Deriu F, Tolu E, et al. A monosynaptic pathway links the vestibular nuclei and masseter muscle motoneurons in rats. Exp Brain Res 2007; 176(4): 665-71. (PMID:17216144).
12. Deriu F, Ortu E, Capobianco S, et al. Origin of sound-evoked EMG responses in human masseter muscles. J Physiol. 2007;580(pt 1):195-209. (PMID:17234698).
13. Boult C, Murphy J, Sloane P, et al. The relation of dizziness to functional decline. J Am Geriatr Soc 1991;39(9);858-61. (PMID:1885859).
14. Pond L, Barghi N, Barnwell G. Occlusion and chewing side preference. The Journal of prosthetic dentistry 1986;55(4):498-500. (PMID:3457182).
15. Jacobson GP, Newman CW. The development of the dizziness handicap inventory. Arch Otolaryngol Head Neck Surg 1990;116(4):424-27. (PMID:2317323).
16. Falla D, Jull G, Russell T, Vicenzino B, Hodges P. Effect of neck exercise on sitting posture in patients with chronic neck pain. Phys Ther 2007 ;87(4):408-17. (PMID:17341512).
17. Nemmers TM, Miller JW, Hartman MD. Variability of the forward head posture in healthy community-dwelling older women. J Geriatr Phys Ther 2009;32(1):10-44. (PMID:19856630).
18. Iinuma T, Arai Y, Fukumoto M, et al. Maximum occlusal force and physical performance in the oldest old: the Tokyo oldest old survey on total health. J Am Geriatr Soc 2012;60(1):68-76. (PMID:22211666).
19. So K, Komiyama O, Arai M, el al. Influence of occlusal contact on cervical muscle activity during submaximal clenching. J Oral Rehabili 2004;31(5):417-22. (PMID:15140166).
20. Kisner C. Colby LA. Therapeutic exercise: foundations and techniques, 5th edtion, FA Davis, Philadelphia, USA 2007, pp 447-53.
21. Shimazaki T, Motoyoshi M, Hosoi K. et al. The effect of occlusal alteration and masticatory imbalance on the cervical spine. Eur J Orthod 2003;25(5):457-63. (PMID:14609013).
22. Troiani D, Petrosini L. Neuronal activity in the vestibular nuclei after trigeminal stimulation. Exp Neurol 1981;72(1):12-24. (PMID:7202617).
23. Kristinsdottir EK, Jarnlo GB, Magnusson M. Asymmetric vestibular function in the elderly might be a significant contributor to hip fractures. Scand J Rehabil Med 2000; 32(2): 56-60. (PMID:10853718).
24. Park SH, Kim HJ, Kim JS, et al. Mastication-induced vertigo and nystagmus. J Neurol. 2014;261(3):480-9. (PMID:24379040).
25. Becker LA. Effect size (ES). [Internet] Available from: http://www.uv.es/~friasnav/ Effect Size Becker.pdf. Accessed: 19.7. 2017.

Turkish Journal of Geriatrics
2017;20 (4):323-330

■ Youngsook BAE[1]
■ Yongnam PARK[2]

Correspondance

Yongnam PARK
Hu Nae Ri center, Gangwon-do,
REPUBLIC OF KOREA

Phone: 82335631103
e-mail: yongnam4654@gmail.com

Received: 04/07/2017
Accepted: 29 /09/2017

[1] Gachon University, College of Health Science, Physical Therapy, Incheon, REPUBLIC OF KOREA
[2] Hu Nae Ri center, Gangwon-do, REPUBLIC OF KOREA

RESEARCH

AGE-RELATED VISUAL PERCEPTION IS CORRELATED WITH POSTURAL BALANCE IN OLDER PERSONS.

Abstract

Introduction: Decreased cognition is accompanied by decreased postural balance, and visual perception is one of the cognition. The aim of this study is identified that the difference between visual perception and postural balance according to gender and age, and the relationship between visual perception and postural balance.in older person.

Materials and Method: The participants of 194 older person measured visual perception, measure time of visual perception and postural balance. Visual perception measured using Motor-Free Visual Perception Test-4, and measure time of visual perception was mean the time taken to measure visual perception. The postural balance was measured area (mm^2), length (cm), and average speed (m/s) of center of pressure displacement in a standing position with open eyes.

Results: Spatial relationship, figure-ground and visual memory of visual perception were lower in 85 years or older than in the other group. Measure time of visual perception was significantly correlated with the length and average speed of center of pressure, and visual perception score was significantly correlated with area of center of pressure. Among the spatial relationship and figure-ground were significantly correlated with area of center of pressure, and visual discrimination was significantly correlated with length and average speed of center of pressure.

Conclusion: This result indicated that visual perception is related to age, and slower measure time of visual perception and lower visual perception scores were correlated with poorer postural balance. Slowed visual processing in elderly individuals may affect postural balance.

Key Words: Aged, Postural balance; Visual perception; Posture; Sex

ARAŞTIRMA

YAŞLI BİREYLERDE POSTURAL DENGEYLE İLİŞKİLİ YAŞA BAĞLI GÖRME ALGISI

Öz

Giriş: Bilişsel durumda gerilemeye postural dengede bozulma eşlik eder ve görsel algılama da bilişsel bir durumu tanımlar. Bu çalışmanın amacı görsel algılama ve postural dengenin cinsiyet ve yaşa göre farklılıklarını ortaya koymak ve yaşlı bireylerde görsel algı ve postural denge arasındaki ilişkiyi incelemektedir.

Gereç ve Yöntem: Araştırmaya katılan 194 yaşlı bireyde görsel algı, görsel algılama zamanı ve postural denge ölçümü yapıldı. Görsel algı, Motor Beceriden Bağımsız Görsel Algı Testi-4 aracılığı ile ve görsel algılama zamanı da algılama için geçen zamanın ortalaması kullanılarak değerlendirildi. Postural denge için, gözün açık olduğu konumda yer değiştirme açısından alan (mm^2), uzunluk (cm) ve ortalama hız (m/s) kategorilerinde değerlendirmeler yapıldı.

Bulgular: Mekansal ilişki, şekil-zemin ve görsel algı 85 yaş ve üzeri grupta diğer yaş gruplarına göre daha düşük bulundu. Görsel algılamanın ölçüm süresi basınç merkezinin uzunluğu ve ortalama hızı ile ve görsel algılama puanı da basınç merkezinin alanı ile anlamlı derecede ilişkili idi. Mekansal ilişki ve şekil zemini arasında basınç merkezi alanı ile anlamlı bir korelasyon vardı ve görsel ayırma, basınç merkezinin uzunluğu ve ortalama hızı ile anlamlı korelasyon içindeydi.

Sonuç: Bu sonuç, görme algılamasının yaşla ve görsel algılama süresinde yavaşlama ile düşük görme algı skorunun kötü postural denge ile ilişkili olduğunu ortaya koymuştur. Yaşlı bireylerde görme işleminin yavaşlaması postural dengeyi etkileyebilir.

Anahtar Sözcükler: Yaşlı; Postural denge; Görsel algı; Duruş; Cinsiyet

INTRODUCTION

Poor functional mobility and decreased independence in older person may be related to balance confidence (1). Lack of confidence in balance may be related to deteriorated function caused by physical degeneration. Stability is affected by the visual system, which perceives the environment, performs perceptual learning to adapt to stable environments, and drives brain responses to sudden changes in the environment (2). In particular, poor visual function in older person can affect their ability to independently perform activities of daily living (ADL) (3).

Slower visual processing in older persons increases the risk of falls and causes mobility problems, such as postural changes (4). Thus, older persons' ability to perform ADL is affected by functional problems and advancing age and may be related to various aspects of visual function (5). Deterioration of the perceptual process in older persons may be the result of visual dysfunction (6), which causes problems such as inadequate responses to environmental changes and reduced postural stability.

Visual perception (VP) includes five components: spatial relationship, visual discrimination, figure-ground perception, visual closure, and visual memory (7). Spatial relationship specifies how objects are located in space in relation to a reference object. Visual discrimination refers to the ability to differentiate between positions, shapes, forms, and colors of objects and letter-like forms. Figure-ground is a type of visual discrimination that refers to the ability to distinguish an object from the background or from another object. Visual closure is also a type of visual discrimination that refers to the ability to perceive a whole figure when only fragments are presented. Finally, visual memory refers to the ability to perceive and remember a viewed stimulus item after a very brief interval. These five categories are most commonly used for assessing VP (8).

In older persons with slow perceptual processes, the length and area of center of pressure (COP) displacement is increased during cognitive tasks (9). Slower perceptual processes may be related to failure to maintain posture, and VP in particular may be related to functional independence (10). Functional independence and good postural balance can be an important factor of the quality of life in older person (11). Also, VP is important for detecting perception of aging and should be tested regularly from age 50 (12). According to the above, visual perception may be a correlation the aging and postural balance (PB).

The purpose of this study was to examine how changes in sex and age can difference VP and PB, and identify correlations between VP and PB in older persons.

MATERIALS AND METHOD

Participants and procedures

Participants were recruited through various community center advertisements, such as posters. Then researcher was interviewed by telephone and recruited as a suitable people for inclusion and exclusion criteria. Inclusion criteria were older person above 65 years and who has the ability to stand and walk without walking aid of 5m or more. Exclusion criteria included a history of lower extremity surgery, falls or dizziness, previous balance and neurological or vestibular impairment, and any contraindications for measurement procedures. In this study, 203 people were recruited, but participants were 194 people, excluding the 9 people who did not perform the VP test.

All participants signed written informed consent forms. This study was approved by the Gachon University Institutional Review Board and was carried out in accordance with the Helsinki Declaration. Before initiating the study, the general

characteristics of all participants were measured. During the study, PB was measured with eyes open, and VP was subsequently analyzed.

Outcome Measures

Visual perception assessment: VP was assessed using the Motor-Free Visual Perception Test-4 (MVPT-4), which was designed for screening, diagnostic, and research purposes. The MVPT-4 provides a quick, reliable, and valid measure of the overall visual perceptual ability of individuals aged 4 to ≥ 85 years; it is suitable for use in clinical practice and is highly reliable (13). MVPT-4 divided 5 categories, such as spatial relationship, visual discrimination, figure-ground perception, visual memory, and visual closure, and each category consists of 9 questions. It is a total of 45 questions. Visual perception was measured by face-to-face interview. The question of the MVPT-4 was drawn the picture. After researchers explained the each categories of MVPT-4, the participant was answer to the question on 9 questions, which is a multiple choice response form. In this study, row scores of MVPT-4 were measured. The row score was the number of correct answer and row scores range from 0 to 45. The higher score, the better the VP ability.

Visual perception time (VP-T) is the time taken to measure MVPT-4. The total time taken for a participant to answer each item was measured, excluding the time taken for the researcher to explain an example, and VP-T for each unanswered item was recorded as 30 s. If the participants did not answer an item for more than 30 s or answered after 30 s, the item was scored as an incorrect answer.

MVPT-4 was translated into Korean and the Cronbach alpha value of this study was 0.772.

Postural balance measurement: PB is conventionally assessed by displacement in COP during quiet standing. PB was measured using a BioRescue system (RM Ingenierie, Rodez, France). The BioRescue system consists of a platform, software, and monitor. The platform (610×580×10 mm) is very thin and equipped with approximately 1,600 pressure sensors. The platform safely and accurately measures the length and area of COP in both feet of an individual and then transmits data to the computer software. Data measured from the platform are visualized as a COP trajectory and displayed on the monitor while the participant maintains a stance with postural stability.

Center of pressure is the outcome of inertial forces acting on the body as the postural control system acts to restore equilibrium, and COP is commonly defined as the point of application of the ground reaction force vector. The area and length include the total area and the distance of the COP trajectory during the time measured. The average speed indicates the speed of the COP trajectory during the time measured. Larger values indicate poor postural stability.

Postural balance was measured by area (mm^2), length (cm), and average speed (cm/s) of COP displacement while participants maintained a static posture with eyes open for 30 s. Mean values for measurements were used.

Statistical analysis

All statistical analyses were performed using SPSS 21.0. The general characteristics of the participants were analyzed using descriptive statistics. Correlations between dependent variables of VP and postural stability were analyzed using the Pearson's correlation test. In addition, dependent variables of VP and postural stability were compared between groups and in terms of sex and age (young older, 65–74 years; middle older, 75–84 years; old older, ≥85 years) using the independent t-tests and one-way analysis of variance (ANOVAs). The significance level was set at $p<0.05$.

