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EDITORIAL ARTICLE

Dilek ASLAN
Hacettepe University, Faculty of Medicine,
Department of Public Health

BRIEF UPDATES on AGED POPULATION in TURKEY

In this editorial, brief updates were highlighted based on the national statistical data about aged population in our country.

According to the recent Turkish Statistical Institute recording system, percentage of the aged population in Turkey has been 8.2% of the total by December 2015 (1). With this percentage, Turkey is the 66th country among 167 globally. Countries with the highest rates were Monaco (30.4%), Japan (26.6%), and Germany (21.5%) (2).

In Turkey, the median aged increased to 31 in the same year (1). Crude birth rate was declared as 5.2 per 1000 population and almost half of deaths 49.5% were recorded for 75 years of and older people. At this age group, the number of deaths among men were higher as compared to women's deaths in number (3). People died most frequently due to circulatory systems diseases (40.3%), tumors (20%), and respiratory system diseases (11.1%) (4).

Due to the results of the Turkish Population and Housing Survey 2011, aged women who have reported at least one disability were recorded to be higher than men at the same age group. Frequency of 65-69 years of aged women who reported either difficulty or impossibility while conducting a facility was found to be 27.2% whereas the frequency was reported as 18.3% for the same age group among men. The percentage of women who have at least one type of disability was 36.3% in 70-74 age group whereas the percentage was found to be 26.3% in men. The difference was more significant when age increases. Disability frequency among 75 years of age and older men was 40.9% and the number was 50.3% among women (5).

Unequal conditions occur for the aged population in Turkey. The three cities with the highest frequency of aged population was Sinop (18.1%), Kastamonu (16.8%) and Çankırı (15.7%) where the lowest frequency was recorded for Hakkari and Şırnak (3.1%) (2).

Poverty frequency among elderly people has been declared as 18.3%. When compared to previous years, the frequency increased among men and increased among women (2).

Only one out of 10 aged persons (11.5%) participated in the labor market (19.3% for men and 5.4% for women). Elderly people worked in mostly agriculture sector (74.1%) (2).

Such data gives significant clues about the aged population in Turkey. Careful analysis can contribute to produce realistic and sustainable solutions starting from today.

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RESEARCH

EFFECTIVENESS OF SCORING IN OUTCOME PREDICTION OF ELDERLY PATIENTS IN INTENSIVE CARE UNITS

ABSTRACT

Introduction: Scoring systems defining the severity of illnesses also predict the risk of mortality in intensive care units (ICUs). The aim of this study is to detect if APACHE II and SAPS II scores are highly sensitive in the prediction of survival in elderly in the ICU.

Materials and Method: Patients >70 years, admitted to the ICU during 2006–2011 were included. Demographic information, diagnosis at admission, comorbidities, duration of ICU stay, survival/mortality and, APACHE II, SAPS II scores at admission and standardized mortality rate (SMR) were recorded. The specificity and sensitivity predictive values of APACHE II and SAPS II scores were calculated on death or survival.

Results: A total of 176 patients aged 70–94 (mean±sd=79.8±5.3) years stayed in the ICU for 1–67 (mean±SD: 8.4±10.3) days, and the mortality rate (MR) was 36.9%. There was a significant relationship of APACHE II and SAPS II scores with the MR. The significance of area under the curve was greater for the APACHE II score than SAPS II score, and the significance scores increased for patients aged 80–85 and >90 years. The cut-off values were 22.5 and 43.5 for the APACHE II and SAPS II scores. SMRs were 77%, 82% and 80% for APACHE II predicted, APACHE II adjusted and SAPS II predicted MRs.

Conclusion: Success rate similar to that in the general population could be achieved in the ICU with the elderly, and APACHE II and SAPS II scores showed similar accuracy in the prediction of mortality and both were reliable for patients aged >70 years.

Kew Words: Health Status Indicators; Apache; Outcome Assessment (Health Care)/methods

ARAŞTIRMA

YOĞUN BAKIMDA GERİATRİK HASTALARDA SKORLAMA SİSTEMLERİNİN MORTALİTEYİ ÖNGÖRMEDEKİ ETKİNLİĞİ

ÖZ

Giriş: Hastalık şiddetini tanımlayan skorlama sistemleri, yoğun bakım ünitelerindeki (YBÜ) mortalite riskini de öngörmektedir. Bu çalışmanın amacı; YBÜ'de takip edilen yaşlı hastalarda sağkalımın öngörülmesinde APACHE II ve SAPS II skorlarının duyarlı olup olmadığının belirlenmesidir.

Gereç ve Yöntem: Çalışmaya 2006-2011 yılları arasında YBÜ'ne yatırılan 70 yaş üstü hastalar dahil edildi. Demografik veriler, yatış tanısı, ek hastalıklar, YBÜ'de yatış süresi, sağ kalım/mortalite, APACHE II ve SAPS II skorları ile standardize mortalite oranı (SMR) kaydedildi. APACHE II ve SAPS II skorlarının ölüm ve sağkalım için spesifisite, duyarlılık ve tahmin değerleri hesaplandı.

Bulgular: YBÜ'nde ortalama 8.4±10.3 (1-67) gün takip edilen 70-94 (ort±ss=79.8±5.3 yıl) yaş arası 176 hastanın (88 erkek, 88 kadın) mortalite oranı %36.9 idi. APACHE II ve SAPS II skorları ile mortalite oranı arasında anlamlı bir ilişki vardı. APACHE II için eğri altında kalan alanın anlamlılığı SAPS II skorundan daha yüksek idi. 80-85 ile >90 yaş hastalar için skorlar anlamlı olarak artmıştı. APACHE II ve SAPS II skorları için cut-off değerleri sırasıyla 22,5 ve 43,5 idi. APACHE II, APACHE II-adjusted ve SAPS II ile öngörülen mortalite oranları için SMR sırasıyla %77, %82 ve %80 idi.

Sonuç: APACHE II ve SAPS II skorlama sistemleri mortalite ve sağkalımı öngörmede YBU nde takip edilen genel hasta popülasyonuna benzer şekilde 70 yaş üstü hastalarda da başarılı öngörme oranlarına sahiptir.

Anahtar Sözcükler: Sağlık Durumu İndikatörleri; Apache; Öngörülen Mortalite.

Introduction

The proportion of elderly patients has increased rapidly in the last decade, including in a young generation society such as Turkey. The Statistical Yearbook 2010 of Turkey reports that 6.4% of citizens were >65 years (1). In the year 2013, this proportion increased to 7.7%. The increase in the elderly population was three times more than that in the overall population (13.7% vs 36.2%). Moreover, the dependency of elderly patients is increasing, as shown by the observation in 2013 that every 100 working persons need to take care of 11 old patients (2). Nguyen et al reported that the proportion of patients aged >80 years in Eastern European countries was 3.1% in 2010, which is expected to reach 6.5% in 2050 (3). This increase in the elderly population reflects the future population in the intensive care unit (ICU). Such an increase in the elderly population in the ICU has an impact on health care costs. In districts where the ICU beds are inadequate, the occupation of technologically highly equipped beds with elderly patients results in a conflict among physicians when young patients with long life expectancy cannot be admitted to the limited amount of beds. The justice in sharing beds between the young and elderly sometimes depends on the success rate of the ICU or the duration and quality of life expectancy. Old age should not be the only criterion in the decision of neglecting patients' admission to the ICU. Elderly patients have increased the prevalence of comorbidities and disabilities than younger age groups.

In the ICU, there is an increasing demand for reliable outcome predictors, assessment tools and prognostic models such as the Acute Physiology and Chronic Health Evaluation (APACHE), the Simplified Acute Physiology Score (SAPS) and several other scoring systems. These scoring systems were developed to grade the severity of illness by using various mixed characteristics and predict hospital survival for the ICU patients. They were prepared for the evaluation of heterogeneous populations for specific disease conditions and are still open to research for validation (4).

The hypothesis in this study is that old age is not the only criterion in predicting the outcome and comorbidities and disabilities affecting APACHE II and SAPS II scores are highly sensitive in the prediction of patient survival in elderly population in the ICU. This study was performed in a hospital complex that consisted of old-folks house and a multidisciplinary hospital.

Materals and Method

Approval for the study was granted by the Clinical Research Ethics Committee of Istanbul Umraniye Training and Research Hospital (Chairman- Prof. Dr. Sait Naderi, January 2016, 1145). The charts of patients who were admitted to the ICU of Surp Pırgiç Armenian Hospital, Istanbul (a charity hospital), were retrospectively reviewed. A seven-bed general ICU with complete facilities providing intensive nursing care, invasive monitoring and active interventions (inotropic support, mechanical ventilation, haemodialysis, etc) and major formal organ support (e.g. mechanical ventilation and renal dialysis) was established in the hospital in 2006. All the records of patients staying in the ICU for >24 h during 2006–2011 were evaluated retrospectively, and the details of only the patients >70 years are presented in this study. Only the first admission was accepted for cases who were admitted several times. Demographic information, diagnosis at admission, additional diseases, duration of ICU stay, survival/mortality and APACHE II and SAPS II scores at admission were recorded. The observed actual hospital mortality after ICU treatment was compared with the estimated risk of hospital death derived from the APACHE II scores and SAPS II predicted mortality rates, and this ratio was termed the standardised mortality ratio (SMR) (5). SMR was calculated to guide the performance of ICU. An SMR of 1.00 shows that the actual and estimated death rates are equal, which implies that the ICU has an average performance. SMR > 1.00 would predict a lower-than-average performance.

Statistical Analysis

The data are expressed as mean±sd. The cut-off values for APACHE II and SAPS II scores were calculated using the maximum value for Youden's index [Youden's index = sensitivity - (1 - specificity)]. The specificity, sensitivity and positive and negative predictive values of APACHE II and SAPS II scores were calculated on non survivors or survivors, and the receiver operating characteristic (ROC) curves were drawn. Area under the curve (AUC) was used to derive the 'sensitivity' and the '1-specificity' relationship (6). An AUC value of >0.8 is considered good, a variation between 0.60 and 0.80 is considered as moderate and an AUC value <0.60 is regarded as poor (7). Pearson correlation analysis was used for assessing the relationship between the scoring systems, mortality rate with age and duration of ICU stay. The definition proposed by Dancey and Reidy was used for defining the strength of correlation, with r = 0.1–0.3 indicating a weak correlation



Table 1— Demographics of the Patients.

	Survivor	Non-survivor	Total
No of patients	111	65	176
Gender			
Female	59	29	88
Male	52	36	88
Age years (mean± SD)	79.5±5.6	80.5±4.9	79.8±5.3
70-75	25	7	32
76-80	31	20	51
81-85	30	27	57
86-90	22	7	29
More than 90	3	4	7
Length of ICU stay days (mean± SD)	7.1±26.9	10±12.3	8.4±10.3

and r = 0.3–0.6 indicating moderate strength correlation. Data were analysed using SPSS® software version 17 (SPSS Inc., Chicago, IL, USA). A p value of <0.05 was considered as statistically significant.

RESULTS

The charts of 547 patients were reviewed, and 176 patients (88 males, 88 females) fulfilled the criteria. The actual mortality rate was 36.9%, i.e. 65 patients died. The patients' age varied from 70 to 94 years, with a mean age of 79.8 ± 5.3 years. The duration of ICU stay was 1–67 days (8.4 ± 10.3 days). The relationship between the mortality rate and age and duration of ICU stay was not significant (p > 0.05). The patients were categorised as survivors and non-survivors (Table 1). The length of ICU stay was also not related to age, and the length of hospital stay was similar between the survivors and non-survivors (p > 0.05).

There was a significant relationship of the APACHE II and SAPS II scores with the mortality rate. The significance of AUC was greater for the APACHE II score (AUC: 0.74, p = 0.006) than for the SAPS II score (AUC: 0.726, p = 0.053). The AUC for APACHE II adjusted prediction ratios was the lowest and the AUC for SAPS II predictive mortality ratio was the highest. The significance increased for patients aged 80–85 years and >90 years. The APACHE II score had a cut-off value of 22.5, whereas the SAPS II score had a cut-off value of 43.5 (Table 2, Figure 1).

A significant correlation was observed between the APACHE II and SAPS II scores (Pearson correlation, r = 0.65; r^2 = 0.42; 95% confidence interval: 0.5573–0.7292, p = 0.0001).

The stratification of patients according to the primary diagnosis at admission to the ICU resulted in variable mortality rates. Patients with metastasis of carcinoma or acute or chronic renal failure diagnosis had 100% mortality. Patients with multiple trauma, neurological disorders, aggravation of chronic multiple organ problems (n = 42) and sepsis (n = 15) had mortality rates of 66%, 52%, 42% and 40%, respectively.