RESULTS

The mean age of the 194 participants was 76.36±6.25 (range, 65–88) years, and the general characteristics of the participants are shown in Table 1. VP and postural stability were compared in terms of sex, and males were found to have significantly higher scores in figure-ground perception than females ($p<0.05$), whereas there was no significant difference in postural stability in terms of sex (Table 2). In the comparison in terms of age, scores in VP, spatial relationship, figure-ground perception, and visual memory were significantly lower in the old older group than in the young older group ($p<0.05$). COP area was significantly increased in the old older group compared with the young older group ($p<0.05$) (Table 3). Analysis of correlations between VP and PS in all participants revealed that VP-T was significantly correlated with COP length and COP average speed ($p<0.05$) and VP was significantly correlated with COP area ($p<0.05$). Spatial relationship ($p<0.05$) and figure-ground perception ($p<0.05$) were significantly correlated with COP area. Visual discrimination was significantly correlated with COP length ($p<0.01$) and average speed ($p<0.05$) (Table 4).

Table 1. Baseline characteristics of the participants.

Characteristics	Male (n=84)	Female (n=110)	Total (n=194)
Age (years)	75.47±7.29	76.51±6.25	76.36±6.25
Height (cm)	164.30±7.44	151.09±5.39	156.90±7.90
Weight (kg)	66.27±10.10	58.24±7.56	59.34±8.38

Values are presented as means±SD.

Table 2. Comparison of visual perception and postural stability according to sex.

Characteristics	Male (n=84)	Female (n=110)	p
COP area (mm^2)	36.13±5.43	36.65±2.09	0.972
COP length (cm)	11.50±1.04	12.33±0.48	0.515
COP average speed (cm/s)	0.37±0.04	0.41±0.02	0.436
Visual perception score	30.73±1.32	26.96±0.53	0.059
VP-T (min)	18.62±0.94	19.11±0.38	0.664
Spatial relationship	5.73±0.36	4.87±0.78	0.076
Visual discrimination	6.67±0.39	6.00±0.14	0.079
Figure-ground perception	5.60±0.46	4.68±0.15	0.030
Visual closure	5.87±0.36	5.42±0.17	0.319
Visual memory	6.87±0.35	5.98±0.18	0.068

Values are presented as means±SE. COP: center of pressure, VP-T: visual perception measurement time

Table 3. Comparisons of visual perception and postural stability according to age.

Characteristics	Young older (n=64)	Middle older (n=84)	Old older (n = 46)	p
Age (years)	67.20±0.49	75.14±0.36[a]	85.84±0.31[a]	0.000
COP area (mm^2)	32.92±4.72	34.88±2.77	41.76±3.23[a]	0.022
COP length (cm)	10.98±0.73	11.98±0.59	13.38±0.92	0.152
COP average speed (cm/s)	0.35±0.02	0.39±0.02	0.44±0.03	0.130
Visual perception score	29.90±1.23	27.70±0.69	25.61±0.85[a]	0.014
VP-T (min)	18.81±0.49	19.08±0.87	19.67±0.64	0.684
Spatial relation	5.55±0.44	5.18±0.21	4.33±0.28[a]	0.023
Visual discrimination	6.25±0.30	6.19±0.19	5.82±0.22	0.389
Figure-ground perception	5.60±0.34	4.75±0.19	4.42±0.26[a]	0.022
Visual closure	5.80±0.35	5.30±0.21	5.61±0.29	0.423
Visual memory	6.70±0.31	6.28±0.23	5.42±0.32[a]	0.018

Values are presented as means±SE. COP: center of pressure, VP-T: visual perception measurement time. [a]$p<0.05$ indicates a significant difference compared with the young older group.

Table 4. Pearson's correlation coefficients between visual perception and postural stability.

Characteristics	Pearson correlation coefficient	p
Visual perception score vs. COP area	−0.258	0.000
VP-T vs. COP length	0.246	0.023
VP-T vs. COP average speed	0.237	0.032
Spatial relation vs. COP area	−0.192	0.045
Visual discrimination vs. COP length	−0.251	0.008
Visual discrimination vs. COP average speed	−0.207	0.030
Figure-ground perception vs. COP area	−0.194	0.043

DISCUSSION

This study aimed to identify correlations between VP and PB in older persons during quiet standing. As age increased, VP decreased, and VP scores and VP-T were significantly correlated with PB.

For older persons who have difficulty with independent living, their perception of the external environment, rather than their sensation of the external environment, is fundamentally important for their movements (14). VP is the perceptual process of visual stimulation, and Tobis et al. (15)

stated that VP is correlated with age and sex. Although this study found no significant differences in terms of sex, the VP score in the old older group was significantly lower. Therefore, authors suggested that age rather than sex may affect VP.

In this study, PB was measured in an upright standing posture. The standing posture requires more attention than the sitting posture, and impaired visual attention or slow visual processing in the older person may be related to poor mobility (16). In this study, VP-T was significantly correlated with the length and average speed of COP displacement, which may indicate that visual processing speed is reduced because of aging; VP was also found to be deteriorated in this study, similar to that reported in previous study. PB is required for mobility (14). Therefore, if visual processing is slow in older persons, it may cause PB problems in dynamic and static postures, such as standing. Further studies comparing static and dynamic postures are necessary in the future.

Tobis et al. (17) reported that VP was low in older persons and in patients with previous falls and decreased PB, indicating an association between VP and PB. They confirmed that VP was significantly correlated with the area of COP displacement and that VP-T was correlated with the length and speed of COP displacement. Our finding indicates that VP and VP-T in community-dwelling older persons are associated with PB.

In this study, there was a difference in spatial relations in terms of sex, similar to results from a study reporting that men have advantages in visuospatial ability (18). This indicates that older females have decreased spatial perception ability compared with older males. In addition, aging may increase the delay in individuals' form perception or affect their shape discrimination (19) and figure-ground separation (20). Results of this study, there were significant differences in spatial relation, figure-ground perception, and visual memory between the old older group and the other groups. Our findings are consistent with those of previous studies, which estimated that spatial perception ability, the ability to perceive the structure of objects are located in space, may decrease because of aging (19,20).

Age is closely related to COP displacement (21), and COP displacement increases in older persons with balance impairment (22). In this study, the area of COP displacement, a measure of PB, increased in the old older group, indicating that VP and PS declined with age. This study also found that VP score and VP-T were significantly correlated with the area, length, and speed of COP displacement. Taken together, these data suggest that slowed visual processing in older persons may be affected by PB.

In particular, previous study found that visual discrimination, figure-ground perception, visual memory, and spatial relations were all decreased in older persons (23). If the VP ability declines, it affects basic and critical ADL (24) and may result in poorer balance and increased risk of falls (25). These results are consistent with those of the present study, which showed negative correlations between PB and spatial relation, visual discrimination, and figure-ground perception among VP items. VP is closely correlated with PB and may affect physical function for maintaining ADL. In this study, the authors predict that decreased VP score and delayed VP-T may be factors for deficits in PB. Therefore, VP measures may be used to evaluate which older persons have poorer PB and greater risk of falls.

In conclusion, this study showed that VP is an association between age rather than sex, and VP-T and VP scores are significant correlated with postural balance, and spatial relationship, figure-ground perception, and visual discrimination are significantly correlated with postural balance. These findings suggest that VP and VP-T may be predicted poor PB in older persons and that maintaining good VP ability is essential as people age.

The present study has a few limitations. First, the authors used self-reported information on VP ability. Second, this study had a cross-sectional design, and 194 participants were not enough to generalize the results of this study. Therefore, authors suggest that further cohort studies of the association between VP and PB in older adults are needed to confirm the present findings.

Conflict of interest

The authors declare no potential conflicts of interest.

REFERENCES

1. Myers AM, Fletcher PC, Myers AH, et al. Discriminative and evaluative properties of the activities-specific balance confidence (ABC) scale. J Gerontol A Biol Sci Med Sci 1998;53(4):M287-94. (PMID:18314568).
2. Sagi D. Perceptual learning in vision research. Vision Res 2011; 51(13):1552-66. (PMID:20974167).
3. Aartolahti E, Häkkinen A, Lönnroos E., et al. Relationship between functional vision and balance and mobility performance in community-dwelling older adults. Aging Clin Exp Res 2013;25(5):545-52. (PMID:24002802).
4. Vance DE, Ball KK, Roenker DL., et al. Predictors of falling in older Maryland drivers: A structural-equation model. J Aging Phys Act 2006;14(3):254-69. (PMID:17090804).
5. Owsley C, McGwin G Jr, Sloane ME., et al. Timed instrumental activities of daily living tasks: relationship to visual function in older adults. Optom Vis Sci 2001;78(5):350-9. (PMID:11384013).
6. Källstrand-Eriksson J, Baigi A, Buer N., et al. Perceived vision-related quality of life and risk of falling among community living elderly people. Scand J Caring Sci 2013;27(2):433-9. (PMID: 23663000).
7. Manckoundia P, Pfitsenmeyer P, d'Athis P., et al. Impact of cognitive task on the posture of elderly subjects with Alzheimer's disease compared to healthy elderly subjects. Mov Disord 2006;21(2):236-41. (PMID:16142775).
8. Fukui T, Lee E. Visuospatial function is a significant contributor to functional status in patients with Alzheimer' disease. Am J Alzheimers Dis Other Demen 2009;24(4):313-21. (PMID:19403740).
9. Fusco N, Fusco N, Germano GD, Capellini SA. Efficacy of a perceptual and visual-motor skill intervention program for students with dyslexia. In CoDAS Sociedade Brasileira de Fonoaudiologia 2015;27(2):128-34. [Internet] Available from: http://www.scielo.br/pdf/codas/v27n2/2317-1782-codas-27-02-00128.pdf. Accessed: 13.6.2017.
10. Fleming RW. Visual perception of materials and their properties. Vision Res. 2014;94:62-75. (PMID:24291494).
11. Karinkanta S, Heinonen A, Sievanen H, Uusi-Rasi K, Kannus P.Factors predicting dynamic balance and quality of life in home-dwelling elderly women. Gerontology. 2005;51(2):116-21. (PMID:15711078).
12. Kim E, Park YK, Byun YH, Park MS, Kim H, Influence of aging on visual perception and visual motor integration in Korean adults. J Exerc Rehabil. 2014;10(4):245-50. (PMCID:PMC4157933).
13. Brown T, Elliott S, Bourne R., et al. The discriminative validity of three visual perception tests. New Zealand J Occup Ther 2011;58(2):14-22. [Internet] Available from: https://www.otnz.co.nz/assets/Uploads/pdfs/Journals-NZJOT/OTJournalSept2011.pdf#page=16. Accessed: 07.6.2017.
14. Shumway-Cook A, Woollacott M. Motor control: Translating research in toclinical practices, 4th ed. Lippincott Williams & Wilkins, 2007, pp 8-12.
15. Tobis JS, Reinsch S, Swanson JM, et al. Visual perception dominance of faller among community-dwelling older adults. J Am Geriatr Soc 1985;33(5):330-3. (PMID:3989198).
16. Owsley C, McGwin G. Association between visual attention and mobility in older adults. J Am Geriatr Soc 2004;52(11):1901-6. (PMID:15507069).
17. Tobis JS, Nayak L, Hoehler F. Visual perception of verticality Horizontality among elderly fallers. Arch Phys Med Rehabil 1981;62(12):619-22. (PMID:7316723).
18. Pauls F, Petemann F, Lapach AC. Gender differences in episodic memoryand visual working including the effects of age. Memory 2013;21(7):85-74. (PMID:23383629).

19. Weymouth AE, McKendrick AM. Shape perception is altered by normal aging. Invest Ophthalmol Vis Sci 2012;53(6):3226-33. (PMID:22531695).

20. Chee MWL, Goh JO, Venkatraman V., et al. Age-related changes in object processing and contextual binding revealed using fMR adaptation. J Cogn Neurosci 2006;18(4):495-507. (PMID:16768356).

21. Du Pasquier RA, Blanc Y, Sinnreich M., et al. The effect of aging on postural stability: a cross sectional and longitudinal study. Neurophysiol Clin 2003;33(5):213-8. (PMID:14672821).

22. Baloh RW, Corona S, Jacobson KM., et al. A prospective study of posturography in normal older people. J Am Geriatr Soc 1998;46(4):438-43. (PMID:9560065).

23. Costello MC, Madden DJ, Mitroff SR, et al. Age-related decline of visual processing components in change detection. Psychol Aging 2010;25(2):356-68. (PMID:20545420).

24. Fusco O, Ferri, A, Santoro, M, Lo Monaco, MR, Gambassi, G, Cesari, M. Physical function and perceived quality of life in older person. AgingClin Exp Res 2012;24(1):68-73. (PMID:22643307).

25. Brown T, Chinner A, Stagnitti K. The reliability of two visual motor integration tests used with healthy adults. Occup Ther Health Care 2010;24(4):308-19. (PMID:23898957).

Turkish Journal of Geriatrics
2017;20 (4):331-343

■ Hande KAYNAK[1]
■ Didem GÖKÇAY[2]

RESEARCH

RESPONSE BIAS SHIFT FOR POSITIVE WORDS IN OLDER ADULTS IN A SURPRISE RECOGNITION MEMORY TASK: AN INCIDENTAL ENCODING STUDY

Abstract

Introduction: Although the advantages of positive words on memory enhancement have been documented, the specific effects of the two prominent emotional dimensions (valence and arousal) under incidental encoding require further investigation. The objective is to study memory accuracy and response bias for positive/negative and highly/medium arousing words in a surprise old/new recognition memory paradigm under incidental encoding.

Materials and Method: 113 volunteers (60 young, 53 older) participated. Emotional words were presented on a computer screen and participants were instructed to count vowels in the incidental encoding phase. After a 30-minute retention interval, participants' memory was assessed with a surprise old/new recognition memory task.

Results: A 2×3×2 mixed analysis of variance was conducted. Memory accuracy (using d' scores) and response bias (using criterion scores) were the dependent variables in Signal Detection Theory. Older adults had a significant bias ($p < 0.05$) responding "yes" to positive words, indicating that they had seen these words beforehand; their memory accuracy did not differ in terms of valence.

Conclusion: Older participants emphasize positive words more than negative words. When considering incidental encoding, this age-related change suggests that older participants regulate their emotion in favor of maintaining their well-being. Our study indicates the importance of disentangling age-related factors from the memory performance metrics.

Key Words: Memory; Recognition (Psychology); Aged; Emotions; Bias; Signal Detection, Psychological

ARAŞTIRMA

SÜRPRİZ BİR ESKİ/YENİ TANIMA BELLEĞİ GÖREVİNDE YAŞLI YETİŞKİNLERDE OLUMLU KELİMELER İÇİN TEPKİ YANLILIĞI DEĞİŞİMİ: BİR TESADÜFİ KODLAMA ÇALIŞMASI

Öz

Giriş: Yaşlı bireylerin özellikle olumlu kelimeleri bellekte daha iyi tuttukları bilinmesine rağmen, duygunun iki boyutunun (olumluluk ve heyecan düzeyleri) tesadüfi kodlama yapılan tanıma belleği performansı üzerindeki etkisi hâlâ netlik kazanmamıştır. Araştırmanın amacı, tesadüfi kodlanan ve olumluluk (olumlu, olumsuz ve nötr) ve heyecan düzeyleri (yüksek ve düşük) değişimlenen kelimelerin tanıma belleği puanları (bellek doğruluğu ve tepki yanlılığı) üzerindeki etkisini, sürpriz bir eski/yeni tanıma belleği göreviyle incelemektir.

Gereç ve Yöntem: Çalışmaya, 60 genç ve 53 yaşlı olmak üzere 113 gönüllü katılmıştır. İlk olarak, duygusal kelimeler bilgisayarda tek tek sunulmuş, tesadüfi kodlama yapması istenen katılımcılardan kelimelerin kaç sesli harften oluştuğunu belirtmesi istenmiştir. 30 dakikadan sonra, test aşamasına geçilmiş, çalışma aşamasına atıfta bulunarak daha önce gördükleri kelimeleri tanımaları yönünde yönerge sunulmuş, sürpriz bir eski/yeni tanıma göreviyle bellek performansı kaydedilmiştir.

Bulgular: 2×3×2 son faktörde tekrar ölçümlü deney deseni kullanılmıştır. Bağımlı değişken, tanıma belleği puanları olup, Sinyal Belirleme Kuramı temel alınarak bellek doğruluğu ve tepki yanlılığı hesaplanmıştır. Varyans analizlerine göre, yaşlıların kelimelerin olumluluk düzeyi açısından bellek doğruluğu puanları değişmemekle birlikte, özellikle olumlu kelimelere karşı istatistiksel olarak anlamlı bir tepki yanlılığı gösterdikleri bulunmuştur.

Sonuç: Yaşlılar olumsuz kelimelere nazaran olumlu kelimelere daha çok önem vermektedir. Kelimelerin çaba harcamadan, tesadüfi kodlandığı koşulda, yaşla birlikte ortaya çıkan bu farklılık, yaşlıların iyi olma hallerini korumak adına duygularını düzenlediklerini öne sürmektedir. Çalışmamız bellek performansı ölçümlerinde, yaşla ilişkili etkenlerin belirlenmesinin önemine dikkat çekmektedir.

Anahtar Sözcükler: Bellek; Tanıma (Psikoloji); Yaşlı; Duygular; Yanlılık (Epidemiyoloji); Sinyal Belirleme, Psikolojik

Correspondance

Hande KAYNAK
Çankaya University
Department of Psychology
ANKARA

Phone: 03122331456
e-mail: handekaynak@gmail.com

Received: 24/05/2017
Accepted: 29/09/2017

[1] Çankaya University,Department of Psychology
ANKARA
[2] Middle East Technical University, Graduate School of Informatics - Medical Informatics
ANKARA

Portions of the study were presented in poster form at the Annual Meeting of the Society for the Neurobiology of Language (SNL), San Diego, CA, on November 6, 2013. Besides, portions of this study were presented in oral presentation form at the Annual Meeting of the Gerontological Society of America (GSA), Washington, DC, on November 7, 2014.

INTRODUCTION

Changes in neurological and neuropsychological status in the aging brain have begun to garner much attention (1-3). The broad consensus is that memory performance declines with increased age; more specifically, as age increases, recognition memory performance decreases. However, memory is suffused with emotion, and hence, the interaction between emotion and aging may result in differential effects in memory enhancement for emotional stimuli. Perhaps due to this, findings on the effect of age on emotional memory performance and/or the relationship between the two are contradictory. Older adults, like young adults, are more likely to detect and attend emotional information than they are to do so for non-emotional information (4,5). Some recent research (6,7) has demonstrated that negative stimuli have a tendency to be better remembered, overall. However, older adults seem to exhibit a positivity bias; in other words, they are more likely to remember positive information than negative information (8). In sum, there is substantial evidence that older adults process emotional information differently from young adults.

There is a theory called "Socioemotional Selectivity Theory" which tries to explain the positivity bias of older adults by positing that as older adults realize that they are close to the end of their lives, they begin to view time as limited. Hence, goals associated with emotional well-being become more salient and, the focus of their goals may change from exploration (or knowledge accumulation) toward emotional gratification (9,10). This kind perspective shift may cause a positivity bias: they are more likely to remember positive information than negative information. Since young adults do not view time as limited and finite, they need not regulate emotions. The "emotional regulation" goals of young and older adults seem to be very different, and this difference results in differential biases for emotional stimuli. Conscious attentional processes may offer an explanation to this finding. When older adults devote full attention towards the emotional information, they show positivity bias (11). Positivity effect may be less likely to occur when the focus of attention or thought is constrained during encoding (8). When their attention is divided or cognitive resources are limited during information via processing experimental task, older participants may not focus their attentional resources towards to positive information, and hence, the positivity bias disappears (12). Several researchers (5,13,14) have failed to find a positivity effect in the memories of older adults. In other words, the attentional effort spent during encoding might be an important variable that results in positivity effect in memory. Thus, it may be concluded that the tendency of shifting attention to positive items in older adults is a controlled and effortful process. On the other hand, Sayar and Cangöz's research (10) revealed that emotional information could be processed and recalled automatically. They observed differences in young and older adults in terms of testing interval and valence levels of words demonstrating that older participants exhibited the positivity effect while recalling the words implicitly. Thus, these findings lead us to choose incidental encoding in study session.

Neuroimaging studies provide support for such "controlled emotion processing". Medial prefrontal activity is often associated with emotion regulation. So, neuroimaging studies which focused on emotion regulation investigate the activity in medial prefrontal cortex and amygdala. In a study which investigated the activity in medial prefrontal cortex and

amygdala during emotion regulation (15) for negative and positive emotion, older adults were presented emotional information, and the prefrontal cortex activation was observed to be increased for negative emotion, while amygdala activation decreased (15). Based on this result, it can be concluded that older adults intentionally and effortfully tried to control their responses to negative items (15). Another interesting neuroimaging result was that older adults showed greater medial prefrontal activity than younger adults while responding to the negative emotional images. This kind of control mechanism was absent in the brains of young adults. Moreover, in a recent study on emotional working memory, positivity effect was observed in people with Alzheimer's disease demonstrating that positively valenced stimuli enhanced memory performance through the higher activity in left ventral prefrontal cortex (3). Consistent with this result, another study conducted by Addis, Leclerc, Muscatell and Kensinger (16) also revealed that while older adults were encoding positive stimuli, their ventromedial prefrontal cortex and amygdala together affected hippocampal activity. In contrast, only thalamus had an influence on hippocampal activity when young adults were encoding these stimuli. This differing influence may be the reason that why young adults are less likely than older adults to remember positive stimuli than negative stimuli. It is also crucial to remember that during the encoding of negative stimuli, no age-related differences were detected in terms of the connectivity among the brain regions. This raises the following question: what happens if older adults encode positive and negative stimuli that have different arousal levels under incidental encoding?

In addition to the valence dimension of emotion (ranging from unpleasant/negative to pleasant/positive), arousal is another factor, ranging from calming to exciting. Due to its relevance to the intensity of emotional experience, arousal is critical for observing the emotional memory enhancement effect. During encoding, the amygdala is indispensable for successful retrieval of arousing items later (17). According to McGaugh's memory modulation hypothesis, as long as the emotional information (either positive or negative) is highly arousing, amygdala–hippocampal interactions guide successful encoding. Involvement of both the amygdala and hippocampus increases the strength of encoding and enhances the consolidation of emotional stimuli (18). Although the "memory modulation hypothesis" concerns only consolidation mechanisms instead of the retrieval of emotional memory, Dolcos, LaBar, and Cabeza postulate the crucial role of the amygdala during retrieval (17). Even though some studies (19,20) indicate the importance of arousal for better memory performance, studies emphasizing the interaction effect of both valence arousal dimensions of emotion are also worth mentioning within the emotional memory network.

While both valence and arousal dimensions of emotion enhances memory accuracy in different ways, it might also induce a response bias. Memory accuracy (d') is a valid measurement of memory performance, but it is not sufficient because it may be contaminated by response bias. Unless response bias is considered, drawing a firm conclusion about memory performance for emotional words is not reliable. Liberal bias, the tendency to respond in a predominantly liberal way, is a strong measure to understand the interference from the cognitive system. In recognition memory tasks, responding "yes" indicates a preference towards recognizing most of the newly presented

items as seen before. Liberal bias indicates a ratio regarding responding "yes" throughout the experiment. Thapar and Rouder (21) stated that emotionally charged words produce a response bias, they do not discriminate memory performance indeed and this pattern is different for young and older participants. Although both groups have a tendency to choose emotional words over neutral ones, they differ in their bias toward positive and negative words. Older participants exhibit bias for positive words while young participants exhibit bias for negative words. It is expected that during incidental encoding, the affective aspects of a stimulus would be processed without conscious cognitive interference brought by an open question, enabling better investigation of young and older adults' natural tendencies in emotional recognition memory performance based on both memory accuracy and response bias.

In this study, we hypothesized that emotional words encoded incidentally are recognized better compared with neutral words in both age groups. Also, emotional words exhibit a response bias in different patterns for young and older participants, especially as a result of the interaction between valence and arousal. In this sense, our main objective was to observe emotional effects resulting from incidental encoding.

We also aimed to detect memory accuracy and response bias, both important measures, during recognition. As we aimed to eliminate the cognitively loaded intentional memory recognition efforts, we chose the incidental encoding.

The chosen word categories were positive and negative with respect to pleasantness and highly and medium arousing with respect to emotional intensity. Neutral words were also used as controls.