Table 2—Analysis of APACHE and SAPS II Scores According to Patient Survival by Using ROC Curves

	All Patients Mean±sd (min-max)	Survivors Mean±sd	Non-survivors Mean±sd	Area Under ROC Curve (95% CI)
APACHE II score	23.8±8.3 (8-53)	21.3±7.5	27.9±8.2	0.739(0.663 to 0.817)
APACHE II predicted mortality	47.6±23.8 (8.7-99)	40.5±20.9	60±23	0.731 (0.652 to 0.810)
APACHE II adjusted mortality	44.8±25.1 (3.2-98)	39.4±23.1	53.9±25.9	0.660 (0.575 to 0.746)
SAPS II score	48.5±17.1 (12-99)	43.7±15.4	56.5±16.8	0.726 (0.649 to 0.804)
SAPS II predicted mortality	46.3±26.3 (3.9±97)	37.8±23.9	60.9±22.8	0.756 (0.682 to 0.830)

Area Under ROC curve analysis ****p value is less than 0.0001 for all scoring systems and mortality predictions.

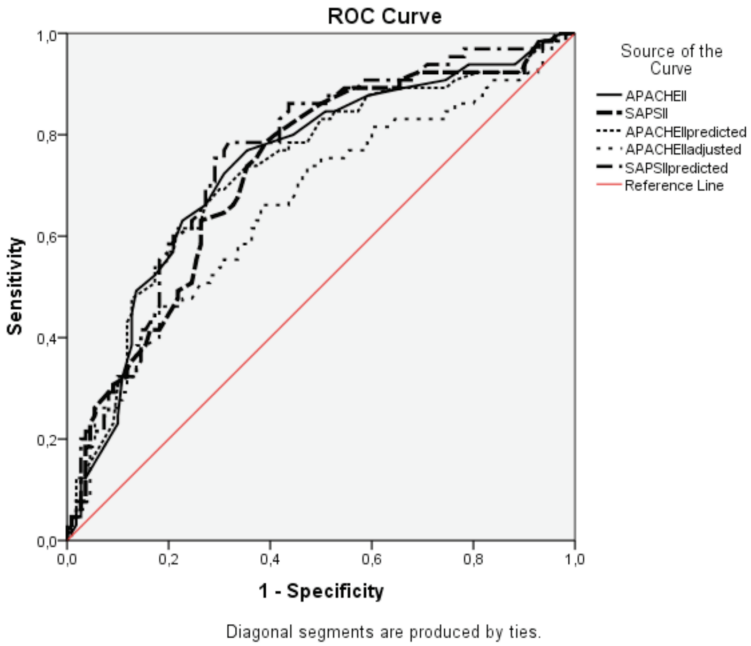


Figure 1— Receiver Operating Characteristic (ROC) Curve.

Table 3— Incidences of Pathologies and Mortality Rates.

Diagnosis	n	Mortality %
Metastatic carcinoma	5	100
Acute or chronic renal failure	4	100
Polytrauma	5	66
Neurological disorders	21	52
Agravation of chronic multi organ problems	42	42
Sepsis	15	40
Isolated respiratory problems	41	29
Cardiac problems	21	23
Post CPR	7	14
Postoperative patients	18	11

The mortality rates in patients with isolated respiratory problems and cardiac problems were 29% and 23%, respectively. One of the three post-CPR patients and two of the 18 (11%) postoperative patients had died (Table 3).

SMR was <1, indicating the success rate of the ICU, and this outcome was observed in all patients treated in the ICU, irrespective of age (SMR = 0.75–0.85, with APACHE II and SAPS II predictions) (Table 4).

Table 4— Standardized Mortality Ratio

Predicted Mortality Scoring System	SMR= Actual Rate/ Predicted Rate
APACHE II predictive rate	0.77
APACHE II adjusted predictive rate	0.82
SAPS II predictive rate	0.80

Discussion

APACHE II consists of 12 different physiological measurements, age and previous health status. The system provides an increasing amount of points for extreme measurements, between 0 and 4 for heart rate, systolic blood pressure, temperature, mechanical ventilation or CPAP (PaO_2, FiO_2) and sodium, potassium, bicarbonate and white blood cell levels. The lowest Glasgow Coma scale has 11 points, and patients aged >75 years received 6 points. The maximum score is 71 points. The impact of the presence of a chronic disease is also included in the evaluation (8).

SAPS II consists of similar variables but has more complicated gradings. Age is defined in more detail. Using the scores evaluated in the first 24 h of admission, the mortality is predicted by using the calculations (8).

The global life expectancy is 69 years and 74.6 years in Turkey (9). In this study, elderly patients were classified as those aged >70 years. In Qiao's study, the elderly group started from the age of 65 years (n = 106). They found similar results to the present study population in terms of APACHE II scores, with an AUC of 0.76 and a cut-off score of 21.5 (10). The AUC for APACHE II adjusted mortality prediction was less accurate than the APACHE II scores. APACHE II scores alone are more highly predictive of mortality. However, SAPS II mortality prediction has a higher predictive power, which is more than that of SAPS II scores.

Because, according to the authors' knowledge, this is the first study evaluating elderly patients in the ICU in Turkey, the outcomes of this study were compared to similar reports from other countries. In a study performed by Ip et al. (11) in Hong Kong on 150 patients aged ≥70 years, the mortality rate was 48% (11). They also observed a good correlation between prognosis (survivors and non-survivors) and APACHE II and SAPS II scores, with correlation coefficients of 0.92 and 0.97, respectively (11). A recent study from Norway including 395 patients aged >80 years (mean age: 83.8 years, 61.0% males) reported overall survival rates of 75.9% (mortality rate of 24.1%) in the ICU and 59.5% in the hospital (12). In this successful ICU performance, mortality was reported to be related to age, SAPS II and multiple trauma with head injury, as well as SOFA and mechanical ventilation. These factors are comparable with the results of the present study. Similarly, Kass et al reported that the severity of acute illness was the most significant predictor of mortality (13). Metastatic carcinoma, acute or chronic renal failure and multiple trauma increased the mortality rate. Exacerbation of chronic illnesses, sepsis and multi-organ involvement were not significantly associated with mortality. Unlike the report by Ip et al, pre-admission cardiopulmonary resuscitation had not resulted in significant mortality in our study group (11).

In contrast to the ICU results in this study, Strand et al reported a relationship between the length of ICU stay and patients >80 years among the non-survivors (14).

Predictions including 'as age increases, mortality increases' are not true in today's settings (15). A success rate similar to that in the general population could be achieved in the ICU with the elderly population, and APACHE II and SAPS II scores demonstrated similar accuracy in the prediction of mortality and both were reliable for patients aged >70 years. A large sample size and long-term studies are required for better evaluation of the ICU status in Turkey.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

PSB participated in study designing, sequence alignment, data collection and analyses and drafting of the manuscript. PC participated in the data collection and analyses and sequence alignment and drafting of the manuscript data. GK participated in the data collection and analyses and sequence alignment and drafting of the manuscript data. AF participated in the data collection and analyses and sequence alignment and drafting of the manuscript data. AD participated in the statistical analyses. BG participated in the data collection and analyses. BB participated in the data collection and analyses. All authors have read and approved the manuscript.

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RESEARCH

EVALUATION OF ELDERLY PATIENTS HOSPITALIZED FOR HYPONATREMIA: IS HYPONATREMIA A REAL INDEPENDENT RISK FACTOR AFFECTING MORTALITY IN THESE PATIENTS?

ABSTRACT

Introduction: Hyponatremia is a significant and common electrolyte disorder in elderly patients that affects in-hospital mortality. We herein aimed to assess the effect of hyponatremia on mortality of elderly patients hospitalized with the diagnosis of hyponatremia from the emergency department.

Materials and Method: Medical records of 7659 patients aged 65 and over hospitalized in Antalya Education and Research Hospital Internal Medicine Clinics between 1 January 2010 and 31 June 2015 were retrospectively screened. Laboratory values, age, sex, comorbidities, medications, complaints at admission, duration of hospital stay and outcomes of 856 patients diagnosed with hyponatremia according to International Classification of Diseases (ICD) system were evaluated. Total 138 pure hyponatremia patients without major diagnosis other than hyponatremia were analyzed.

Results: Among a total of 7659 geriatric patients hospitalized during the study period, all-cause and pure hyponatremia prevalences were 11.1% (856/7659) and 1.8% (138/7659), respectively. The 3 most common causes of hyponatremia were diuretic use (47/138, 34%), syndrome of inappropriate antidiuretic hormone secretion (27/138, 19.5%), and reduced oral intake (18/138, 13%). The average duration of hospital stay was 5 days and in-hospital mortality was 5.8% (8/138).

Conclusion: The most common causes of hyponatremia in elderly patients requiring hospitalization were diuretic use, syndrome of inappropriate antidiuretic hormone secretion and reduced oral intake. The mortality of patients hospitalized with purely hyponatremia is not different from the normal population.

Kew Words: Hyponatremia; Geriatric Assessment; Mortality.

ARAŞTIRMA

HİPONATREMİ NEDENİYLE YATIRILAN YAŞLI HASTALARIN DEĞERLENDİRİLMESİ: HİPONATREMİ MORTALİTEYİ ETKİLEYEN GERÇEK BİR RİSK FAKTÖRÜ MÜ?

ÖZ

Giriş: Hiponatremi yaşlılarda sık görülen ve hastane içi mortaliteyi etkileyen önemli bir elektrolit bozukluğudur. Çalışmamızda acil servisten hiponatremi nedeniyle hastaneye yatırılan yaşlı hastalarda hiponatreminin mortalite üzerine etkisini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Antalya Eğitim ve Araştırma Hastanesi İç Hastalıkları Kliniklerine 1 ocak 2010 ve 31 haziran 2015 tarihleri arasında yatan 65 yaş ve üstü 7659 hastalanın kayıtları retrospektif olarak tarandı. Uluslararası hastalık sınıflaması (International Classification of Diseases-ICD) tanısı hiponatremi olan 856 hastanın laboratuvar değerleri, yaş, cinsiyet, ek hastalıkları, kullandığı ilaçları, başvuru şikayetleri, hastanede kalış süreleri ve taburculuk şekilleri incelendi. Esas yatış tanısı hiponatremi olan ve hiponatremi dışında majör yatış tanısı olmayan 138 hastanın verileri analiz edildi.

Bulgular: Toplam 7659 geriatrik hastanın %11.1'inde (856/7659) hiponatremi tespit edildi. Hastaların %1.8'nin (138/7659) esas yatış tanısı hiponatremiydi. Bu hastalarda hiponatreminin en önemli 3 nedeni diüretik kullanımı (47/138, %34), uygunsuz antidiüretik hormon sekresyonu sendromu (27/138, %19.5) ve azalmış oral alım olarak bulundu (18/138, %13). Hastaların ortalama hastanede kalış süresi 5 gün ve hastane içi mortalite oranı %5.8 (8/138) olarak saptandı.

Sonuç: Hastaneye yatmayı gerektirecek hiponatremisi olan yaşlı hastalarda en sık hiponatremi nedenleri diüretik kullanımı, uygunsuz antidiüretik hormon sekresyonu sendromu ve azalmış oral alım olarak bulunmuştur. Sadece hiponatremi tanısı ile yatırılan hastalarda mortalite normal popülasyondan farklı değildir.

Anahtar Sözcükler: Hiponatremi; Geriatrik Değerlendirme; Mortalite.

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INTRODUCTION

Hyponatremia is defined as a decrease in serum sodium to levels below 135 mEq/L. It has critical implications as the most commonly observed electrolyte abnormality in hospitalized patients. In geriatric patients, defined as those aged ≥65 years, hyponatremia may result from increased exposure to drugs, diseases associated with hyponatremia, and aging-related impairment in water excretion capacity (1). The majority of these patients has mild hyponatremia and is clinically asymptomatic. Therefore, they are usually not hospitalized. However, even mild hyponatremia can cause falls, unsteadiness, bone demineralization, fractures, and cognitive problems in the geriatric patients, leading to serious consequences in the long term (2). The major clinical presentation of acute hyponatremia is neurologic dysfunction induced by cerebral edema that is proportional to the degree of hyponatremia (3). Nausea and malaise are the earliest symptoms and may be observed at serum sodium concentrations below 125–130 meq/L. Headache, lethargy, obtundation, and eventually seizures, coma, and respiratory arrest can occur if serum sodium concentration falls below 115–120 meq/L (4, 5). As hyponatremia was shown to be an independent risk factor, increasing hospital mortality by 40%, its early recognition is critical (6). The reported prevalence of hyponatremia varies between studies and is estimated to increase up to 20% in hospitalized patients (7); however, it is observed substantially more frequently in geriatric patients, and can directly affect mortality (8). However, the relationship between hyponatremia with hospital morbidity and mortality remains controversial, mainly because of the methodology and design of studies (9). Specifically, differences in serum sodium cut-off values, small number of patients, and absence of control groups contribute to the conflicting results (10). It is also unclear whether the relationship between hyponatremia and adverse outcomes is associative or causative. Age, comorbidities, severity and etiology of hyponatremia, treatment failure, and rate of onset were determinants of clinical outcomes in hospitalized hyponatremic geriatric patients (9, 11). In this study, we investigated whether these factors were associated with outcomes in geriatric patients who were hospitalized with the major diagnosis of hyponatremia.