MATERIALS AND METHOD

Participants

A total of 113 volunteers participated; 60 young adults [mean age, 20.77 (range 18–24) years, 30 F, 30 M] and 53 older adults [mean age, 77.13 (range 65–91) years, 33 F, 20 M). Undergraduate students at Middle East Technical University (METU), Marmara and Istanbul University received course credits for participating in the study. The older adult participants were chosen from among the residents of Istanbul Etiler Nursing Home of Social Security Institution for Civil Servants, the Istanbul Kızılay Nursing Home, and the Izmir Narlıdere Nursing Home of Social Security Institution for Civil Servants. Older adults who were living longer than 1.5 years at a nursing home were excluded from the study. All participants were native Turkish speakers with normal or corrected-to-normal vision and had no history of a neuropsychological, psychiatric disorder, or alcoholism and no use of medication affecting the central nervous system for the last 6 months. The participants in both groups were individuals who received education for 11 or more years. Statistically, age groups did not differ significantly with respect to total years of education, ($t_{(52)}$=.46, p >.05). The demographical information of the participants is shown in Table 1. Informed consent read and signed by the participants was obtained in a way approved by the METU Ethics Committee. The participants in the healthy, older adult group were selected among those who fulfill the criteria for "healthy elderly." In order to determine whether the participants fulfilled this criterion, screening tests and/or scales were employed: the Standardized Mini-Mental State Examination (22), Geriatric Depression Scale (23), and Functional Activities Questionnaire (24). In order to choose "healthy" young participants, the Beck Depression Inventory was used (25). Table 2 presents the scores for these tests.

Table 1. The demographical information of the participants.

Age	Young	mean=20.77 sd=1.54	
	Older	mean=77.13 sd=7.01	
Years of Education	Young	mean=13.27 sd=1.04	
	Older	mean=12.96 sd=2.06	
Gender	Young	Female=30 Male=30	(50%) (50%)
	Older	Female=33 Male=20	(62%) (38%)
Marital Status	Young	Married=- Single=60 Widowed/Divorced=-	 (100%)
	Older	Married=13 Single=6 Widowed/divorced= 34	(25%) (11%) (64%)
Occupation	Young	State=- Private=- Self-employed=- Nonworking/student= 60	 (100%)
	Older	State=2 Private=4 Self-employed=1 Nonworking/retired= 46	(4%) (8%) (1%) (87%)

sd= standard deviation

Table 2. Means and standard deviations of the scores that participants got from screening tests and/or scales and the cut-off points for "healthy" young and older adults.

SMMSE (Older)	mean=27.68 sd= 1.68	Cut-off point ≥25
GDS (Older)	mean=4.28 sd= 2.86	Cut-off point ≤11
FAQ (Older)	mean=0.23 sd=0.82	60–69 years old= 2 or more activities ≤ 5 points 70 years old and above=2 or more activities ≤9 points
BDI (Young)	mean=7.62 sd=3.84	Cut-off point ≤ 17

sd= standard deviation

SMMSE=Standardized Mini Mental State Examination; GDS=Geriatric Depression Scale; FAQ=Functional Activities Questionnaire; BDI=Beck Depression Inventory.

Word stimuli

A total of 180 concrete words (30 words from each category highly arousing positive, highly arousing negative, medium arousing positive, medium arousing negative, and 60 neutral words) were selected from the Turkish Affective, Semantic and Evaluative word norm database, TÜDADEN (26). The words were controlled for word length ranging from 4-7 letters and 2 or 3 syllables. In this regard, on average, the words used in the study session (*M*=5.43; *SE*=.11) and the words added for test session (*M*=5.42; *SE*=.10) did not differ in terms of word length ($t_{(89)}$=.08, *p* >.05). On a scale of 1–9, the mean valence of the positive words was 7.58; the mean valence of the negative words was 2.46; the mean arousal of the highly arousing words was 6.76**,** and the mean arousal of the medium arousing words was 4.90.

The words were distributed to four lists such that Word List 1 and Word List 2 were used during incidental encoding and contained 45 words each, and Word List 3 and Word List 4 were used during recognition and contained 90 words each. The main difference between these lists was the arousal levels. Word Lists 1 and 3 contained medium arousing words, and Word Lists 2 and 4 contained highly arousing words. The distribution of the words is illustrated in Figure 1.

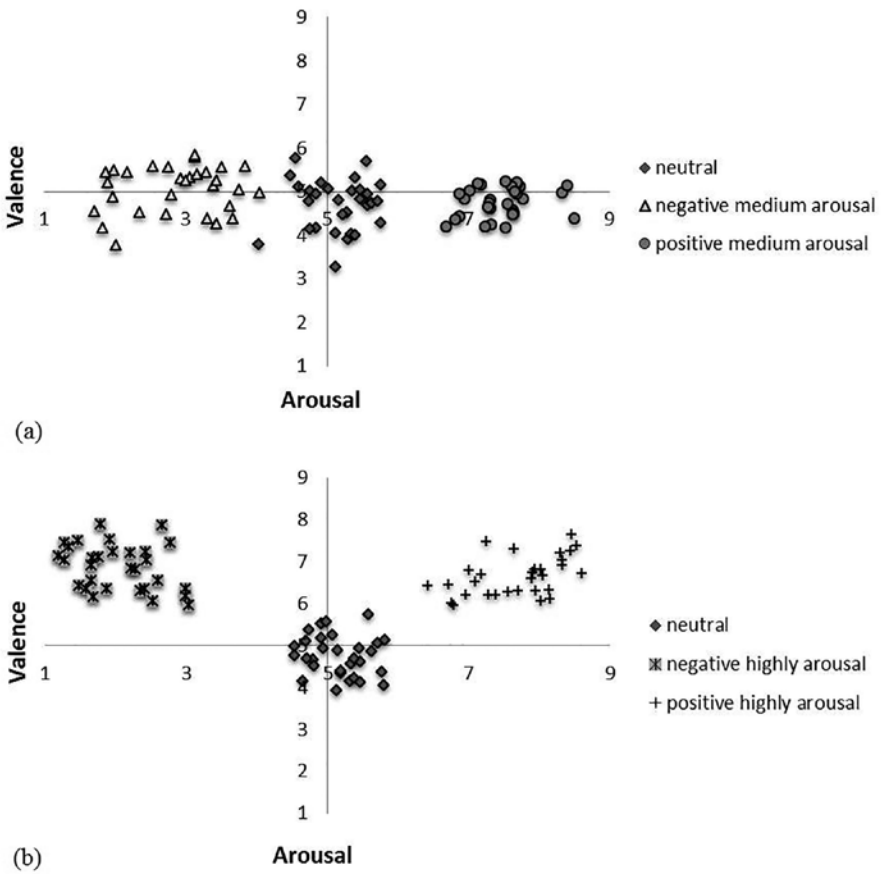


Figure 1. The distribution of words used in Word List 3 (a) and Word List 4 (b) according to the values in two dimensions of emotion (x-axis: valence and y-axis: arousal).

Procedure

The participants completed the informed consent form in which no mention was made of the forthcoming memory test. Instead, it was indicated that the aim was to examine differences among adults in terms of processing words and numbers. Before participants were recruited into the study, they were exposed to screening tests in order to ensure that all participants met the selection criteria. After the administration of the screening tests, the participants from two age groups were randomly assigned to group 1 or group 2. The variable "arousal levels of words" was designed as "between group," which differed between these two groups. On the hand, the variable "valence levels of words" was within subject. The experiment started with incidental encoding (study session), in which the participants viewed words from either Word List 1 or Word List 2 one at a time on the computer screen for 1 second. Participants were told to simply look at the words on the computer screen and decide how many vowels each word contained by pressing the respective number button (that is, 2 or 3) within 2 seconds. Following the study session, the participants were given a 2-minute distractor task. In the distractor task, 50 simple mathematical operations requiring a decision whether the number pairs are equal or not were presented on the computer screen. Next, a 30-minute delay (27) was introduced before starting the surprise recognition memory task (test session). A classical old/new paradigm was used in the test session. During this self-paced test session, participants saw 90 words from either Word List 3 or 4. Among these words, half had been presented in the study session. For each word, participants pressed a button to indicate whether they had seen the word before. "Yes" responses were categorized as "old" and "No" responses were categorized as "new." Stimulus presentation and response recording for each of the sessions were controlled by a 15.4 inch laptop, with E-prime v.1.2 software (Psychology Software Tools Inc., Pittsburg, PA). The words were presented on a light gray background with letters in Arial font, in black color, and all upper case. At the end, the participants were asked if they had expected a memory test. Participants who had answered negatively in the debriefing forms (113 out of 113) were included in the statistical analyses.

Data analysis

To measure memory performances of the participants, Signal Detection Theory (SDT) (28) was used. The participants' "yes" responses to the studied words were called "hits." "Yes" responses for non-studied words were called "false alarms." After calculating hits and false alarm rates, memory accuracy d' was computed as follows.

$$d' = z(\text{Hit rates}) - z(\text{False alarm rates})$$

d' indicates the difference between rates of correctly recognized old words in the test list and misclassified new words in the test list as study items. d' is a normalized score because z-scores are used instead of actual hits and false alarms.

In addition, response bias, which is the calculated criterion scores using hits and false alarm rates based on SDT, was computed as follows.

$$\text{Criterion} = -0.5 * [z(\text{Hit rates}) + z(\text{False alarm rates})]$$

Criterion scores quantify the tendency of participants to respond in a predominantly liberal way by favoring "yes" responses (more negative scores reflect a liberal pattern, which gives an opportunity to evaluate the response change towards responding as "old").

The exclusion criterion was based on the participant's performance in d' scores. Participants with memory accuracy less than a threshold ($d' \leq 0$) were excluded: only one participant from young

adults and five participants from older adults. Afterwards, possible outliers were scanned to get the efficient statistical results. For this reason, all scores were transformed to standardized scores (that is, z-scores) and examined. No data were needed to be excluded, so normalization was provided for further analysis.

As preliminary analyses revealed no effects for gender, it is not included as a factor in the analyses reported below. The data were analyzed in a 2 (age: young and older) × 2 (arousal: high and medium) × 3 (valence: positive, negative and neutral) mixed analysis of variance (ANOVA). The independent variables "age" and "arousal levels of words" were between groups; while the independent variable "valence levels of words" was within subjects. Participants' memory was assessed with a surprise old/new recognition memory task. In this regard, primary analyses were performed on memory accuracy and response bias using the d' scores and criterion scores as the dependent measures, respectively. For all of the analyses in this study, a .05 alpha level and $\eta\varrho^2$ to measure effect sizes were used.

RESULTS

Analyses of d' scores

Results indicated main effects of age ($F_{(1, 109)}$=38.53, p =.000, $\eta\varrho^2$=.26), arousal ($F_{(1, 109)}$=8.35, p =.005, $\eta\varrho^2$=.07) and valence ($F_{(2, 218)}$=3.63, p < .05, $\eta\varrho^2$=.03) on d' scores. There was also a significant age × valence interaction ($F_{(2, 218)}$=2.93, p=.05, $\eta\varrho^2$=.03) (Figure 2). Results for age × valence × arousal mixed ANOVA indicated a significant three-way interaction effect ($F_{(2, 218)}$=7.07, p=.001, $\eta\varrho^2$=.06) (Figure 3).

In a more detailed post-hoc analysis, paired samples t-tests were conducted in order to isolate the differences. Significance levels for each group were determined by Holm's Sequential Bonferroni correction method. In order to be significant at the .05 level under Bonferroni, .05 was divided by the number of pairwise comparisons.

Since there are lots of comparisons and the three-way interaction effect was found significant, only the three-way interaction analysis is further indicated in this paper as summarized in Figure 3.

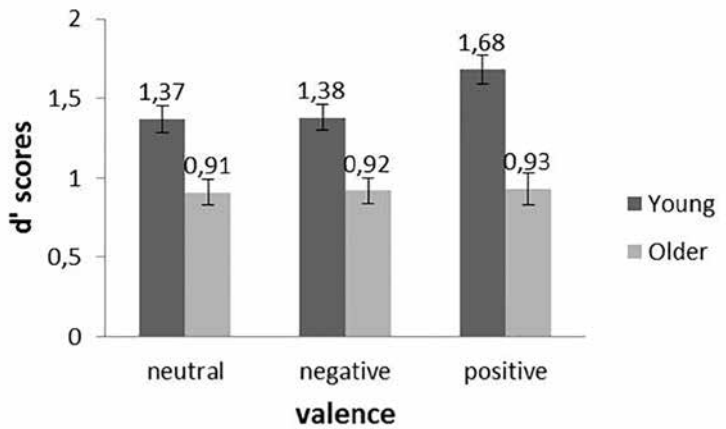


Figure 2. Age × Valence on d' scores. Error bars represent standard error.

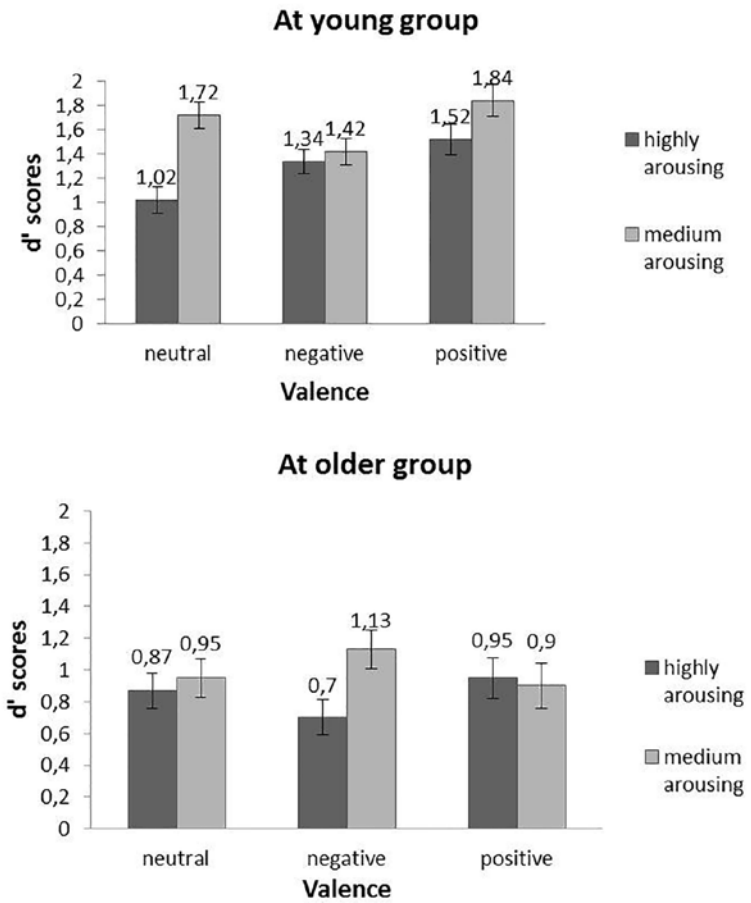


Figure 3. Age × Valence × Arousal on d' scores. Error bars represent standard error.

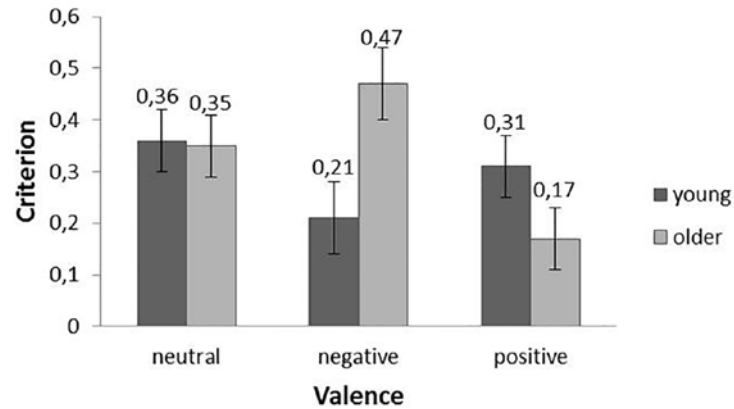


Figure 4. Age × Valence on criterion values. Error bars represent standard error.

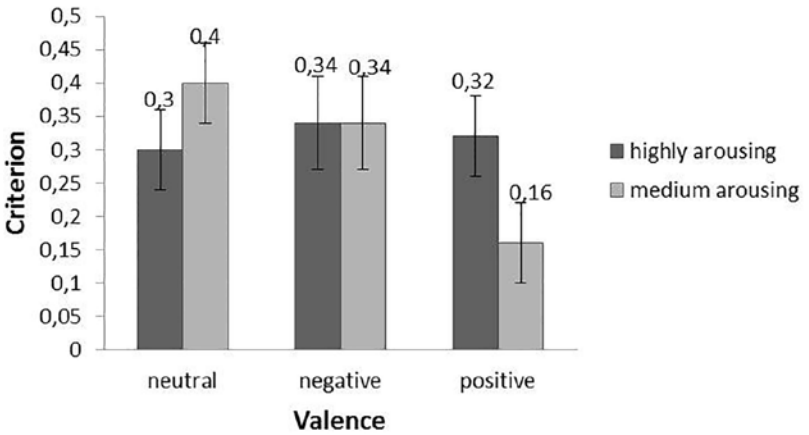


Figure 5. Valence × Arousal on criterion values. Error bars represent standard error.

Accordingly, young adults recognized highly arousing positive words (M=1.52) more accurately than neutral words used in the highly arousing verbal material list (M=1.02), $t_{(30)}$=3.13, p=.004. Young adults also recognized highly arousing negative words (M=1.34) more accurately than neutral words used in the highly arousing verbal material list (M=1.02), $t_{(30)}$=2.50, p =.018. When considering the medium arousing word list, young adults recognized medium arousing positive words (M=1.84) more accurately than medium arousing negative words (M=1.42), $t_{(28)}$=3.67, p=.001. Young adults also recognized neutral words (M=1.72) more accurately than medium arousing negative words (M=1.42), $t_{(28)}$=2.20, p=.036. Furthermore, young adult participants recognized neutral words used in the medium arousing verbal material list (M=1.72) more accurately than they did neutral words used in the highly arousing verbal material list (M=1.02), $t_{(28)}$=4.09, p=.000. For the older participant sample, medium arousing negative words (M=1.13) were recognized more accurately than highly arousing negative words (M =.70), $t_{(23)}$=3.71, p=.001.

Analyses of criterion scores

Results indicated a main effect of valence ($F_{(2, 218)}$=6.91, p=.001, $\eta\varrho^2$=.06) on criterion scores. There was no main effect of age and arousal. There was also a significant age × valence interaction ($F_{(2, 218)}$=18.53, p=.000, $\eta\varrho^2$=.15) (Figure 4). Results for arousal × valence mixed ANOVA indicated a significant 2-way interaction effect ($F_{(2, 218)}$=7.65, p=.001, $\eta\varrho^2$=.07) (Figure 5). The age × arousal × valence three-way interaction on criterion scores did not reach conventional levels of significance.

In a more detailed analyses of paired samples t-tests for age × valence interaction (Figure 4), young participants were more willing to classify negative words (M=.21) as old than neutral words (M=.36), $t_{(59)}$=2.89, p=.005. Moreover, young participants were more willing to classify negative words (M=.21) as old than positive words (M=.31), $t_{(59)}$=2.09, p=.041. However, older participants were more willing to classify positive words (M=.17) as old than they were to classify both neutral words (M=.35) and negative words (M=.47), $t_{(52)}$=3.88, p=.000, t(52)=6.34, p=.000, respectively. Moreover, criterion values for neutral (M=.35) and negative words (M=.47) did significantly differ from each other, $t_{(52)}$=2.63, p=.011, reflecting greater liberal bias for neutral words in the older group. In addition, young participants (M=.21) were more willing to classify negative words as old than older adults were (M=.47), $t_{(52)}$=3.15, p=.003.

DISCUSSION

The present study was designed to examine the effects of the arousal and valence axes of emotion on incidentally encoded recognition memory for emotional words in young and older adults. The main effect of age was replicated in the d' scores. More specifically, older adults were postulated to be impaired in their ability to incidentally encode the emotional words and then intentionally recollect them. As age-related losses are substantial in recognition memory tasks (1), the reduction in d' scores with aging was an expected result. Furthermore, the present finding revealed an overall significant valence main effect in d' scores favoring recognition of positive words. However, the recognition accuracies of positive, negative, and neutral words for older adults did not differ significantly. At this point, considering the contribution of a bias factor through criterion scores becomes plausible because regardless of the recognition memory accuracy (d'), the participants exhibited a liberal response bias. A moderate "positivity bias" demonstrated its strength on these scores. "Liberal criterion" analysis emphasized that older adults showed a more liberal tendency than young adults towards positive words.

As mentioned earlier, according to Socioemotional Selectivity Theory, older adults are highly motivated to daily seek meaningful and positive emotional experiences. They are more attracted to positive information and avoid negative information (10,15). Older participants seem to "expect" more positive words during the test session. In the test session, while older participants ignored negative words, they indicated more liberally that the positive words were present in the study session. Hence, we observed an age-related "positivity effect" for older adults. This is a replication of the findings of the study by Fernandes, Ross, Wiegand, and Schryer (29), in which they used three types of materials (autobiographical memories, pictures, and words) to examine the effect of the valence component of emotion on memory performance. The results of false alarm rates for words showed that older adults had higher false alarm rates for positive words than they did for negative and neutral words. Therefore, we can conclude that the older participants preferentially recognized positive words in our study.

However, in young adults, negative words produced higher liberal response bias than did positive and neutral words. These results are in agreement with Thapar and Rouder (21). In their study, recognition memory was tested by an unspecified memory task, which involved intentional learning. Thapar and Rouder (21) concluded that the valence component of emotion influenced the young and older participants' memory performance through response bias, with older participants exhibiting a greater response bias for positive words and young participants exhibiting a more liberal response bias for negative words.

The limitation of the present study includes the stimulus presentation. In this study, the words were presented visually on the computer screen. During the study session, the words stayed on the screen for 1 second and the participants made their vowel number decisions within 2 seconds. Especially for older participants, the suitability of the 2-second time period for decision making is not justified. This time period could have been longer, and possibly decided after a pilot study in the older population.

In conclusion, it is important to note that most of the existing studies have been conducted under intentional encoding. In the present study, a further question not addressed in the literature to date has been raised: Does the nature of bias differ under incidental encoding? In a verbal incidental encoding task, followed by a surprise recognition memory task, we observed unintentional emotional effects during encoding and response biases during surprise recognition. Both young and older adults were more willing to recognize emotional words over non-emotional ones, but they differed

in their response bias toward positive and negative words. Our results indicated that increasing age was associated with a more liberal bias for positive words. It seems that the emotional enhancement effect reported in the literature for the older age group was due to this bias for positive words. To sum up, older participants had a tendency to respond in such a bias way that recognizing emotional words was might base on response bias, not memory accuracy. Out of this work, a future research direction emerges for investigating biases in eyewitness phenomenon.

REFERENCES

1. Grady CL. Functional brain imaging and age-related changes in cognition. Biol Psychol 2000;54(1-3):259-81. (PMID:11035226).
2. Makris N, Papadimitriou GM, van der Kouwe A, et al. Frontal connections and cognitive changes in normal aging rhesus monkeys: a DTI study. Neurobiol Aging 2007;28(10):1556-67. (PMID:16962214).
3. Ateş FE, Cangöz B, Özel-Kızıl ET, Baskak B, Baran Z, Özgüven, HD. Frontal activity during a verbal emotional working memory task in patients with Alzheimer's disease: a functional near-infrared spectroscopy study. Psychiatry Res 2017;261:29-34. (PMID:28126617).
4. Leclerc CM, Kensinger EA. Effects of age on detection of emotional information. Psychol Aging 2008;23(1):209-15. (PMID:18361668).
5. Baran Z, Cangöz B, Özel-Kızıl ET. The impact of aging and Alzheimer's disease on emotional enhancement of memory. Eur Neurol 2014;72(1-2):30-7. (PMID:24853408).
6. Estes Z, Verges M. Freeze or flee? Negative stimuli elicit selective responding. Cognition 2008;108(2):557-65. (PMID:18433742).
7. Kapucu A, Rotello CM, Ready RE, Seidl KN. Response bias in "remembering" emotional stimuli: a new perspective on age differences. J Exp Psychol Learn Mem Cogn 2008;34(3):703-11. (PMID:18444767).
8. Mather M, Knight M. Goal-directed memory: the role of cognitive control in older adults' emotional memory. Psychol Aging 2005;20(4):554-70. (PMID:16420131).
9. Carstensen LL, Fung HH, Charles ST. Socioemotional selectivity theory and the regulation of emotion in the second half of life. Motiv Emotion 2003;27:103-23.
10. Sayar F, Cangöz B. A comparison between young and elderly people with respect to emotional memory functions. Turkish Journal of Geriatrics 2013;16(2):177-84. (in Turkish).
11. Kensinger EA, Leclerc CM. Age-related changes in the neural mechanisms supporting emotion processing and emotional memory. Eur J Cogn Psychol 2009;21(2/3):192-215.
12. Knight M, Seymour TL, Gaunt JT, Baker C, Nesmith K, Mather M. Aging and goal-directed emotional attention: distraction reverses emotional biases. Emotion 2007;7(4):705-14. (PMID:18039037).
13. Comblain C, D'Argembeau A, Van der Linden M, Aldenhoff L. The effect of ageing on the recollection of emotional and neutral pictures. Memory 2004;12(6):673-84. (PMID:15724356).
14. Murphy NA, Isaacowitz DM. Preferences for emotional information in older and younger adults: a meta-analysis of memory and attention tasks. Psychol Aging 2008;23(2):263-86. (PMID:18573002).
15. Williams LM, Brown KJ, Palmer D, Liddell BJ, Kemp AH, Olivieri G, Peduto A, Gordon E. The mellow years?: neural basis of improving emotional stability over age. J Neurosci 2006;26(24):6422-30. (PMID:16775129).
16. Addis DR, Leclerc CM, Muscatell KA, Kensinger EA. There are age-related changes in neural connectivity during the encoding of positive, but not negative, information. Cortex 2010;46(4):425-33. (PMID:19555933).
17. Dolcos F, LaBar KS, Cabeza R. Dissociable effects of arousal and valence on prefrontal activity indexing emotional evaluation and subsequent memory: an event-related fMRI study. Neuroimage 2004;23(1):64-74. (PMID:15325353).
18. McGaugh JL. The amygdala modulates the consolidation of memories of emotionally arousing experiences. Annu Rev Neurosci 2004;27:1-28. (PMID:15217324).
19. Kensinger EA, Corkin S. Two routes to emotional memory: distinct neural processes for valence and arousal. P Natl Acad Sci USA 2004;101(9):3310-15. (PMID:14981255).