MATERIALS AND METHOD

Study Population

Medical records of geriatric patients (age, ≥65 years) who were hospitalized at Internal Medicine Clinics of Antalya Training and Research Hospital between January 1, 2010 and June 31, 2015 were retrospectively screened. Among a total of 7659 geriatric patient admissions, 856 patients diagnosed with hyponatremia (serum sodium ≤ 135 meq/L) according to ICD (International Classification of Diseases) system were evaluated. Patients diagnosed with decompensated heart failure (HF), decompensated cirrhosis, treatment resistant and/or end stage malignancy, severe diarrhea, acute cerebrovascular disease (CVD), and myxedema were excluded. The records of remaining 168 geriatric patients in whom major hospitalization diagnosis was hyponatremia were further evaluated in detail, and those who developed hyponatremia during hospitalization, those with incomplete clinical and laboratory data in medical records, and those with repeated admissions were also excluded. Finally, 138 (41 males, 97 females) pure hyponatremia patients without major diagnosis other than hyponatremia were included in the study.

Study Parameters

All records of hyponatremic patients were reviewed for the following parameters: laboratory values, age, gender, comorbidities, medications, complaints at admission, duration of hospital stay and patient outcomes. The cause of hyponatremia was categorized into the following 3 groups based on the volume status of patients at admission: hypovolemic, normovolemic, and hypervolemic. In cases where this categorization was not defined in the medical records, clinical symptoms and findings of the physical examination, including symptoms related to hydration status, skin turgor, presence of edema, and blood pressure were used to categorize the volume status. Laboratory parameters at admission, which included serum sodium, serum potassium, urine sodium, blood urea nitrogen (BUN), serum osmolarity, urine osmolarity, and whole blood count, were also noted. Syndrome of inappropriate antidiuretic hormone secretion (SIADH) was diagnosed based on the guidelines (12).

Statistical Analysis

Student's *t* test or Mann–Whitney *U* test were used to compare quantitative data from 2 independent groups. The relevance of normal distribution of continuous variables was investigated with the one sample Kolmogorov–Smirnov test. Chi-square test or Fisher's exact probability test was performed to test correlations between groups of qualitative data. In correlation analysis for variables with normal distribution, Pearson correlation analysis was used, whereas Spearman corre-



lation analysis was used for abnormally distributed variables. Results were expressed with a 95% confidence interval (CI) and were considered statistically significant if *P* values were <0.05. All statistical analysis were performed using the Statistical Package for Social Sciences (SPSS; Chicago, IL, USA) software, version 16.0. The study protocol was conducted in accordance with the ethical principals stated in the Declaration of Helsinki and was approved by the local Research Institutional Ethics Committee (reference, 62/10).

RESULTS

Patient characteristics are shown in Table 1. The prevalences of all-cause hyponatremia and pure hyponatremia cases without major diagnosis other than hyponatremia were 11.1% (856/7659) and 1.8% (138/7659), respectively. The mean age of geriatric patients hospitalized with the pure diagnosis of hyponatremia (n = 138) was 75.28. Of these, 97 (70.3%) were female and 41(29.7%) were male. The average duration of hospital stay was 5 days. The mean serum sodium level was 118 meq/L (range, 103–132 meq/L) and serum osmolarity was 253.72 ± 20.26 mOsm/L, which was compatible with the sodium level. Hypertension (66.7%) was the leading concomitant systemic disease and was followed by neurological diseases (35.5%), diabetes mellitus (DM) (28.3%), HF (17.4%), and chronic kidney disease (CKD) (10.1%) (Table 1).

Table 1— Baseline Characteristics of the Study Population.

Characteristics	Mean ±sd, Median (range) or % (n)
Age (years)	75.28±7.66
Female % (n)	70.3 (97)
Serum sodium (mEq/L)	118.0 (33)
Urine sodium (mEq/L)	67.98±53.53
Serum osmolarity (mOsm/L)	253.72±20,26
Urine osmolarity (mOsm/L)	244,81±189,80
BUN (mg/dL)	21.00 (121)
Serum potassium (mEq /dL)	4.41±0.93
Hb (gr/dL)	10.97±1.69
Duration of hospital stay (day)	5 (36)
Hypertension % (n)	66.7 (92)
Diabetes Mellitus % (n)	28.3 (39)
Heart failure % (n)	17.4 (24)
Chronic kidney damage % (n)	10.1 (14)
Neurological disorder % (n)	35.5 (49)
Diuretic use	50.7 (70)

The values of serum sodium, blood urea nitrogen (BUN), duration of hospital stay are shown as median (range), age, serum sodium, urine sodium, serum osmolarity, urine osmolarity, serum potassium, hemoglobin (Hb) values are expressed as mean (±standart deviation); other values are expressed as % (n).

Table 2— Distribution of the Type of Neurological Disorders

Type of Neurological Disorder	Number	Percent (%)
Cerebrovascular disease	15	30.61
Dementia	12	24.49
Depression	8	16.33
Parkinson's disease	5	10.2
Epilepsy	3	6.12
Schizophrenia	3	6.12
Malignancy	2	4.08
Bipolar Disorder	1	2.04
Total	49	100.0

The distribution of neurological/psychiatric disorders in 49 patients were as follows: 15 patients (30.61%) had CVD, 12 patients (24.49%) had dementia, 8 patients (16.33%) had depression, 5 patients (10.2%) had Parkinson's disease, 1 patient (2.04%) had bipolar disorder, 3 patients (6.12%) had epilepsy, 3 patients (6.12%) had schizophrenia, and 2 patients (4.08%) had malignancy (Table 2).

According to the volume status, hypovolemia, hypervolemia, and normovolemia were observed in 68 (49.3%), 26 (18.8%), and 44 (31.9%) patients, respectively (Table 3). The cause of hypovolemia was diuretic use in 47 patients (69.1%), lack of oral intake in 18 patients (26.5%), and vomiting rela-

Table 2— Etiological Distribution According to Volume Status

Volume Status % (n)	Etiology % (n)
Hypovolemic 49.3 (68)	Diuretic usage 69.1 (47)
	Decreased oral intake 26.5 (18)
	Vomiting 4.4 (3)
Normovolemic 31.9 (44)	SIADH 61.4 (27)
	Hypothyroidism 22.7 (10)
	Hypopituitarism 13.6 (6)
	Polydipsia 2.3 (1)
Hypervolemic 18.8 (26)	Congestive heart failure 42.3 (11)
	Chronic kidney disease 26.9 (7)
	Cirrhosis 11.5 (3)
	Hypoalbuminemia 3.8 (1)
	Idiopathic 15.4 (4)

Table 4— Admission Complaint Distribution of the Patients

Admission complaint	Number	Percent (%)
Nausea and vomiting	36	26.08
Altered mental status	32	23.2
Fatigue	23	16.6
Impaired general condition	11	8
Shortness of breath	11	8
Edema	9	6.5
Poor intake orally	6	4.3
Headache	6	4.3
Seizures	2	1.4
Loss of appetite	1	0.7
Inability to talk and walk	1	0.7
Total	138	100.0

ted in 3 patients (4.4%). The cause of hypervolemia was HF in 11 patients (42.3%), CKD in 7 patients (26.9%), cirrhosis in 3 patients (11.5%), hypoalbuminemia in 1 patient (3.8%), and idiopathic etiology in 4 patients (15.4%). In the normovolemic group, 27 patients (61.4%) had SIADH, 10 patients (22.7%) had hypothyroidism, 6 patients (13.6%) had hypopituitarism, and 1 patient (2.3%) had polydipsia. Of the 138 patients included in the final analysis, 27 patients (19.6%) had a diagnosis of SIADH. The specific etiologies of SIADH were medications (63%), central nervous system (CNS) pathology (14.8%), pulmonary system pathology (14.8%), and idiopathic (7.4%).

Complaints of patients at first admission were as follows: nausea and vomiting in 36 patients (26.1%), altered mental status in 32 patients (23.2%), fatigue in 23 patients (16.7%), general poor condition in 11 patients (8%), dyspnea in 11 patients (8%), edema in 9 patients (6.5%), reduced oral intake in 6 patients (4.3%), headache in 6 patients (4.3%), seizures in 2 patients (1.4%), anorexia in 1 patient (0.7%), and inability to walk and talk in 1 patient (% 0.7) (Table 4).

Clinical and laboratory data of 27 patients with SIADH were compared with those of non-SIADH patients. Age, frequency of hypertension, and diuretic use were significantly lower (*P* values; 0.006, 0.006, and 0.001, respectively) and neurological disease rate was significantly higher ($P < 0.001$) in the SIADH group. There were no statistically significant differences in sex distribution, BUN, serum potassium and sodium levels, urine sodium level, serum and urine osmolality, hemoglobin level, length of hospital stay, and diabetes, HF, and CKD prevalence between the two groups (Table 5).

Table 5— Comparison of the Patients with SIADH to Those Without SIADH

	SIADH (+) n:27	SIADH (-) n:111	p
Age (years)	71.70±6.40	76.15±7.72	**0.006***
Female % (n)	55.56 (15)	73.87 (82)	0.062**
Serum sodium (mEq/L)	118.0 (20)	118.0 (33)	0.207***
Urine sodium (mEq/L)	86.93±65.71	62.66±48.95	0.110*
Serum osmolarity (mOsm/L)	247.44±17.02	255.81±21.10	0.290*
Urine osmolarity (mOsm/L)	370.7±269.28	187.59±105.48	0.064*
BUN (mg/dL)	18.0 (111.0)	22.0 (121.0)	0.055***
Serum potassium (mEq /dL)	4.21±0.49	4.47±1.01	0.062*
Hemoglobin (gr/dL)	11.43±1.71	10.85±1.67	0.113*
Duration of hospital stay (day)	5.0 (17.0)	5.0 (36.0)	0.362***
Hypertension % (n)	44.44 (12)	72.07 (80)	**0.006****
Diabetes Mellitus % (n)	25.92 (7)	28.83 (32)	0.764**
Heart failure % (n)	7.41 (2)	19.82 (22)	0.102**
Chronic kidney damage % (n)	11.11 (3)	9.91 (11)	0.543**
Neurological disorder % (n)	70.37 (19)	27.03 (30)	**<0.001****
Diuretic use % (n)	22.22 (6)	57.66 (64)	**0.001****

Mean ±SD, median (range) or % (n) are reported for continuous and categorical variables regarding their distribution status.
* Student's t-test was used.
** Chi-Square test was used.
*** Mann whitney U test was used.



Hospital mortality rate of the patient cohort included in final analysis was 5.8% (8/138). There were no significant differences in any of the clinical and laboratory values between these 8 patients and others.

When we examined associations between serum sodium level and other variables, we observed a positive correlation of serum sodium level with serum osmolality (r=0.742, p<0.001), serum potassium (r=0.178, p=0.041), and serum BUN (r=0.218, p=0.013). There were no correlations between serum sodium level and other variables.

Discussion

As in many developing countries, the average life expectancy in Turkey has been increasing in the last decades. According to data from the Turkish Statistical Institute (www.tuik.gov.tr), the highest death rates were observed in the population who were >75 years of age, and the mortality rates among those ≥75 years were 48.6% and 47.1% in 2014 and 2013, respectively. Numerous etiologies, such as comorbid medical conditions, polypharmacy, and altered oral intake, may affect fluid and electrolyte imbalance in geriatric patients; thus, they are more likely to encounter associated morbid and potentially life- threatening conditions (13). Physiologic changes in regulation of water excretion that occur as part of normal aging also render geriatric patients more susceptible to the development of hyponatremia (14).

The results based on our hospital records revealed that the prevalences of all-cause hyponatremia and pure hyponatremia were 11.1% and 1.8%, respectively. These rates were lower than those reported by Sturdik *et al*. and Correia *et al*. (9, 15), which may be because of the early diagnosis and treatment of hyponatremic geriatric patients in whom serum sodium levels may not have yet required hospitalization depending on the clinical condition and evaluation in emergency department.

Nausea, headache, lethargy, confusion, muscle cramps, irritability, and seizures are general complaints related to hyponatremia. Depending on the magnitude and rate of decline of serum sodium levels, the severity of symptoms may be augmented. Coma, permanent brain damage, respiratory arrest, brain stem herniation, and death are symptoms of severe and rapidly developing hyponatremia (13). In our study, none of the patients exhibited these life threatening symptoms.

Hyponatremia can be classified based on the volume status (16). Hypovolemic hyponatremia was the most common type in our study (47/138, 49.3%), which was reported by other studies as well (13,15). The vast majority of hypovolemic hyponatremia cases was the result of a side effect caused by diuretic usage. This finding was expected as diuretics were previously shown as one of the most common causes of severe hyponatremia (17). Both loop and thiazide diuretics can precipitate hyponatremia. In our study, of the 70 patients (50.7%) who used diuretics, 47 had hypovolemic hyponatremia. In contrast, SIADH and hypervolemic hyponatremia were observed in 6 and 17 patients, respectively.