20. Mickley Steinmetz KR, Addis DR, Kensinger EA. The effect of arousal on the emotional memory network depends on valence. Neuroimage 2010;53(1):318-24. (PMID:20542121).
21. Thapar A, Rouder JN. Aging and recognition memory for emotional words: a bias account. Psychon Bull Rev 2009;16(4):699-704. (PMID:19648455).
22. Güngen C, Ertan T, Eker E, Yaşar R, Engin F. Reliability and validity of the standardized Mini Mental State Examination in the diagnosis of mild dementia in Turkish population. Turk J Psychiatry 2002;13(4):273-81. (PMID:12794644). (in Turkish).
23. Ertan T, Eker E. Reliability, validity, and factor structure of the Geriatric Depression Scale in Turkish elderly: are there different factor structures for different cultures? Int Psychogeriatr 2000;12(2):163-72. (PMID:10937537).
24. Selekler K, Cangöz B, Karakoç E. Adaptation and norm determination study of the Functional Activities Questionnaire (FAQ) on Turkish adults (ages 50 and over). Turk J Neurol 2004;10(2):102-7. (in Turkish).
25. Hisli N. The reliability and validity study of the Beck Depression Inventory in a Turkish sample. Turk J Psychol 1988;6(22):118-22. (in Turkish).
26. Gökçay D, Smith MA. TÜDADEN: Turkish affective, semantic and evaluative word norm database, In: Bingöl H (Ed). Brain and Computer: Proceedings of Brain as an Information Processing Machine I-IV. 2nd ed. Pan Publishing, Turkey 2012, pp 436-45. (in Turkish).
27. Kaynak H, Cangöz B. Does aging affect immediate and delayed implicit memory performance? Turkish Journal of Geriatrics 2010;13(1):26-35. (in Turkish).
28. Yonelinas AP. Receiver-operating characteristics in recognition memory: evidence for a dual-process model. J Exp Psychol Learn Mem Cogn 1994;20(6):1341-54. (PMID:7983467).
29. Fernandes M, Ross M, Wiegand M, Schryer E. Are the memories of older adults positively biased? Psychol Aging 2008;23(2):297-306. (PMID:18573004).

Turkish Journal of Geriatrics
2017;20 (4):344-350

- Vildan YILDIZ
- Oya ÖZDEMİR
- Yeşim GÖKÇE KUTSAL

Correspondance

Oya ÖZDEMİR
Hacettepe University, Faculty of Medicine,
Department of Physical Medicine and Rehabilitation,
ANKARA

Phone: 903123094142
e-mail: oyaunalozdemir@yahoo.com

Received: 04/07/2017
Accepted: 16/10/2017

[1] Hacettepe University, Faculty of Medicine,
Department of Physical Medicine and Rehabilitation,
ANKARA

REWIEW ARTICLE

MEDICATION NONADHERENCE IN ELDERY AND RECOMMENDATIONS TO IMPROVE ADHERENCE

Abstract

Medication adherence means that patients use their drugs as recommended. There are many factors that affect medication adherence such as age, polypharmacy, patients' concerns about drug adverse effects, beliefs about medication, lack of social support, socioeconomic factors, health system, depression, lack of health literacy, communication with health care providers, and cultural considerations. Inadequate adherence to medication regimens causes worsening of disease, increases morbidity and mortality. On the other hand, nonadherence may lead to misuse of medical resources and cause serious regressions in health indicators particularly in developing countries. All over the world, one of the most substantial difficulties in health care services is ensuring patients to fully adhere to treatments. To improve adherence with treatment, there are various strategies. The evaluation of individual differences of patients is crucial for planning the treatment, hereby this approach could enhance the medication adherence of patients. The aim of this article is to review the factors leading to medication nonadherence and make recommendations to improve adherence in elderly patients.

Key Words: Medication adherence; Education, medication; Aged

DERLEME MAKALE

YAŞLI HASTALARDA İLAÇ UYUMSUZLUĞU VE UYUMU ARTIRMAK İÇİN ÖNERİLER

Öz

Tedavi uyum, hastaların ilaçlarını önerildiği şekli ile kullanmasıdır. Tedaviye uyumu etkileyen faktörler arasında yaş, çoklu ilaç kullanımı, hastaların ilaç yan etkileri hakkındaki düşünceleri, sosyal destek azlığı, sosyoekonomik faktörler, sağlık sistemi, depresyon, sağlık okuryazarlığının olmaması hekimi ile iletişim, kültürel farklılıklar ve yer almaktadır. Tedaviye uyumun yetersiz olması, hastalıkların daha da kötüleşmesine, morbidite ve mortalitenin artmasına yol açar. Ayrıca, tedaviye uyumsuzluk tıbbi kaynakların yanlış kullanımına ve özellikle gelişmekte olan ülkelerde sağlık göstergelerinde ciddi düşüşlere neden olur. Tüm dünyada, sağlık hizmetlerinde en önemli zorluklardan biri, hastaların tedavilere tamamen uymalarını sağlamaktır. Tedaviye uyumu arttırmak için çeşitli stratejiler mevcuttur. Tedavinin planlarken hastaların bireysel farklılıklarının değerlendirilmesi kritik önem taşır, böylelikle hastaların tedavi uyumu artırabilir. Bu makalenin amacı tedaviye uyumsuzluğa neden olan faktörleri gözden geçirmek ve yaşlı hastalarda uyumu artırmak için önerilerde bulunmaktır.

Anahtar Sözcükler: İlaç uyumu; Eğitim; Yaşlı

INTRODUCTION

Definition of the problem

Adherence to treatment means that patients use their medication as recommended. Using the word 'adherence' is better than 'compliance'. Because 'compliance' means that the patient has passively adhered to the orders of the healthcare provider and has not been included in the treatment plan. But these two words are used as if they were synonymous (1). Nonadherence involves not only medications, but also breaking appointments, the failure to follow advised eating behaviors and the other recommended health care applications as well (2).

All over the world, one of the most important challenges in health care services is ensuring patients to fully comply with their treatments. The rate of adherence with treatment for chronic diseases is 50% on average. In the United States, the adherence rate of patients with hypertension is only 51%. In developing countries, compliance rates are even lower, 43% in China, 27% in Gambia (3). Poor adherence to medication causes worsening of the diseases, enhanced morbidity and mortality (4). Furthermore, it may lead to misuse of medical resources and serious declines in health indicators especially in developing countries (3). The aim of this article is to review the factors leading to medication nonadherence and make recommendations to improve adherence in elderly patients.

Factors that affect adherence

1. Age

Comorbidity and polypharmacy are more common in the elderly compared to the youngers. Although full adherence to the recommended treatments is crucial for the treatment of chronic diseases, with increasing numbers of medications, low adherence is a growing concern in elderly.

In geriatric population, there are various medication adherence problems because of the lack of adequate training of the patients (5). Additionally, there are insufficiencies in cognitive health and physical abilities so the risk of nonadherence to medications may be higher at this ages. Another issue is, older patients may deliberately choose not to adhere to medication (called as intentional non-adherence) to avoid adverse effects. The interventions employed to improve adherence must be multifaceted and the patient perspective must also be considered. Practical approaches such as; reducing unnecessary drugs and simplifying dosage regimens are recommended (6).

2. Polypharmacy

It is well known that polypharmacy increases drug related morbidity and mortality and impairs quality of life**.** Furthermore, polypharmacy in the elderly also increases cost, and is a great challenge for healthcare systems. The incidence of drug interactions and adverse effects increases exponentially with the increase in polypharmacy. It has been also shown that polypharmacy correlates with the patients' age, sex, marital status, number of children, status of retirement, and presence of chronic medical conditions (7). Because of the high prevalence of comorbid systemic disorders in the elderly population, many of them are treated with multiple medications. In the last years, the numbers of elderly exposed to polypharmacy (defined as concomitant prescription of ≥ 5 drugs) is rapidly increasing (8). Approximately 20-40% of adults aged ≥ 65 years in developed countries are prescribed ≥ 5 medications (9). The increasing number of drugs prescribed at hospital discharge was found to be correlated with nonadherence. Unfortunately, most of the patients did not understand the purpose of the medications prescribed (10).

Safety of drug use, which is defined by the maximum efficacy, safety of drug and its convenience for the patient and cost-benefit relation, is especially important for elderly. Therefore, the physicians should pay great attention for safe use of drugs in this group. Further studies are warranted to find out the most effective way to reduce polypharmacy,

especially in the frail elderly, and to quantify the real advantages of simplifying their drug regimens in terms of improved quality of life (11).

3.Concerns about drug adverse effects

Nonadherence to medication is mostly in association with patients' apprehensions of medication adverse effects. Nonadherence with drugs due to adverse effects is defined as 'rational nonadherence'. It isn't possible to prevent rational nonadherence by removing the patient's specific adverse effect concerns (12). The patients who have had adverse effects from previous medications are less adhere to treatment. In a study with 1015 patients who received bisphosphonate treatment showed that participants who had experienced symptomatic adverse effects were 6.8 times more likely to be nonadherers than those least symptomatic (13). It is important to evaluate the adverse effect profiles and the health care provider should interview the patient at each visit before and after the first prescription (12).

4. Beliefs about medication and lack of social support

Patients' social group members affect their attitudes and adherence to treatment. If the patients' beliefs are not compatible with the healthcare provider, recommendations may be more difficult to follow (14). Appropriate communication and support of patients' families significantly related to the adherence to treatment and facilitate following the recommendations of physicians. If the patients suffer from chronic disabilities, the understanding and support of the family becomes more important (2). It has been shown that the patient's beliefs and attitudes about the efficacy of treatment, experiences with previous pharmacological treatments, and lack of motivation influence the degree of adherence (15). In addition, patients who have asymptomatic diseases are frequently disposed to not participate their treatment regimen. For all these reasons, communication between doctors and patients is as important as family support.

5. Socioeconomic factors

Among the patients with low socioeconomic status, the barriers to medication adherence has been identified as high medication costs, lack of transportation, and poor understanding of directions (16). Consideration of the economic status of the patient is extremely important. By recognizing the patients' economic limitations, their ability to adhere to their medication may be improved (17).

6. Health system

In an overloaded health system, physicians have limited time to examine the patients due to excess number of patients. In such a system, the time spent by the clinician with the patient may be insufficient to completely evaluate and understand the patients' drug intake behavior. Due to time insufficiency, physicians may not be able to talk with patients about the importance of treatment compliance and strategies for increasing treatment success (17).

7. Depression

One of the strongest reasons for the patient's treatment incompatibility is depression, which is associated with serious limitations in access to health care and daily functioning. The likelihood of depressive patient's nonadherence to medical treatment is three times higher when compared to non-depressive patients (18).

Half of the major depression patients who are prescribed antidepressants do not continue to take their medicines three months after the beginning of the treatment (1). Depressed patients have complaints of pessimism, mental impairment and community support, and these can reduce their willingness and facility to adhere medications. Patients who have psychiatric illness typically have enormous difficulties following a drug regimen, but at the same time they have the greatest potential for benefit from the treatment (19). To recognize the importance of the mental health of the patients can help to reduce the risk of nonadherence of the patients and improve the health indicators (14).