There is also an association between hyponatremia and malnutrition (18). The geriatric patients, particularly those with neurological diseases, are at an increased risk of malnutrition. Reduced oral intake was the second most common cause of hypovolemic hyponatremia in our cohort, affecting 18 patients. Therefore, clinicians should be specifically careful when prescribing diuretics to geriatric patients with reduced oral intake.

Loss of water and sodium through vomiting is also a risk factor for hyponatremia. Unfortunately, it was very difficult to determine whether vomiting was the cause or the consequence. Although the complaint at admission was nausea and vomiting in 36 patients, only 3 patients had vomiting as the etiology of hypovolemia in this study.

We found that normovolemic hyponatremia (31.9%) was the second most common condition when patients were stratified according to their volume status. SIADH, a subtype of normovolemic hyponatremia, is the most common cause of hyponatremia in geriatric patients (19). In this study, 27 patients (19.6%) had SIADH, which was the most common pathological condition leading to hyponatremia. SIADH is a diagnosis of exclusion and is characterized by continued release of ADH (12). It should be suspected when hyponatremia is accompanied by hyperosmolar urine when compared with plasma. Many diseases of the geriatric population can cause SIADH (19). Almost all CNS disorders can lead to dysfunction of the hypothalamic system and induce ADH release. Risk for water retention and consequent hyponatremia may be apparent by this way (20). In our study, 4 patients in the SIADH group had CNS pathology. In addition, certain drugs can cause hyponatremia as a side-effect by precipitating SIADH. Antipsychotic and antidepressant drugs, opiates, nonsteroidal anti- inflammatory agents, sodium valproate, and amiodarone are drugs that may cause SIADH (19). Seventeen patients with SIADH were associated with use of these drugs in our study. Malignancies and pulmonary pathologies can also cause SIADH by different mechanisms. In our study, 4 patients had lung malignancies. Drug-induced SIADH was the most common condition in this study, as only geriatric pati-

ents with the major diagnosis of hyponatremia were included. CNS pathologies, malignancies, and pulmonary diseases may demonstrate organ-specific symptoms and not hyponatremia. Of note, 2 patients had no apparent etiology related to comorbidities and drugs to explain SIADH.

When we compared the clinical and laboratory findings of SIADH patients with those of the non-SIADH patients, we found that the mean age of SIADH group (71.7 years) was significantly lower than that of the non-SIADH group (76.15 years; $P = 0.006$), which was in contrast to that reported by Sweed (18). Advanced age itself may be a risk factor for hyponatremia, and SIADH was described in geriatric patients with idiopathic hyponatremia. Two patients with idiopathic SIADH in this study were 69 and 73 years old, whereas Miller *et al*. reported that the idiopathic form of SIAHD could be observed in geriatric individuals who were generally older than 80 years of age (21).

The frequency of hypertension and diuretic use were significantly lower in the SIADH group than in the non-SIADH group in our study. Furthermore, concomitant neurological diseases in the SIADH group was significantly higher ($P < 0.001$), in agreement with the literature. In contrast, gender, BUN, serum potassium and sodium levels, urine sodium level, serum and urine osmolality, hemoglobin level, length of hospital stay, diabetes, HF, and CKD prevalence were not significantly different between these 2 groups. The mean duration of hospitalization was 5 days for both SIADH and non-SIADH patients.

Hypothyroidism is a rare cause of normovolemic hyponatremia and can induce it via undefined mechanism. Reduced cardiac output and glomerular filtration are the default mechanisms that could lead to water uptake, subsequently reducing plasma sodium concentration by dilution (18). In our study, 10 patients (7.2%) in the normovolemic group had hypothyroidism. Although the literature regarding this subject was insufficient, it can be assumed higher.

Impaired pituitary–adrenal axis is linked to hyponatremia; glucocorticoid deficiency impairs water excretion in patients with hypopituitarism (22) because of altered ADH inhibitory and decreased mineralocorticoid activities of cortisol (23). In this study, 6 patients in the normovolemic group had hypopituitarism.

Compulsive water drinking or psychogenic polydipsia causes hyponatremia in individuals with chronic mental illness. These patients suffer from polydipsia and polyuria in the absence of identifiable underlying medical causes. Although the underlying pathophysiology of this syndrome is unclear, several factors have been implicated to induce polydipsia and symptomatic hyponatremia. These include a possible hypothalamic defect, SIADH, and neuroleptic medication (24). In this study, 1 patient with hyponatremia was diagnosed with polydipsia; she was 68 years old without any obvious etiology for hyponatremia and her condition improved following fluid restriction.

Several mechanisms mediate volume overload and hyponatremia in hypervolemic conditions. Both hyponatremia and fluid congestion share many common pathophysiological pathways, including activation of the sympathetic nervous system, the renin–angiotensin– aldosterone system, and arginine vasopressin (25). Hypervolemic conditions were the least common causes of hyponatremia in our study. In this group, 11 patients had HF, 7 patients had CKD, 3 patients had cirrhosis, 1 patient had hypoalbuminemia, and 4 patients were considered as idiopathic hyponatremia.

There was a significant correlation between serum sodium levels and serum osmolality in this study, as expected. However, the correlation of serum sodium with serum potassium and BUN was weak. There were no correlations between serum sodium levels and other variables in our study.

Our study is the first study in which the major diagnosis of hyponatremia at admission was investigated in elderly patients. The hospital mortality rate of hyponatremic geriatric patients in this study was found 5.8% (8/138) in this study. None of these patients had SIADH; 4 patients were hypervolemic and 4 were hypovolemic. Sturdik *et al*. showed that mortality rate of hyponatremic patients was significally higher than that of non-hyponatremic patients (22% and 7%, respectively; $P < 0.0001$) (9). Age, failure to correct hyponatremia, dilution, and reduced oral intake were predictors of increased hyponatremia-associated mortality in that study, and the severity of hyponatremia was not found to be a contributor to mortality (9). Because of the small number of mortalities in our study, there were no significant differences in the clinical and laboratory parameters between the deceased patients and survivors; however, we propose that the main factor affecting hyponatremia-related mortality in geriatric patients was underlying comorbidities.

In conclusion of this retrospective study, the prevalence rates of all-cause and pure hyponatremia at admission were 11.1% and 1.8%, respectively. The most relevant risk factor for hyponatremia was medications, through related side effects or via SIADH. Thus, clinicians must be particularly careful when prescribing diuretics and neurological drugs to geriatric patients. Studies investigating hyponatremia-related



mortality report conflicting results for numerous reasons. In this study, hyponatremia-related mortality was very low, raising the possibility that hyponatremia may not be a significant independent risk factor for mortality in geriatric patients, contrary to previous studies. Besides many conditions leading or facilitating hyponatremia in geriatrics, disturbed water regulatory mechanisms as a result of aging may be a benign predisposing factor of hyponatremia. In the light of abovementioned findings and all other studies, perhaps hyponatremia can be a natural concominant of aging in the near future. Thus, well organized, exhaustive, case-controlled trials with large number of patients are needed to address this issue.

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RESEARCH

AN INTERDISCIPLINARY OVERVIEW OF START/STOPP CRITERIA IN ELDERLY PATIENTS' DRUG USAGE: A SPECIALIST'S PERSPECTIVE

ABSTRACT

Introduction: Elderly people have a high prevalence of chronic illness and multiple prescriptions. This study aimed to screen the inappropriate prescribing according to START/STOPP criteria, evaluate the related specialist's opinion, and discuss the difference between the screening tool and expert opinions in the elderly population.

Materials and Method: Data were collected via personal interview with the patient by a physiatrist. Screening tool START/STOPP criteria were used to identify inappropriate prescriptions at Physical Medicine and Rehabilitation outpatient clinic. The specialists examined the referred patients in their areas of expertise.

Results: We enrolled 374 patients aged over 65. According to STOPP criteria, 96 (25.6%) patients were accepted as potentially inappropriate medication recipients. Among those, 54 (4.2%) were found to be inappropriate according to both STOPP criteria and expert opinion. The most frequently observed inappropriate medications in the screening tool were 30 proton pump inhibitors and 14 sulfonylurea medications; however, only 4 proton pump inhibitors and 4 sulphonylurea usage were considered inappropriate after specialist consultation.

Conclusion: All specialists who treat the geriatric population should be aware of inappropriate drugs and refer the patients to the relevant departments. The alerts of STOPP/START criteria may help in finding individualized solutions for each patient.

Kew Words: Aged; Disease; Potentially Inappropriate Medication List.

ARAŞTIRMA

YAŞLI HASTALARIN İLAÇ KULLANIMINDA START/STOPP KRİTERLERİNİN İNTERDİSİPLİNER DEĞERLENDİRİLMESİ: UZMAN HEKİM PERSPEKTİFİ

ÖZ

Giriş: Yaşlılar yüksek kronik hastalık ve çoklu ilaç kullanım oranına sahiptirler. Bu çalışmanın amacı yaşlı populasyonda START/STOPP kriterlerine göre uygunsuz ilaçları taramak, ilgili uzman görüşü ile değerlendirmek ve uzman görüşü ile tarama aracı arasındaki farkları tartışmaktır.

Gereç ve Yöntem: Veriler bir fiziyatrist tarafından gerçekleştirilen yüz yüze görüşme ile toplandı. Fiziksel Tıp ve Rehabilitasyon polikliniğindeki uygunsuz reçetelemeleri belirlemek için START/STOPP kriterleri kullanıldı. Her hasta kendi alanında değerlendirilmek üzere uzman hekimlere danışıldı.

Bulgular: Çalışmaya 65 yaş üzerinde 374 hasta alındı. STOPP kriterlerine göre, 96 (25.6%) hasta uygunsuz ilaç kullanıcısı olarak değerlendirildi. Bu uygunsuz ilaç kullanıcıları arasında, 54 (%4.2)'ünde Hem STOPP kriterlerine göre hem de uzman görüşüne göre uygunsuzluk tespit edildi. Tarama aracına göre en çok uygunsuz kullanılan ilaçlar, 30 adet ile proton pompa inhibitörü (PPI) ve 14 adet ile sulfonilure olarak gözlemlendi. Ancak, sadece 4 proton pompa inhibitörü ve 4 sulfonüre kullanımı uzman görüşü sonrasında uygunsuz ilaç olarak değerlendirildi.

Sonuç: Geriatrik populasyonu tedavi eden tüm uzmanlar uygunsuz ilaç kullanımının farkında olmalı ve ilgili bölümlere hastaları danışmalıdır. STOPP/START kriterlerinin uyarısı her hasta için kişiye özgü çözümler bulmaya yardımcı olabilir.

Anahtar Sözcükler: Yaşlı; Hastalık; Potansiyel Sakıncalı İlaç Listesi.



Introduction

Elderly people have a high prevalence of chronic illnesses and multimorbidity. They have a significant potential for developing side effects due to the chronic use of drugs that may elicit strong systemic interactions. These patients commonly use multiple medications, which leads to inappropriate prescribing. Inappropriate prescribing is described as the use of medicines that introduce significant risk of an adverse drug-related event while there is evidence for an equally or more effective, lower risk alternative therapy available for treating the same condition (1). It includes drug–drug or drug–disease interactions, prolonged duration, and use of drugs at a higher frequency. It is an important public health, social, and economic problem in the community (2).

Several screening tools have been developed to assess inappropriate medications in elderly populations, such as inappropriate prescribing in elderly tool (IPET), the Beers Criteria, the Medication Appropriateness Index (MAI), Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP), and the Screening Tool to Alert Doctors to the Right Treatment (START) (3). Although Beer's criteria have been widely used for a long time, it has several deficiencies, including the lack of drug–drug interactions and drug class prescription duplication. Developed in 2003, STOPP/START is considered to be more comprehensive (3). It comprises 65 criteria for potentially inappropriate prescribing incidences according to systems including drug–drug and drug–disease, falls and therapeutic duplications. A new version of START/STOPP focusing on commonly prescribed medicines in older people has been recently validated and published in 2015, it is not only valid and reliable, but also has comprehensive screening tools applicable to routine clinical practice (4).

The objectives of this study were to screen potentially inappropriate prescribing according to new version START/STOPP criteria, to evaluate related specialists' opinion, and to discuss the difference between the screening tool and experts' opinion in the elderly population.

Materials and Method

Patients

A prospective cross-sectional study was performed on a group of older patients. 374 elderly patients who were evaluated in the outpatient clinic at the Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Physical Medicine and Rehabilitation during a four month period between May and August 2015 were recruited for the study. Those who were aged over 65 and were able to converse and complete the questionnaires in Turkish were selected to participate in the study.

All patients provided informed consent for participation. This study complies with the Declaration of Helsinki and was approved by the Local Ethics Committee.

Study Design

All data were collected by physiatrist via face to face interviews with the participants and/or caregivers. Medical histories, current diagnoses, current regular medications, number of medication and basic demographic data including age, gender, and educational level were elicited. Pharmacy records were asked if necessary.

START/STOPP criteria were used to identify inappropriate prescriptions (4). All patients were asked whether they had symptoms such as constipation, orthostatic hypotension or falling, incontinence, other medical conditions such as glaucoma, gout disease, or coronary stent insertions in the previous 12 months, deep venous thrombosis in the previous 6 months and pulmonary embolus in the previous 12 months. The patients' medications were classified as cardiovascular, gastrointestinal, endocrine, neurological, musculoskeletal, respiratory medicine, and psychiatric drugs. Potentially inappropriate drug–drug and drug–disease combinations were identified by START/STOPP criteria. The physiatrists referred the patients who were potentially inappropriate to related departments such as cardiology, gastroenterology, endocrinology, respiratory medicine, psychiatry, and urology.

The consulted specialists were trained to investigate inappropriate prescribing according to STOPP/START criteria. They examined the patients with detailed medical history and previous laboratory tests in their areas of expertise according to START/STOPP criteria. The patients were informed about inappropriate drugs and were recommended to use appropriate medication.

Descriptive statistical analysis was performed for all variables using the percentage, mean value, and standard deviation. SPSS 11.5 for Windows was used for all analyses (Chicago, IL, USA).

Results

374 patients aged over 65 were enrolled for the study. Among the patients, 116 (31%) were male and 258 (69%) female.

Table 1— Demographic Characteristics of the Patients.

	n=374
Age (years)*	72.9±6.2
Gender	
Female	258 (69%)
Male	116 (31%)
Education Level	
Illiterate	139 (37.2%)
Literate	69 (18.4%)
Primary School	138 (36.9%)
High School	18 (4.8%)
University	10 (2.7%)
Number of medication*	**3.3±2.2**
0	35 (9.4%)
1-2	106 (28.3%)
3-4	134 (35.8%)
≥5	99 (26.5%)
Most Common Comorbidities	
Cardiovascular system	
HT	254 (67.9%)
Ischemic hearth disease	62 (16.5%)
Hyperlipidemia	23 (6.1%)
Arrhythmia	21 (5.6%)
Congestive heart failure	5 (1.3%)
Gastrointestinal disorders	
Peptic Ulcer	35 (9.3%)
Gastroesophageal reflux	11 (2.9%)
Neurological diseases	
Cerebrovascular disease	8 (2.1%)
Dementia	6 (1.6%)
Parkinson	7 (1.8%)
Endocrinological disease	
Diabetes mellitus	102 (27.2%)
Hypothyroidism	31 (8.2%)
Hyperthyroidism	3 (0.8%)
Musculoskeletal disorders	
Degenerative disease	159 (42.5%)
Osteoporosis	62 (16.5%)
Polyneuropathy	25 (6.6%)
Rheumatoid arthritis	20 (5.3%)
Intervertebral disc disease	17 (4.5%)
Urological disease	
Benign prostate hyperplasia	40 (10.6%)

*Mean ± standard deviation.

Mean age was 72.9±6.2 years. Patients were using a total of 1259 medications and the mean number of medications was 3.3±2.2 medications per patient. Patients' demographics are presented in Table 1.

96 (25.6%) patients were found to be under potentially inappropriate medication according to STOPP criteria. Those patients were assessed by related departments. Among 96 patients (120 medications), 73 patients were consulted by one department, 21 patients with two departments, and 2 patients with three departments. 28 patients (30 medications) refused to be consulted by related departments. 68 patients (90 medications) were consulted by related departments. From 120 potentially inappropriate medications, which comprised 9.5% of the total medications, 54 (4.2%) were found to be inappropriate medication according to both STOPP criteria and expert opinion. Details of these patients are demonstrated in the flowchart (Figure 1).

Among potentially inappropriate medications according to STOPP criteria, proton pump inhibitors (PPI) were the most frequent (in 30 patients) and sulphonylureas were the second most frequent (in 14 patients) medication. After consultation with the specialists, nonsteroid anti-inflammatory drugs (NSAID) and nonselective alpha blockers were found to be the most frequent inappropriate medications. Table 2 presents potentially inappropriate medications and inappropriate medications after specialists' opinion.

Thirty patients were referred to gastroenterology outpatient clinic. All of the patients were consulted for potentially inappropriate -PPI usage. PPIs were considered appropriate in 10 patients who had gastric erosion or esophagitis in their upper gastrointestinal endoscopy which was recently done, and in five patients who had clinical gastroesophageal reflux disease (GERD) symptoms (heartburn, acid regurgitation). Control upper gastrointestinal endoscopy was advised in the latter group. Additionally, PPIs were decided to be appropriate in 11 patients. Of these patients, six patients were using aspirin for coronary artery disease, two patients had a history of previous peptic ulcer disease, two patients were using warfarin therapy for heart valve replacement, and one patient was using steroid and immunosuppressive drugs. Only in the four patients, PPIs were considered inappropriate, and the patients were informed.

Fourteen patients were referred to an endocrinology outpatient clinic. All patients had type-2 diabetes and all were using oral antidiabetic medications. Mean duration of diabetes was 14.1±7.9 years and mean age was 73.9±6.7. According to the blood tests, mean hemoglobin A1c level was 7.1 %, serum BUN, creatinine, AST, and ALT values were within normal ranges. None of the patients had experienced severe hypoglycemic symptoms and three patients noted probable symptomatic hypoglycemia less than twice a year. 11 patients were using sulfonylureas combined with other anti-



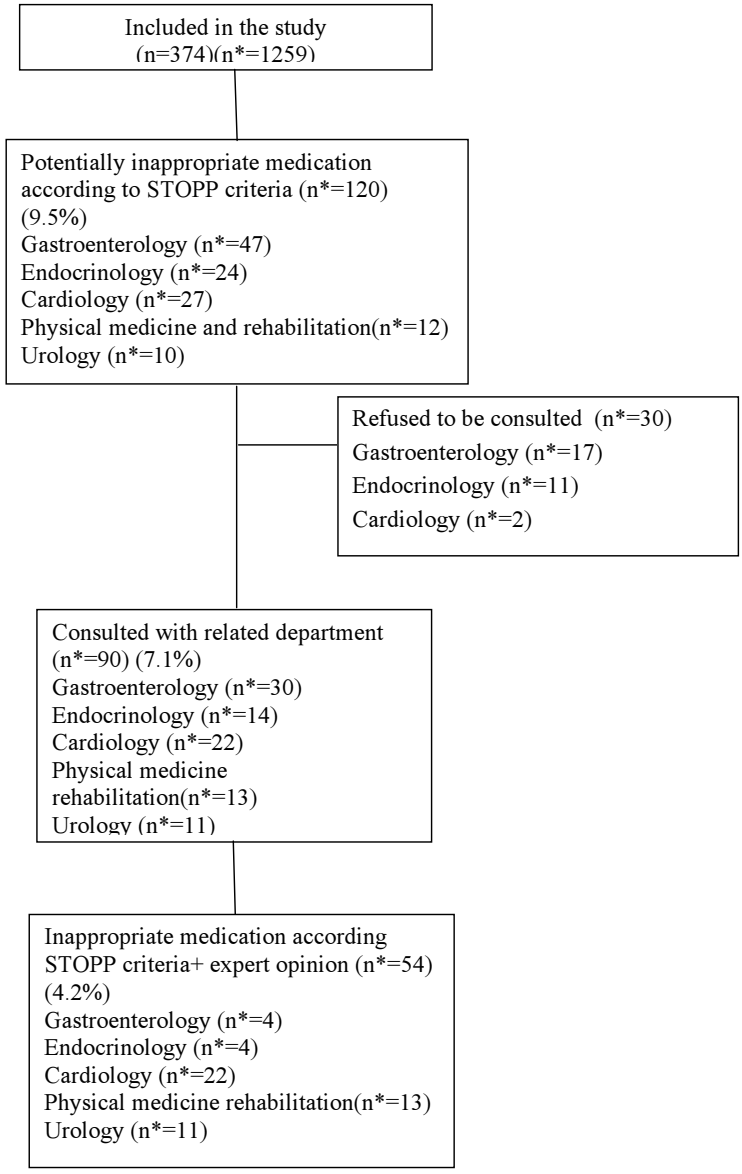


Figure 1— Flowchart of the study.
n = number of patients
n* = number of medications

diabetics and three patients were using only sulfonylureas. 12 patients were using modified release gliclazide and two patients were using glimepride. None of the patients were using glibenclamide or chlorpropamide which are sulphonylureas with a long duration of action. Sulphonylureas were not considered inappropriate for 10 patients, however, they were considered inappropriate for four patients due to symptomatic or probable symptomatic hypoglycemia and very low hemoglobin A1c levels. The patients were informed about the inappropriateness. In one patient insulin, and in two patients' sitagliptin and repaglinid, were recommended because of insufficient glycemic control.

Table 2— Potentially Inappropriate Medication According to STOPP Criteria.

	Consultant Department	Potentially inappropriate medication according to STOPP criteria n=90(%)	Inappropriate medication according STOPP criteria + expert opinion n=54(%)
PPI for uncomplicated peptic ulcer or erosive osephagitis full dosage ≥8 weeks	Gastroenterology	30 (33.3)	4(7.4)
Sulphonylureas with long duration of action with DM	Endocrinology	14(15.5)	4(7.4)
Long term use of NSAID (≥3 months)	PMR	10(11.1)	10(18.5)
Nonselective alpha blockers in those with orthostatic hypotension	Urology	10(11.1)	10(18.5)
Aspirin ≥160 mgr./day	Cardiology	9(10)	9(16.6)
μ blockers in DM with frequent hypoglycemic episodes	Cardiology	1(1.1)	1(1.8)
Duplication drug class		10(11.1)	10(18.5)
Antiaggregan	Cardiology	5	
Diuretic	Cardiology	2	
Ca canal blocker	Cardiology	1	
NSAID	PMR	1	
Alfa-blocker	Urology	1	
Vasodilator drug with persistent postural hypotension	Cardiology	1(1.1)	1(1.8)
Thiazide using with gout disease	Cardiology	2(2.2)	2(3.6)
Digoxin for heart failure with normal systolic function	Cardiology	1(1.1)	1(1.8)
Long term use of colchicine (≥3 months)	PMR	2(2.2)	2(3.6)

PPI: proton pump inhibitors, NSAID: nonsteroidal anti-inflammatory drugs, DM: diabetes mellitus PMR: physical medicine and rehabilitation.

Twenty-one patients were referred to the cardiology outpatient clinic. Nine patients were using high dose aspirin, five patients were using dual anti-platelet therapy without any clinical indications, one patient with diabetes mellitus was using a beta-blocker, one patient was using only an alpha-blocker for hypertension, two patients without heart failure were using dual diuretic therapy for hypertension, one patient was using digoxin without atrial fibrillation or heart failure, one patient was using angiotensin converting enzyme inhibitor and had symptomatic orthostatic hypotension, and finally two patients with gout disease were using thiazide diuretics. These medications were considered inappropriate and the patients were informed about it.

Ten patients were referred to the urology clinic. These patients had orthostatic hypotension due to a-1 blockers used for prostate hypertrophy. The patients were informed about the inappropriateness and were recommended to use more selective a1 blockers. Only one patient had a history of nausea after silodosin treatment; therefore, tamsulosin was recommended for this specific patient.

The physiatrist evaluated 11 patients for inappropriateness. 10 patients were using long term NSAID (≥3 months) due to osteoarthritis related pain and two patients were using long term colchicine (≥3 months) due to gout disease, one patient was using combined NSAID and colchicine. The patients were informed about the inappropriateness.

None of the patients had potential inappropriateness in the respiratory and psychiatry departments.

Discussion

This study revealed 9.5% potentially inappropriate medication according to STOPP/START criteria and 4.2% inappropriate medication after specialists' opinion in a total of 1259 medications. 26.5% of patients were using > 5 medicines simultaneously. To our concern, this is the first study eva-



luating the difference between specialists' opinions and the suggestions in the screening tool STOPP/START criteria. From potentially inappropriate drugs, PPIs and long duration of action sulfonylureas were mostly considered appropriate by the specialists.

Older patients have multiple co-morbidities and are prescribed multiple medications. The decline in physiological functions can be a factor that alters drug disposition and can have important influences on pharmacokinetics in geriatric patients. Health care professionals should be aware of the risks and interventions aiming to reduce exposure and minimize the risk associated with potentially harmful drug combinations (5). In our study 26.5% used > 5 medications simultaneously and this ratio went up to 57% in a US study (6). With the increase in the number of prescribed medications, the risk of side effects and interactions dramatically increases. Polypharmacy, chronic drug use, self-medication, and non-compliance are common factors in the elderly population. There is no standard definition of polypharmacy but it is a concept associated with both quantity and appropriateness of medication (7). Inappropriate prescription results in major morbidity and mortality. Our study showed that 9.5% of the medications were potentially inappropriate according to START/STOPP criteria and 4.2% of medications were inappropriate according to specialists' opinion after the evaluation of individual patients. Kara et al and Yayla et al found that respectively 41.2% and 14.8% of the patients were inappropriate according to STOPP/START criteria (8,9). Because some of the patients had inappropriateness reported from various departments, we calculated the inappropriate medicines, not the patients in our study.