8. Lack of health literacy

The lack of information about the patients' illnesses, lack of participation in the decision-making process and inadequacy of medical literacy, adversely affect patients' adherence to the treatment. Many patients with low basic health literacy may not be able to read a medicine bottle or poison warning. And it is clear that if the patients are not able to read and understand basic written medical instructions, treatment compliance rates are decreasing (20). Patients with inadequate healthcare literacy are more likely to be hospitalized. Approximately 90 million adults, in the United States alone, have insufficient medical literacy which puts them at risk for increased hospitalizations and worse clinical outcomes (21). In a research of over 2500 patients found that approximately one third had insufficient health literacy. Of these, 42% misapprehended directions for taking drugs on an empty stomach, 25% misapprehended the setting the next appointment date, and almost 60% were incapable to read and understand a typical informed consent form (22).

In order to improve medical adherence, instead of standard written instructions, using pictorial and audiovisual educational materials may be more effective on patients.

9. Communication with health care providers

A good patient-physician relationship, based on good communication is important to achieve successful outcomes in treatment. Unfortunately, communication of the physicians with their patients is often insufficient, which reduces the compliance of patients with treatment (23). Zolnierek et al. reported that there is a 19% higher risk of nonadherence among patients whose physician communicates poorly than among patients whose physician communicates well (24).

Effective communication in between the patient and the physician has a positive effect not only on emotional health of the patient but also on resolution of symptoms including pain, functional and physiological status. Patients need to feel that they are active participants in the planning of treatment and this can facilitates adherence to treatment. So they should be encouraged to ask questions as much as possible and given explicit information about their situations. It should also be taken into consideration that, patients frequently misapprehend usual directions. So, it is important for physicians to use simple, daily language and have the patient repeat the directives to confirm proper understanding.

10. Cultural Considerations

In order to provide the best health care, a physician should comprehend the patient's social, cultural and personal history as well. The evaluation of some basic cultural differences between the patient and the clinician is crucial for planning the treatment, hereby this approach could enhance the treatment compliance of patients. Health care providers can built trust with patients and prevent any culture- or belief-related adherence barriers by accepting the existence of cultural beliefs and attitudes (14).

Recommendations to improve adherence

There is no single method to increase treatment compliance for all patients. First step to improve treatment compliance is to correctly assess whether patients adhere to the recommended treatment. Adherence assessments that are simplistic and nonthreatening will also probably yield the most truthful and accurate replies (14).

Most methods used for increasing medical adherence have required combinations of behavioral interventions and reinforcements in addition to increasing the convenience of care, providing educational information about the patient's condition and the treatment, and other forms of supervision or attention.

Educational intervention is an effective way to increase compliance with treatment. The education of the patients with their family members may be

more efficacious. Effective patient education should be multi-factorial and privatized according to the patient's individual differences (4). It is important to use the 'teach-back approach' when talking about patients' illnesses or treatments. By asking questions about the considerable important points, the health care provider can determine whether the patient fully understands the subject (18).

Good communication between the physician and the patient is an effective way for enhancing treatment compliance. It is important for optimal communication between the patients and physician to create an encouraging environment where the patients are praised for achieving their treatment purposes and where permission is given to fairly ask questions about their treatment (18).

Health care providers can provide efficacious patient education by using everyday language, particularly when giving recommendations for treatment (2).

Relationship of trust between doctors and patients may greatly improve the patient's outcome. In primary health care, adherence to recommended treatment regimens was found to be nearly three times higher in patients, due to the fact that doctors fully recognize their patients and the good relationship of trust are valid between patient and physician (25).

Physicians should consider patients' cultural beliefs and attitudes in order to determine the most appropriate treatment options. By accepting the existence of various cultural beliefs and attitudes, physicians can establish reliable relationships with patients and can eliminate any adherence difficulties associated with their beliefs (14).

Regulation and improvement of dosing programs is an important factor in following treatment plans and improving treatment outcomes. Many methods can be used for improving daily drug dosing, such as simplifying the regimen, using pillboxes, and suggesting tips to remind patients to take medication (26). Reducing the dose frequency of drugs can be used to reduce drug abandonment rates. With this strategy, patients' compliance with medical treatment increases and long-term treatment results increase (27). In a study involving approximately 6,000 patients, new lipid-lowering or antihypertensive drugs were added to previous treatments of patients. Treatment compliance rates decreased between 30 and 41 % and, the treatment compliance of patients taking more than 10 medications per day was only 20% (28).

One strategy that may be effective in promoting adherence is reducing the number of pills by using fixed-dose combination therapies. When prescribing medications, choosing long-release formulations or fixed dose combinations is an important strategy in increasing drug adherence. Thus, both the rate of polypharmacy and related complications can be reduced, and also achieved significant cost savings (6). A meta-analysis of an average of 20,000 patients comparing fixed dose and free drug regimens found a 26% reduction in the risk of nonadherence in the group using the fixed dose combination (29). When the frequency of drug doses of patients can not be reduced, drug intake should be matched to their daily living activities. For patients, remembering to take pills is more easier when physician advised before/after a meal or before bedtime (2)

Providing a shame-free environment is necessary for patients with poor health literacy. Because poor health literacy affects health care negatively. Pictorial or audiovisual materials may be a good method while educating the patients with poor health literacy in place of written instructions.

The adverse effects should be considered. Because patients may leave their medications because of their fears about adverse effects. Therefore, the possible adverse effects of the drugs should be discussed clearly in each visit with the

patients. And patients should be removed from their false beliefs about adverse effects (12).

It is crucial for patients to **keep their appointments,** and some behavioral interventions can be used for reminding their appointments. Reminders via telephone, mail, computer or home visits improve patients' compliance with appointments (30).

A good health system is essential to assess the adherence to treatment and to allow adequate time for each patient to receive personalized treatment. Therefore, necessery health system changes should be made to ensure the best health care.

As the former Surgeon General C. Everett Koop reminded us, "Drugs don't work in patients who don't take them" (1).

REFERENCES

1. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med 2005;353(5):487-97. (PMID:16079372).
2. Atreja A, Bellam N, Levy SR. Strategies to enhance patient adherence: making it simple. Med Gen Med 2005;7(1):4. (PMID:16369309).
3. Adherence to long-term therapies: evidence for action. World Health Organization. 2003. [Internet] Available from: http://apps.who.int/iris/bitstream/10665/42682/1/9241545992.pdf. Accessed: 30 May, 2017.
4. Warriner AH, Curtis JR. Adherence to osteoporosis treatments: room for improvement, Curr Opin Rheumatol 2009;21(4):356–62. (PMID:19412103).
5. Yap AF, Thirumoorthy T, Kwan YH. Medication adherence in the elderly. J Clinical Gerontol Geriatr 2016;7:64-7.
6. Toh MR, Teo V, Kwan YH, Raaj S, Tan SY, Tan JZ. Associacion between number of doses per day, number of medications and patient's non-compliance, and frequency of readmissions in multi-ethnic Asian population. Prev Med Rep 2014;1:43-7. (PMID:26844038).
7. Gökçe Kutsal Y, Barak A, Atalay A, et al. Polypharmacy in the elderly: A multicenter study. J Am Med Dir Assoc 2009;10(7):486-90. (PMID:19716065).
8. Urfer M, Elzi L, Dell-Kuster S, Bassetti S. Intervention to improve appropriate prescribing and reduce polypharmacy in elderly patients admitted to an internal medicine unit. PloS One 2016;Nov 30;(11) e0166359.
9. Charlesworth CJ, Smit E, Lee DS, Alramadhan F, Odden MC.Polypharmacy among adults aged 65 years and older in the United States: 1988-2010. J Gerontol A Biol Sci Med Sci 2015;70(8):989-95.
10. Pasina L, Brucato AL, Falcone C, et al. Medication non-adherence among elderly patients newly discharged and receiving polypharmacy. Drugs Aging 2014;31(4):283-9. (PMID:24604085).
11. Gokce Kutsal Y, Aslan D, Basar M. Aging and basic health issues in Turkey. In: Powell JL, Chen S (Eds): Global dynamics of Aging, Nova Science Publishers, New York, 2012,pp:101-20.
12. Garner JB. Problems of nonadherence in cardiology and proposals to improve outcomes. Am J Cardiol 2010;105(10):1495-501. (PMID:20451702).
13. McHorney CA, Schousboe JT, Cline RR, Weiss TW. The impact of osteoporosis medication beliefs and side-effect experiences on non-adherenceto oral bisphosphonates. Curr Med Res Opin 2007;23(12):3137-52. (PMID:17988435).
14. Martin LR, Williams SL, Haskard KB, DiMatteo MR. The challenge of patient adherence. Ther Clin Risk Manag 2005;1(3):189–99. (PMID:18360559).
15. Joyner-Grantham J, Mount DL, McCorkle OD, Simmons DR, Ferrario CM, Cline DM. Self-reported influences of hopelessness, health literacy, life-style action, and patient inertia on blood pressure control in a hypertensive emergency department population. Am J Med Sci 2009;338(5):368-72. (PMID:19838100).
16. Kripalani S, Henderson LE, Jacobson TA, Vaccarino V. Medication use among inner-city patients after hospital discharge: patient-reported barriers and solutions. Mayo Clin Proc 2008;83(5):529-35. (PMID:18452681).
17. Brown MT, Bussell JK. Medication Adherence: WHO Cares? Mayo Clin Proc 2011;86(4):304-14. (PMID:21389250).

18. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000;160(14):2101-7. (PMID:10904452).

19. Nose M, Barbui C, Gray R, Tansella M. Clinical interventions for treatment nonadherence in psychosis: meta-analysis. Br J Psychiatry 2003;183(3):197-206. (PMID:12948991).

20. Haynes RB, McDonald HP, Garg AX. Helping patients follow prescribed treatment: clinical applications. JAMA 2002;288 (22):2880-3. (PMID:12472330).

21. Baker DW, Parker RM, Williams MV, Clark WS. Health literacy and the risk of hospital admission. J Gen Intern Med 1998;13(12):791-8. (PMID:9844076).

22. Williams MV, Parker RM, Baker DW, et al. Inadequate functional health literacy among patients at two public hospitals. JAMA 1995;274(21):1677-82. (PMID:7474271).

23. Kripalani S, LeFevre F, Phillips CO, Williams MV, Basaviah P, Baker DW. Deficits in communication and information transfer between hospital based and primary care physicians: implications for patient safety and continuity of care. JAMA 2007;297(8):831-41. (PMID:17327525).

24. Zolnierek KB, Dimatteo MR. Physician communication and patient adherence to treatment: a meta-analysis. Med Care 2009;47(8):826-34. (PMID:19584762).

25. Safran DG, Taira DA, Rogers WH, Kosinski M, Ware JE, Tarlov AR. Linking primary care performance to outcomes of care. J Fam Pract 1998;47(3):213–20. (PMID:9752374).

26. Haynes RB, McDonald H, Garg AX, Montague P. Interventions for helping patients to follow prescriptions for medications. Cochrane Database Syst Rev 2002;2:CD000011. (PMID:12076376).

27. Garfinkel D, Mangin D. Feasibility study of a systematic approach for discontinuation of multiple medications in older adults: addressing polypharmacy. Arch Intern Med 2010;170(18):1648-54. (PMID:20937924).

28. Benner JS, Chapman RH, Petrilla AA, Tang SS, Rosenberg N, Schwartz JS. Association between prescription burden and medication adherence in patients initiating antihypertensive and lipid-lowering therapy. Am J Health Syst Pharm 2009;66(16):1471-7. (PMID:19667004).

29. Bangalore S, Kamalakkannan G, Parkar S, Messerli FH. Fixed-dose combinations improve medication compliance: a meta-analysis. Am J Med 2007;120(8):713-9. (PMID:17679131).

30. Marcharia WM, Leon G, Rowe BH, Stephenson BJ, Haynes RB. An overview of interventions to improve compliance with appointment keeping for medical services. JAMA 1992;267(13):1813-7. (PMID:1532036).

Turkish Journal of Geriatrics
2017;20 (4):351-354

- Diğdem ÖZER ETİK[1]
- Nuretdin SUNA[1]
- Merih TEPEOĞLU[2]
- Mehmet COŞKUN[3]
- Haldun SELÇUK[1]

CASE REPORT

ACUTE PANCREATITIS CAUSED BY PRIMARY PANCREATIC LYMPHOMA IN A GERIATRIC PATIENT WITH SARCOIDOSIS: REPORT OF A COMPLEX CASE

Abstract

The purpose of reporting this case is to raise the awareness of the rapid worsening clinical presentation of acute pancreatitis in an older patient, unexpected encounter with pancreatic lymphoma, and sarcoidosis–lymphoma syndrome. An 80-year-old woman was diagnosed with sarcoidosis 16 years ago. Following recent hospitalization because of acute pancreatitis, non-obstructive and non-invasive pancreatic mass was found on radiological images. Histopathology confirmed the mass to be diffuse large B-cell lymphoma. We report this case because of its complicated the etiology of acute pancreatitis in an older patient, presentation of pancreatic lymphoma, and immune pathogenesis of sarcoidosis-lymphoma syndrome.