PPIs are extensively prescribed worldwide in particular for GERD and dyspeptic patients (10). Kara et al found that the most common potentially inappropriate medication were PPIs (9). Patients with dyspepsia after an average of 50 years of age or with the presence of alarm symptoms are advised endoscopy in the guidelines (11). Organic dyspepsia is common in elderly dyspeptic patients and the most common causes of organic dyspepsia are GERD and peptic ulcer disease (12). GERD is a common disorder among elderly patients and has a higher rate of complications such as erosive esophagitis (10). In our study it was considered appropriate to use full-dose PPI treatment as a maintenance treatment for people with severe esophagitis or gastric erosion, either approved by endoscopy or the presence of severe symptom history. Current guidelines recommend the use of PPI therapy for 8 weeks for GERD. Moreover, maintenance of PPI therapy should be administered for the patients who keep on having symptoms after the PPI is discontinued and for the patients with complications including erosive esophagitis (12). In addition, prophylactic PPI treatment is prescribed for people at high risk (older age, previous ulceration, concurrent anticoagulant and steroids use) (13). In the study by Hsu et al, patients with a high GI risk (history of bleeding peptic ulcer, prior peptic ulcer, age > 70 years) concomitant drug therapy with non-steroidal anti-inflammatory drugs, other antiplatelet agents (clopidogrel or anticoagulants), and steroids should be recommended with proton pump inhibitors (14). For these reasons, PPI treatment was considered appropriate in most of the patients. It is not possible for any physician or specialist excluding gastroenterologists to decide whether the patient had a complicated ulcer or not.

Diabetes mellitus is an important health problem for the geriatric population and carries the risk of micro- and macrovascular complications in younger age groups (15). Glycemic targets should be individualized according to the patients' life expectancy, coexisting chronic illnesses, as well as patients' cognitive and physical function (16). Risk of hypoglycemia should be considered while prescribing any antihyperglycemic medication. Patients with diabetes in the geriatric population are prone to hypoglycemia for reasons such as age-related declines in renal function, hepatic enzyme activity, insulin deficiency, polypharmacy, etc. Consequently, use of long acting sulfonylureas such as glibenclamide or chlorpropamide is not recommended according to the current guidelines (16,17). Currie CJ et al. showed that very low hemoglobin A1c levels were associated with increased mortality and cardiac events as high levels (18). Therefore, it is important to evaluate older diabetic patients both with laboratory tests and self-monitoring of blood glucose at routine intervals to achieve the safest glycemic targets in order to minimize the risk of hypoglycemia. In the present study, the patients were not using glibenclamide, or chlorpropamide. None of the consulted patients using modified-release gliclazide and glimepiride had experienced severe hypoglycemia; three patients noted probable symptomatic hypoglycemia less than twice a year. A potential reason of this situation may be that the patients enrolled in our study were relatively healthy, were not too old and had relatively short duration of diabetes.

When we evaluated the cardiac medications of patients, we observed that the most frequent mistake was the dosage of aspirin usage. Previously, doses of 500–1500 mg daily were found to be effective for cardiovascular disease in clinical trials. However, a meta-analysis has shown that daily doses of

75–150 mg are as effective as the previously used higher doses (19). In another study performed in our country, Yayla et al also found that aspirin at dose > 150 mg/d was the second cause of potential inappropriateness (8). The second potentially inappropriate drug consulted to cardiology was dual antiplatelet therapy. Current guidelines recommend the use of dual antiplatelet therapy for 1 year after acute coronary syndrome and/or stent implantation even though there is a debate about the treatment duration. Single antiplatelet therapy such as aspirin only should be continued indefinitely (20). Physicians should be aware of this issue and be alert to the potential harmful effects of antiplatelet therapy.

Currently available α1-blockers include: alfuzosin hydrochloride, doxazosin mesylate, silodosin, tamsulosin hydrochloride, terazosin hydrochloride. There are three alpha-1 adrenergic receptor subtypes: alpha-1A, -1B, and -1D. Silodosin and tamsulosin hydrochloride are more selective α1A-blockers. Although different formulations result in different pharmacokinetic and tolerability profiles, the overall clinical impact of the different formulations is similar and modest (21). The most frequent adverse events associated with α1-blockers are asthenia, dizziness, and (orthostatic) hypotension. Vasodilating effects are most common for doxazosin and terazosin, and are less common for alfuzosin and tamsulosin (22). Moreover, patients with cardiovascular comorbidity and/or vaso-active co-medication may be susceptible to α1-blocker-induced vasodilatation (23). In contrast, silodosin appears less likely to cause cardiovascular side effects because it has a low selectivity for α1B-adrenoceptors involving blood pressure control (24). The frequency of hypotension with the α1A- selective blocker silodosin is comparable with placebo. Therefore, silodosin was considered for the patients with orthostatic hypotension.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are widely used for the treatment of musculoskeletal pain in the elderly population. Additionally, therapeutic duplication is frequent in NSAIDs. Yayla et al, showed that the most common inappropriate drugs used were NSAIDs (8). In elderly population, use of non-pharmacological treatments should be encouraged as an alternative to NSAIDs. In our study, we found frequent inappropriate use of NSAIDs, which was consistent with the previous study (8).

Gout is an inflammatory metabolic disease. It is increasingly seen in the elderly population. Colchicine therapy is advised as a prophylaxis for 6 months when used in combination with urate lowering drugs (25). As none of our patients were using urate lowering therapy, we informed the patients about the inappropriateness.

In this study, as a screening tool we considered 9.5% of the medicines potentially inappropriate, but after consulting the patients to the related departments it was 4.2%. START/STOPP criteria were never meant to replace clinical judgement based on high-level clinical knowledge and experience; rather they were intended as an aid to routine pharmacotherapy.

The difference of our study from the others was that we screened the patients by physiatrists and the patients were evaluated by the specialists for the final decision. It had some limitations. The patients participating in the study were admitted to the same outpatient clinic, but our hospital is one of the referral hospitals from the other cities.

To sum up, polypharmacy is a common problem in elderly patients. No screening tool can replace the clinical knowledge, experience and judgement of health care professionals in determining the most appropriate medications for their patients. All specialists who treat geriatric patients should be aware of inappropriate drugs and consult the patients to the related departments. It will be the patients' benefit when their treatment is organized in a multidisciplinary and individual fashion.

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RESEARCH

ANALYSIS OF THE USE OF RESOURCES AND FEATURES OF PRESENTATIONS AND THE TRENDS IN GERIATRIC PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT: 2011–2015

ABSTRACT

Introduction: The purpose of the present study was to evaluate presentation and resource utilization at the emergency department by patients ≥65 years of age and the associated trends over the years.

Materials and Method: This is a descriptive and retrospective study. Data related to patients ≥65 years of age who presented to emergency department of an urban university hospital between January 1, 2011 and December 31, 2015 were gathered from the hospital information management system. The data were analyzed using SPSS v17.0 software.

Results: A total of 29,298 (20.3%) of emergency department visits were made by patients ≥65 years of age. The composition of this group of patients was predominantly female and within the 65–74-year-old age group. A 25% increase in the number of emergency department visits by geriatric patients was observed between 2011 and 2015. Among the geriatric presentations, 76.5% had urgent conditions and 9.3% were admitted to the hospital. Most of the non-urgent patients were females of 65–74 years of age ($p<0.05$). Female patients had the highest wait times before evaluation by a physician and the highest non-admission rates ($p>0.05$). Patients of 75–84 years of age had the highest total costs as a group, whereas patients ≥85 years of age had the highest per-patient costs.

Conclusion: Resource utilization, length of emergency department stay, and hospital costs increased with geriatric patients' age. Analysis of the frequency of ED use and of resource utilization by geriatric patients would allow patient-centered and cost-effective planning for emergency department care.

Kew Words: Emergency Service; Hospital; Geriatrics; Patients.

ARAŞTIRMA

ACİL SERVİSE BAŞVURAN GERİATRİK HASTALARDA TRENDLERİN, BAŞVURU ÖZELLİKLERİNİN VE KAYNAK KULLANIMLARININ ANALİZİ: 2011–2015

ÖZ

Giriş: Çalışmanın amacı; acil servise başvuran ≥65 yaş hastaların acil servis başvurularını, kaynak kullanımlarını ve yıllar içerisindeki eğilimlerini değerlendirmektir.

Gereç ve Yöntem: Çalışma tanımlayıcı ve retrospektif bir çalışmadır. Bir üniversite hastanesinin acil servisine başvuran ≥65 yaş geriatrik hastaların verileri, 1 Ocak 2011-31 Aralık 2015 tarihleri arasında, hastane bilgi yönetim sisteminden elde edildi. Veriler SPSS 17.0 ortamına yüklenerek değerlendirildi.

Bulgular: Acil servs başvurularının 29.298'i (%20.3) ≥65 yaş hastalar oluşturdu. 65-74 yaş hastalar ve kadın hastalar bu grupta dominanttı. 2011-2015 arasındaki geriatrik hasta başvurusunda %25'lik artış saptandı. Hastaların %76.5'i 'acele' hastaydı ve %9.3'ü hastaneye yatırıldı. Acil olmayan hastaların çoğu 65-74 yaş ile kadın hastalardı ($p<0.05$). Kadın hastalar en yüksek, hekim muayenesini bekleme sürelerine ve yatışı yapılamayan hasta oranlarına sahipti ($p>0.05$). 75-84 yaş hastalar hizmet maliyeti en fazla, >85 yaş hastalar kişi başı hizmet tutarı en fazla olan gruptu.

Sonuç: Geriatrik yaş grubu yükseldikçe acil servis kaynak kullanımlarının, acil serviste kalış sürelerinin ve hizmet maliyetlerinin arttığı saptanmıştır. Geriatrik hastalar tarafından acil servisin kullanımının sıklığı ve kaynak kullanımı analizi, acil servis bakımı için hasta yararı odaklı ve maliyet etkin planlar yapılmasını sağlayacaktır.

Anahtar Sözcükler: Acil Servis; Başvuru; Geriatri; Hasta.

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Introduction

The percentage of geriatric patients receiving services from emergency departments (EDs) has been increasing over the years. Due to the services provided to the geriatric population at ED, the atypical disease presentations, and the multiple sources of health disorders in this population, the management of this patient group requires multi-dimensional planning. For this reason, having knowledge about the reasons and trends in geriatric patient ED visits is critical to allow the use of health resources in an efficient, productive, and cost effective manner.

With regard to the defining age of geriatric patients, it is only possible to discuss a widely accepted age range, rather than an age on which there is a consensus. In general, the well-accepted geriatric age range is ≥65 years (1, 2). Geriatric ages are grouped as: young-old (65–74 years), middle-old (75–84 years), and oldest-old (≥85 years) (1, 2).

Recent developments in medicine and improvements in life conditions resulted in an increased life expectancy at birth and an increase in the ratio of the geriatric population to the general population (3-5). In 2013, the life expectancy at birth was 76.3 years in Turkey (3). The percentage of the population ≥65 years of age was 7.2% in 2010, and it rose to 8% in 2014. This rate is expected to reach 10.2% by 2023 (3). Furthermore, in recent years, the rates of hospital admission, resource utilization, number of ED visits by geriatric patients have increased (5,7).

Using institutional and national epidemiological data, this study aims to contribute to the planning of emergency healthcare services for geriatric patients by evaluating ED use by this population.

Materials and Method

Study Design and Population

This descriptive and retrospective study was approved by Baskent University Institutional Review Board (Project No: KA15/283). Geriatric patients ≥65 years of age who had presented to the Baskent University Ankara Hospital Adult Emergency Department (ED) between January 1, 2011 and December 31, 2015 were included in the study, excluding patients with incomplete hospital records.

Study Scope

Data regarding the use of emergency services and the demographic characteristics of geriatric patients during the study period were obtained from the hospital patient information management system (PIMS). The following evaluations were conducted on the patients:

a. Parameters, including gender, age group, presentation time, triage codes (emergent, urgent, non-urgent), International Classification of Diseases (ICD) 10 codes, complaints, wait times for physician examination, resource utilization rates, ED length of stay, admission rates to observation units or other wards, consultation rates, death rate, referral rate, prescription rates upon discharge, and average costs for services.
b. Changes number of ED visits, rates of use of resources, and rates of admission to the intensive care unit (ICU) and other wards during the study period.
c. Analyses were performed to determine whether there was a statistically significant difference between different age groups and genders and their respective wait times for physician examinations, triage codes, length of stay in ED, and admissions to ICU and other wards.

Data Analysis

The study data were analyzed using the SPSS 17.0 software. The descriptive statistical data were presented as frequency distributions, percentages, minimum and maximum values, mean, median, and standard deviations. Analytical data, including the relationship between the patients' genders and ages and their respective length of stay in ED, presentation time, triage codes, admission to ICU or another ward from ED, and wait times for examination by a physician were tested using the chi-square test. The differences between the rates of these variables for different categories of patients were assessed for statistical significance using the Z-test. A p-value of <0.05 was considered to be statistically significant.

Results

A total of 166,519 adult patient presentations to ED occurred during the study period. Among these, 33,789 (20.3%) of the patients were >65 years of age. Among this geriatric group, 4,491 were excluded from the study due to incomplete patient records. For the remaining group of 29,298 patients, 44% were of ages 65–74 years and 61% were female (Table 1). From the first (2011) to the last year (2015) of the study, geriatric patient presentations at ED increased by 25% (Table 2).

The time duration between admission to ED and examination by the emergency physician was defined as "physician

Table 1— Distribution of Geriatric Patient Age Groups Based on Gender and Associated Costs for Services

Age Group (years)	Male (n)	Female (n)	Total (n/%)	Total Costs for Services (TL)	Costs for Services per-patient (TL)
65–74	5.305	7.505	12.810/44	1.134.697	89
75–84	4.272	6.782	11.054/37	1.185.315	107
≥85	1.829	3.605	5.434/19	698.495	129
Total (n/%)	11.406/39	17.892/61	**29.298/100**	3.018.506	103*

*Mean service cost per geriatric patient

Table 2— Trends in the Numbers of Geriatric Patients Presenting to ED

Data	2011 (n)	2015 (n)	Change During 2011–2015 (%)*
Age (years)			
65–74	2521	3245	+29
75–84	2303	2661	+16
≥85	1025	1407	+37
Gender			
Female	3645	4416	+21
Male	2204	2897	+31
Total	**5849**	**7313**	**+25**

**Per cent increased in the number of patients presented to the ED in the years 2011 and 2015.

examination wait time." The mean physician examination wait time was 22 min 49 s (95% CI, 22.42–22.95) and the median physician examination wait time was determined to be 15 min 55 s.

A statistically significant relationship was found between the patient genders and the physician examination wait times ($p<0.05$). Accordingly, while the majority of male patients waited for 15 min to be examined by the emergency physician, the majority of female patients waited for 60–90 min (Figure 1). Similarly, a statistically significant relationship was found between the patient age groups and the physician examination wait times ($p<0.05$). Patients ≥85 years waited for a shorter period for the physician examination than the patients of age 65–74 years (Figure 2).

Triage codes for patients have been recorded in PIMS since January 1, 2012. A total of 24,904 geriatric patients were coded from that day. Among those, 76.5% were urgent, 17% were emergent, and 6.5% were non-urgent cases (Table 3).

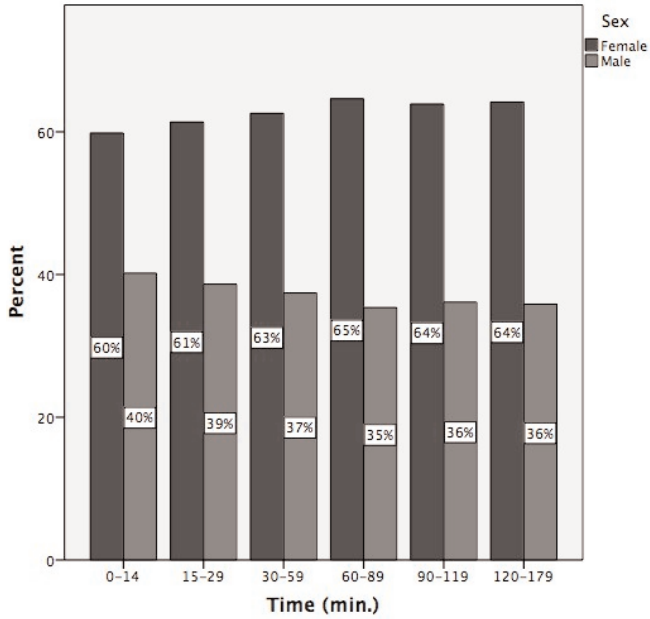


Figure 1— Relationship between patient genders and physician examination wait times.

A statistically significant relationship was found between patient gender and triage codes ($p<0.05$). The percentages of female patients categorized as non-urgent and male patients categorized as emergent were higher than percentages of each gender categorized under other triage codes.

A statistically significant relationship was also found between the patient age groups and triage codes ($p<0.05$). Specifically, the percentages of patients in the 65–74 age group categorized as non-urgent and in the 75–84 and the ≥85 age groups categorized as urgent and emergent, respectively, were higher than those categorized under other triage codes.

Table 3— Distribution of the Triage Codes Based on Geriatric Age Groups and Genders

Data	Emergent			Urgent			Non-Urgent		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
Age (years)									
65–74	1686	40	(0.385-0.415)	8313	44	(0.433-0.447)	950	59	(0.566-0.614)
75–84	1606	38	(0.365-0.395)	7211	38	(0.373-0.387)	480	30	(0.278-0.322)
≥85	961	23	(0.217-0.243)	3520	18	(0.175-0.185)	177	11	(0.095-0.125)
Gender									
Female	2377	56	(0.545-0.575)	11698	61	(0.603-0.617)	1053	66	(0.637-0.683)
Male	1876	44	(0.425-0.455)	7346	39	(0.383-0.397)	554	34	(0.317-0.363)
Total	4253	100		19044	100		1607	100	

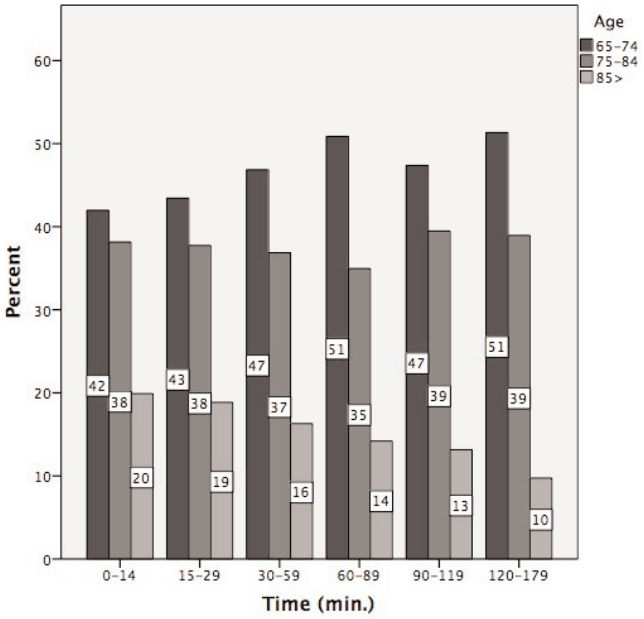


Figure 2— Relationship between patient age groups and physician examination wait times.

Among all patients, 43.8% were determined to have presented to ED during work hours ICD-10 diagnostic group records of the patients revealed that 16% of the patients visited ED due to circulatory problems, 15% due to metabolic/endocrine disorders, 9% due to respiratory system disorders, 6% due to gastrointestinal system disorders, 6% due to genitourinary system disorders, and 5% due to injuries sustained during falls. On the other hand, the R-coded ICD-10 diagnostic groups (symptoms, signs, and abnormal clinical and laboratory findings) patients' initial complaints included kidney function disorders (14%), abdominal pain (12%), nausea/vomiting (9%), chest pain (8%), difficulty in breathing (7%).

Among the geriatric patients presenting in ED during the course of this study, intravenous access was obtained in 61%, complete blood count was performed in 77%, renal function tests in 68%, liver function tests in 17%, and cardiac enzymes in 31.4% of the patients. Electrocardiography was performed in 33.3% of the patients, bleeding parameters were analyzed in 13.7%, CRP in 19.6%, D-Dimer 3.6%, urinalysis in 26.4%, and arterial blood gas analysis in 19.1%. Imaging studies included direct radiography in 74% of the patients, computed tomography in 27%, ultrasonography in 7%, angiography in 4%, and magnetic resonance imaging in 0.05%. The percentages of change in the rates of use of resources at EDs between 2011 and 2015 are presented in Table 4.

Among the treatments provided, 11% of the patients received bronchodilator treatment, 10.1% received supplemental oxygen, 8.5% received acetyl salicylic acid, 6.9% received intravenous hydration, 5.7% received anticoagulant agent, 3.6% received antiarrhythmic agents, 1.6% had orthopedic intervention, 1% received transfusion of blood and/or blood products, 1% received vasopressor agents, 0.6% had endotracheal intubation, 0.5% had cardiopulmonary resuscitation, and 0.04% had cardioversion.

We determined that 65.7% of the patients presenting to ED in 2014 were placed in the ED observation room. Among all geriatric patients that presented to ED between 2011 and 2015, 4.3% were admitted to ICU and 5% were admitted to another ward. Trends in patient admission from ED between 2011 and 2015 are shown in Table 5. Geriatric patients were most frequently admitted to the neurology, general surgery,

Table 4— Trends in Imaging and Laboratory Studies Utilized and Treatment Given for Geriatric Patients Between 2011 and 2015

Used Resource	2011 5849*		2015 7313*		2011–2015 Percentage of Change
	(n)	%	(n)	%	(%)
Imaging					
Any imaging	3760	64.3	5373	73.5	9.2
Any X-Ray	3155	53.9	4451	60.9	7
Any CT	1001	17.1	1960	26.8	9.7
Any MRI	32	0.5	16	0.2	-0.3
Any USG	318	5.4	605	8.3	2.9
ECG	1152	19.7	3122	42.7	23
Cardiac Monitoring	100	1.7	224	3.1	1.4
Laboratory					
Blood	3857	65.9	5723	78.3	12.4
Urinalysis	1497	25.6	1968	26.9	1.3
Treatment					
Intravenous fluid	1604	27.4	5314	72.7	45.3
Drugs	1187	20.3	5015	68.5	48.2
Intervention	1504	25.7	4053	55.4	29.7

*Total number of geriatric patients presenting to ED in the corresponding year.

Table 5— Trends in Patient Admission from ED Between 2011 and 2015

	n	¥(%)	§(%)	n	¥(%)	§(%)
Total number ED visits	30361	100	-	33706	100	-
Geriatric patients	5849	19	100	7313	22	100
65–74 years	2521	8	43	3245	10	44
74–85 years	2303	8	39	2661	8	36
≥85 years	1025	3	18	1407	4	19
Other patients	24512	81	-	26393	78	-
Total number of hospital admission	751	2	-	1055	3	-
Geriatric patients	289	-	5	402	-	5
Other patients	462	-	2	653	-	3
Total number of ICU admissions	491	2	-	534	2	-
Geriatric patients	262	-	4	314	-	4
Other patients	289	-	1	356	-	1

¥Rate of total number of ED visits
§Corresponding rates of total number of geriatric and other patients

cardiology, and nephrology wards, in the order mentioned. Similarly, the most frequent ICU admissions took place for cardiology, pulmonology, neurology, and anesthesiology.

Among the admitted female patients, 3% were admitted to the ICU while 3.4% were admitted to other wards. Similarly, among the male patients admitted, 4% were admitted to the ICU while 4.5% were admitted to other wards. Of all patients admitted to the wards other than the ICU, 55% were female and 45% were male. Almost half of the patients (50.1%) admitted to the ICU were female while the other half (49.9%) were male. Among the patients who were not admitted neither to the wards or to ICU, 61% were

female and 39% were male. A statistically significant relationship was found between patient gender and hospital admission (to hospital ward and ICU) rates from ED ($p<0.05$) The rate of female patients among those who were not admitted is higher than the female among those who were admitted to the hospital. On the other hand, the rate of the male patients among those who were admitted is higher than the male among those who were not admitted to the hospital.

When all geriatric age groups considered, the combined rate of ICU admission from the ED is 3.4% while 4% of those patients were admitted to other wards from the ED. No statistically significant relationship was found between the age groups and service admission ($p>0.05$). A statistically significant relationship was found between the age groups and ICU admission ($p<0.05$). The rate of patients over 85 years of age and were admitted to the ICU is higher than those over 85 years of age and not admitted to the ICU.

The length of stay (LOS) in ED was defined as the time between entry into ED and departure from ED. In 2015, the mean ED LOS for geriatric patients was 457 min 13 s (95% CI, 437.34–476.03) and the median was determined to be 239 min 05 s. Approximately half (50.2%) of the patients stayed in ED for 0–4 hours, whereas 6% spent >24 hours in ED. No statistically significant relationship was found between patient gender and ED LOS ($p>0.05$). On the other hand, there was a significant relationship between the age group of the patients and ED LOS ($p<0.05$). The most common LOS intervals were 0–4 and 4–12 hours for the 65–74 age group, while the most common LOS was ≥24 hours and 12–24 hours for 75–84 age group and ≥85 age group, respectively. It was noted that the length of ED stay had increased as the age of the patients increased. (Figure 3).