Key Words: Pancreatitis; Lymphoma, Non-Hodgkin; Sarcoidosis

Correspondance

Diğdem ÖZER ETİK
Baskent University, Ankara Hospital
Department of Gastroenterology
ANKARA

Phone: 05332402368
e-mail: digdemozer@hotmail.com

Received: 12/09/2017
Accepted: 18/10/2017

[1] Baskent University, Ankara Hospital
Department of Gastroenterology
ANKARA
[2] Baskent University, Ankara Hospital
Department of Pathology
ANKARA
[3] Baskent University, Ankara Hospital
Department of Radiology
ANKARA

OLGU SUNUMU

SARKOİDOZLU GERİATRİK HASTADA PRİMER PANKREATİK LENFOMANIN SEBEP OLDUĞU AKUT PANKREATİT: KOMPLEKS BİR OLGU SUNUMU

Öz

Bu olgu sunumunun amacı, yaşlı bir hastada hızla kötüleşen akut pankreatit kliniğine, pankreatik lenfoma ile beklenmedik karşılaşmaya, sarkoidoz–lenfoma sendromuna dikkat çekmektir. 16 yıl önce Sarkoidoz tanısı alan 80 yaşındaki kadın hastada, akut pankreatit tanısı ile hastaneye yatışını takiben, radyolojik incelemede tıkayıcı veya invaziv olamayan pankreatik kitle saptandı. Histopatolojik inceleme kitlenin B hücreli lenfoma olduğunu gösterdi. Yaşlı bir hastadaki akut pankreatitin kompleks etiyolojisi, pankreatik lenfomanın ortaya çıkışı ve sarkoidoz-lenfoma sendromunun immün patogenezi sebebiyle bu olguyu sunulmuştur.

Anahtar Sözcükler: Pankreatit; Lenfoma, Non-Hodgkin; Sarkoidoz

INTRODUCTION

The World Health Report has emphasized the acceleration of the aging of the population worldwide, with a marked increase in age related diseases in many countries. Here we report a case of an 80-year-old woman who developed B cell non-Hodgkin lymphoma subsequent to 16 years after the first diagnosis of sarcoidosis. She then presented to the hospital with acute severe pancreatitis. This provides evidence of a a rare and complicated circumstance relating to a complex combination of these clinical entities.

CASE REPORT

An 80-year-old woman was admitted to the emergency department of a hospital with progressively worsening abdominal pain and nausea. Physical examination revealed significant abdominal tenderness and distention on palpation with no rebound. She was diagnosed with sarcoidosis 16 years previously, she had presented with bilateral hilar lymphadenopathy and mediastinal and lung parenchyma symptoms. She was treated with a low dose steroid for an unknown time period. She underwent regular clinical and radiological follow-up examinations that revealed no relapse or progression of the disease. Following hospitalisation, initial laboratory tests showed elevated levels of amylase 386 U/L (normal reference range 20-160U/L), lipase (1424 U/L (8-78U/L) and C-reactive protein (150 mg/dL (0-0.5mg/dL) with normal liver and kidney function test results. The preliminary diagnosis was acute pancreatitis, with low severity scores and good prognosis according to Ranson's criteria, Acute Physiology and Chronic Health Evaluation (Apache) II score and Bedside Index of Severity in Acute Pancreatitis. Subsequently, urgent treatment was provided. Abdominal computed tomography (CT) revealed bulky, homogeneous, diffuse infiltrative mass extending from the pancreatic head and corpus to the gastro-colic ligament, paraaortic and paracaval areas, and left kidney and its vein (Figure 1). The size of the mass was approximately 120x78x96 mm. There was no pancreatico-biliary duct dilatation, although the mass was surrounding the adjacent celiac trunk, splenic artery, hepatic artery and the proximal side of the portal vein without invasion (Figure 2). Furthermore, there was no peripheral lymphadenopathy except for stable paratracheal and subcarinal lymphadenopathies seen on thoracic CT compared with previous scans. There were also high levels of lactate dehydrogenase [LDH, 1674 U/L (125-245U/L)] and beta-2 microglobuline [6.29 mg/L (0.9-2.6 mg/L)] along side a large non-obstructive and non-invasive pancreatic mass. Furthermore, immunglobulin G4 (IgG4) was within normal limits and cancer antigen 19-9 was mildly elevated at 73 IU/mL (0-37 IU/mL). CT-guided tru-cut biopsy of the pancreatic mass was performed to elucidate the underlying cause. Histopathologic analysis revealed a diffuse large B-cell lymphoma and immunohistochemistry of the specimen demonstrated cells positive for CD19 and CD20 but negative for CD3 (Figure 3). Before histopathological diagnosis, steroid therapy was administered based on radiological results that suggested pancreatic lymphoma. However, there was no reduction in the severity of pancreatitis following treatment. Subsequently, the patient died of rapid and irreversible pulmonary and renal system failure 10 days after the diagnosis of pancreatitis.

Ethical approval for this case was received from the local ethics committee of our institute. A written informed consent was obtained form her parents before this report was prepared.

DISCUSSION

This is an interesting case, although it is complicated in many aspects. First, the gallstone is the most common etiology of acute pancreatitis in older patients, whereas, this patient presented with primary pancreatic lymphoma (PPL), an uncommon cause of acute pancreatitis. PPL accounts for only 1% of extranodal lymphomas and 0.5% of all pancreatic masses (1). The rare and often subclinic

characteristics of PPL make it a diagnostic challenge (2). Primary pancreatic lymphoma concurrent with acute pancreatitis, as in the present study patient, is an infrequent presentation. Several factors were more suggestive of PPL rather than pancreatic adenocarcinoma or lipomatous pseudohypertrophy. These included the presence of normal bilirubin and enzymes of cholestasis, along with the absence of pancreatic and biliary duct dilatation despite the large size of mass. Furthermore, there was no heavy fat composition and no invasion or occlusion of the abdominal vascularity (3,4). The absence of pancreatic calcification and necrosis provided additional evidence for the diagnosis of PPL.

Several existing reports suggest that patients with sarcoidosis have a higher risk of developing lymphoma in later life**.** The patient's history of sarcoidosis would, therefore, support diagnosis of pancreatic lymphoma regarding sarcoidosis-lymphoma syndrome (5,6). While it remains controversial, it is noteworthy that there was a long interval between the two diagnoses in our patient, which might provide a possible basis for a proposed immunopathogenic model. Our patient was evaluated both in terms of autoimmune pancreatitis and sarcoidosis with pancreatic involvement. Several analyses showed normal serum IgG4 level, no plasma cell infiltration, and storiform fibrosis or obliterative phlebitis. This alongside no other organ involvement made a diagnosis of IgG4 related pancreatitis unlikely. The incidence of gastrointestinal involvement in sarcoidosis is less than 1.0%, and the patients with pancreatic involvement have also rarely been reported (5). In this patient with pancreatic involvement was excluded because no peripancreatic lymphadenopathy or granulomatous inflammation was observed on histopathological findings.

It is important to evaluate the severity of pancreatitis as early as possible in order to decrease mortality rates. High serum LDH and older age are independent risk factors of severity and poor outcome of acute pancreatitis according to several clinical scoring systems. However, the presence of malignancy with a high cell turnover may be another negative predictive sign for pancreatitis in older patients.

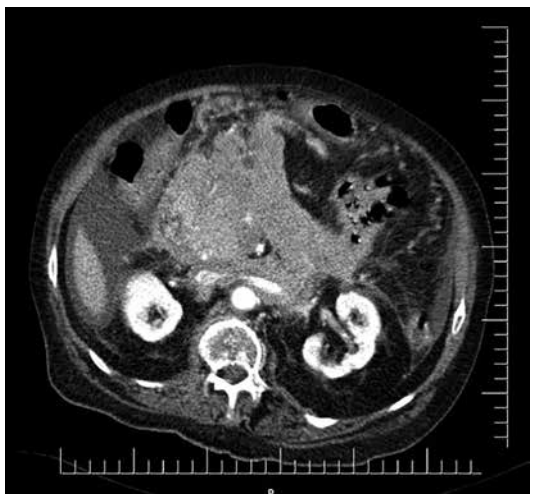


Figure 1. Abdominal computerised tomography imaging revealed a mass extending from the pancreatic head and corpus to the gastro-colic ligament, paraaortic and paracaval areas, and left kidney and its vein.

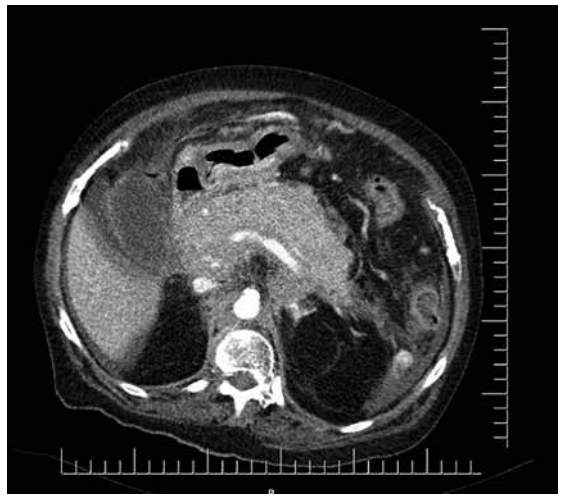


Figure 2. No pancreatic duct dilatation or vessel invasion was observed, despite the presence of a large pancreatic mass seen on abdominal computerised tomography imaging.

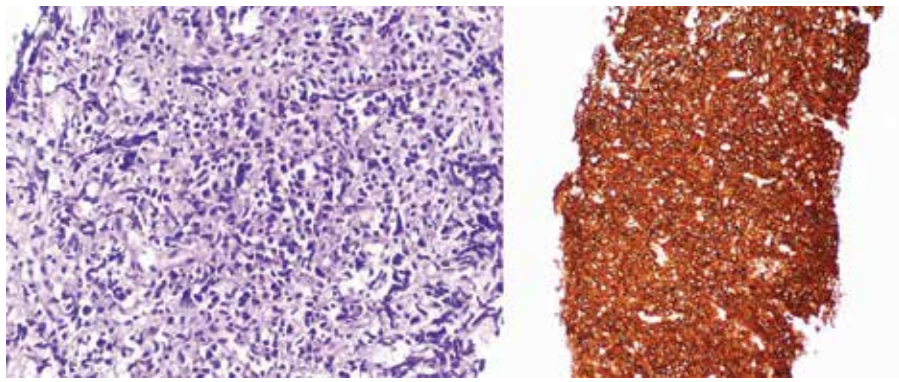


Figure 3. Left: the tumor was composed of large lymphoid cells with hyperchromatic nuclei and membrane-bound nucleoli (hemotoxylin-eosin, x200). **Right:** neoplastic cells showed diffuse membrane staining for the pan B-cell marker,CD 20 (CD 20, x100).

REFERENCES

1. Mishra MV, Keith SW, Shen X, Ad VB, Champ CE, Biswas T. Primary pancreatic lymphoma: a population-based analysis using the SEER program. Am J Clin Oncol 2013;36(1):38-43. (PMID:22134518).
2. Du X, Zhao Y, Zhang T, et al. Primary pancreatic lymphoma: a clinical quandary of diagnosis and treatment. Pancreas. 2011;40(1):30-6. (PMID:20683215).
3. Sadot E, Yahalom J, Do RK, et al. Clinical features and outcome of primary pancreatic lymphoma. Ann Surg Oncol. 2015;22(4):1176-84. (PMID:25341750).
4. Anand D, Lall C, Bhosale P, Ganeshan D, Qayyum A. Current update on primary pancreatic lymphoma. Abdom Radiol (NY). 2016;41(2):347-55. (PMID:26830418).
5. Judson MA. The clinical features of sarcoidosis: A comprehensive review. Clin Rev Allergy Immunol 2015;49(1):63-78. (PMID:25274450).
6. Brincker H. The sarcoidosis-lymphoma syndrome. Br J Cancer 1986;54:467-73. (PMID:3756082).

Turkish Journal of Geriatrics

2017; 20(4)