The specialist consultation rate for the geriatric patients between 2011 and 2015 was 56%. Consultations were most commonly requested from the cardiology, pulmonology, and neurology departments every year during the study period. The average time for consultation was 183 min. The death rate of geriatric patients in ED was 0.3%, rate of referral to another hospital was 4%, rate of discharge was 20.7%, and rate of prescription upon discharge was 42%.

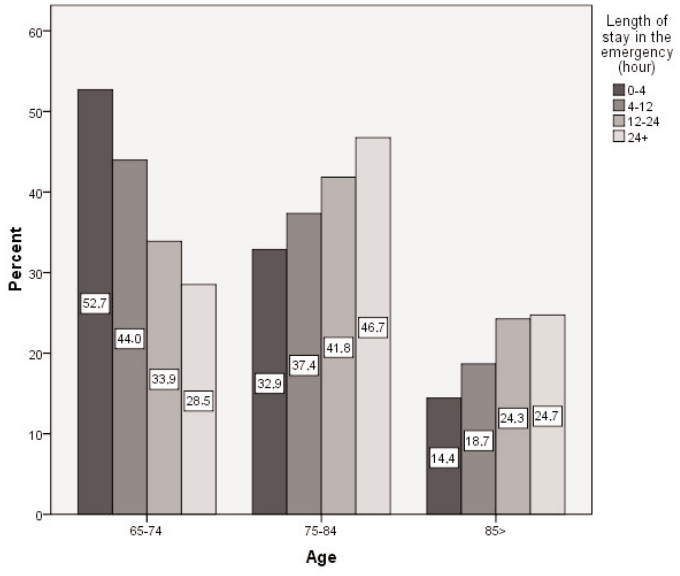


Figure 3— Relationship between age groups and length of stay in the emergency department.

Discussion

Historically, geriatric patients constitute 9–37% of the patients presenting to EDs (4-15). During the present study, this rate was 20.3%. In the present study, the majority of these patients were females, and the most common age group was 65–74 years, which is similar to previous findings (5,6,16,17). Overall, a 25% increase in ED visits by geriatric patients was observed over the length of the study from 2011 to 2015. This increase was even higher at 37% for those ≥85 years of age. An increase in the number of geriatric patient ED visits was also observed by Strange et al. (16% increase) and Pines et al. (24.5% increase) (5,7).

A total of 93.5% of the geriatric patients were categorized as urgent and emergent in the present study. In the study by Latham, this rate was 74.2% (16). The present study also revealed that female patients and patients between 65–74 years of age were found to present with non-urgent conditions, whereas those ≥85 years of age more commonly presented with emergent conditions. The present study revealed that geriatric patients more frequently visit EDs after business hours. These results are in line with the Taymaz (8) study; however, they contradict the findings of Akpinar et al. and Mert, in which they found ED visits more commonly taking place during business hours (6,13). We were able to observe a significant increase in the use of ED resources between 2011 and 2015. In particular, use of electrocardiography, computed tomography, direct X-ray, blood analyses, intravenous fluid and drug administration, and rates of interventions have increased. Similarly, the study by Pines reported an increase in the rate of resource utilization (7).

Akpinar et al. reported the most common diagnoses to be cardiovascular and respiratory diseases (6), whereas Kekec et al. reported metabolic/systemic, cardiovascular, and cerebrovascular diseases (14). The present study results showed the most common diagnoses to be circulatory system (cardiovascular and neurovascular), metabolic, respiratory, and alimentary system diseases. Similarly, the most frequent complaints were kidney function disorders, abdominal pain, nausea and vomiting, and chest pain. In Latham's study, however, the cost common complaints were reported to be difficulty in breathing, chest pain, and injuries (16). We believe the reasons for these differences are related to the healthcare centers being reference centers for specific diseases, geographic locations within the country, and sociocultural differences of the population to which the hospital provided services.

The percentage of geriatric patients admitted to the hospital from ED has a range of 11.5–61% (8,11,13-15). We found that 65.7% of the geriatric patients who presented in ED were admitted to the monitored observation units in ED. The total rate of admission to ICU or other wards from ED was 9.3% in our study. In spite of the increase in the number of ED visits by geriatric and non-geriatric patients between 2011 and 2015, the rates of admission to ICU and other wards remained constant for both groups in the present study. In their study, Strange et al. reported an increase in admission rates to other wards for geriatric and non-geriatric patient groups over the years (5). We attribute this discrepancy between the rates of geriatric patient admission to the possible variation in the rates of old age in different countries or in different regions of the same country, the level of care provided by ED, and the general health insurance coverage policies in different countries.

The wards that admitted the most ED patients were neurology, general surgery, and cardiology. In the study by Taymaz, general internal medicine, neurology–neurosurgery, and cardiology were the wards that admitted the highest number of ED patients (8), whereas it was neurology, pulmonology, and cardiology in the study by Akpinar et al. (6). We found that cardiology, pulmonology, and neurology ICU wards admitted ED patients most frequently. This order of admission was exactly the same in the study by Akpinar (6).

In the present study, the rate of consultation requests for geriatric patients was 56%. The most frequent disciplines from which consultations were requested were cardiology, pulmonology, and neurology. In their study, Logoglu et al. found this rate to be 43.4%, and the most frequent disciplines from which consultations were requested were cardiology, internal medicine, and pulmonology (17).

We found a higher rate of ED presentation, a higher rate of ICU admission, a longer ED LOS, and greater use of resources, which in turn increases the costs in the geriatric patient groups as their ages increased. These results are consistent with the results of similar studies in the literature (4,5,10,13,15,18-21).

As ages of geriatric patients increased, the average costs for services per individual have been reported to increase. The service cost per individual at ED was found to be 103 TL. In the study by Kapci et al., the average service cost for patients being discharged from ED was 115 TL (21).

Periodic analyses and comprehensive reviews and meta-analyses of the use of ED services by geriatric patients are needed to increase awareness of emergency health issues of geriatric patients and to allow formulation of effective solutions to meet their needs. The current study presents results concerning the use of EDs by geriatric patients and can be used to optimize planning of ED service processes, resource utilization, and investment at institutional and national levels.

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RESEARCH

TIMING OF LAPAROSCOPIC CHOLECYSTECTOMY IN ELDERLY PATIENTS WITH MILD ACUTE BILIARY PANCREATITIS

ABSTRACT

Introduction: Age-related diseases have increased with the increase in average life expectancy. Biliary pancreatitis is one such disease, and its incidence increases with age. This study aimed to evaluate treatment outcomes for patients aged >65 years who were hospitalized for biliary pancreatitis and underwent cholecystectomy during initial hospitalization.

Materials and Method: A retrospective study was designed for patients aged >65 years who underwent early cholecystectomy for acute biliary pancreatitis at Istanbul Faculty of Medicine, Department of General Surgery, between January 2010 and December 2015. Patients were divided into group A (aged 65-74 years) and group B (aged ?75 years). Patients' demographics, comorbidities, American Society of Anesthesiology (ASA) scores, history of previous abdominal operations, operation duration, postoperative morbidity and mortality, and length of hospital stay were analyzed.

Results: In total, 192 geriatric patients with acute biliary pancreatitis were analyzed. Seventy-nine (45 women, 34 men) of them underwent early LC for acute biliary pancreatitis during initial hospitalization. There was no significant difference in operation duration and length of hospital stay between the two groups. Postoperative oral intake started within 8 h. No significant difference was found in mortality and morbidity rates between the two groups.

Conclusion: Old age and accompanying comorbidities are fundamental predictors of surgical outcomes. Early LC should be suggested in elderly patients with the regression of mild pancreatitis before hospital discharge, with acceptable morbidity and mortality. It is feasible and safe for older patients to undergo LC. Cholecystectomy could be the definitive treatment for gallstone disease to prevent recurrent pancreatitis.

Kew Words: Geriatrics; Aged; Cholecystectomy, Laparoscopic; Gallstone.

ARAŞTIRMA

HAFİF AKUT BİLİYER PANKREATİT GEÇİREN YAŞLI HASTALARDA LAPAROSKOPİK KOLESİSTEKTOMİ NE ZAMAN YAPILMALI?

ÖZ

Giriş: Ortalama insan ömrü arttıkça yaşla ilişkili hastalıkların sıklığı artmaktadır. Safra taşına bağlı pankreatit, yaşla ilişkili hastalıklardan biridir ve yaşlanma ile birlikte sıklığı artmaktadır. Bu çalışma, 65 yaşın üstünde biliyer pankreatit tanısıyla yatan ve aynı yatışta laparoskopik kolesistektomi (LK) yapılan hastaların tedavi yöntemlerini ve sonuçlarını değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Ocak 2010 - Aralık 2015 tarihleri arasında İstanbul Tıp Fakültesi, Genel Cerrahi Anabilim Dalı'da, biliyer pankreatit tanısıyla erken laparaskopik kolesistektomi yapılan 65 yaş üstü hastalar retrospektif olarak değerlendirildi. Hastalar Grup A (65-75 yaş) ve Grup B (> 75 yaş) olarak ayrıldı. Hastalar, ek hastalıkları, önceden geçirilmiş karın ameliyatı, ameliyat süresi, ameliyat sonrası mortalite/morbitide oranı, hastanede yatış süresi ve Amerika Anesteziyoloji Derneği'nin (ASA) skoruna göre değerlendirildi.

Bulgular: Toplam192 akut biliyer panreatit geçiren yaşlı hasta değerlendirildi. Bu hastaların 79'una hastaneye ilk yatışları sırasında akut biliyer pankretit tanısıyla erken LK yapıldı. İki grup arasında ameliyat ve hastanede kalış süresi açısında anlamlı fark saptanmadı. Ameliyat sonrası 8 saat içinde oral gıda alımına başlandı. Grup A ve Grup B arasında mortalite ve morbitite bakımından fark bulunmadı.

Sonuç: Yaşlılık ve eşlik eden hastalıklar cerrahi sonuçların esas belirleyicileridir. Erken dönemde LK, hafif pankreatit geçiren yaşlı hastalara taburculuktan önce kabul edilebilir düzeyde mortalite ve morbiditeyle önerilebilir Bu hastalara güvenli ve etkili bir şekilde LK yapılabilir. Kolesistektomi, rekürren pankreatiti önlemede kesin tedavi olabilir.

Anahtar Sözcükler: Geriatri; Yaşlı; Laparoskopik Kolesistektomi; Safra Taşı.

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Introduction

Acute pancreatitis (AP) is an acute inflammatory process of the pancreas. This disease can be divided into two main categories, interstitial and necrotizing AP (1). The pathogenesis of AP is very complicated. The etiology of pancreatitis is mostly biliary (80%-90%), but sometimes it may be idiopathic. Mortality rates for interstitial edematous pancreatitis increase with the development of pancreatic necrosis (2,3). The modern lifestyle and eating habits have led to an increase in the incidence of cholelithiasis (4). Gallstones are the most common causes of acute abdominal pain in elderly patients and are the reason for a significant percentage of abdominal operations in patients aged >65 years (5,6). The frequency of occurrence of this disease increases with age in all populations, in both sexes, and in industrialized and non-industrialized countries (7,8).

Cholecystectomy, which is performed in the first biliary pancreatitis attack, decreases the risk of recurrent biliary pancreatitis and other gallstone-related complications. Currently, cholecystectomy is delayed for 6 weeks because it is risky to operate while pancreatitis is in the active state in the early days (9). However, the patient is at risk of biliary events throughout this period, which is why cholecystectomy should be performed during the initial hospitalization in patients with non-severe biliary pancreatitis (10). Keeping in mind that elderly patients have similar results to younger patients, age is not a contraindication for cholecystectomy. The increased mortality in elderly patients is due to the presence of concomitant diseases. Age is generally an independent risk factor for elderly patients who undergo surgery (6,7). This study aimed to evaluate outcomes of treatment methods for patients aged >65 years who were hospitalized for biliary pancreatitis and underwent cholecystectomy during the initial hospitalization.

Materials and Method

Elderly patients who were admitted to the Emergency Surgery Clinic at Istanbul Faculty of Medicine, Department of General Surgery, between January 2010 and December 2015 were evaluated. Their written and electronic medical records were retrospectively reviewed, seeking the terms "*abdominal pain,*" "*gallstones*," "*biliary disease*," "*cholecystitis*," and "*cholangitis*," and patients with pancreatitis as the primary diagnosis. This retrospective study was approved by the Istanbul Faculty of Medicine Institutional Review Board of Istanbul University.

All diagnoses were made with a combination of medical history, physical examination, laboratory tests, and imaging techniques [ultrasonography, magnetic resonance cholangiopancreatography (MRCP), computed tomography (CT)]. Acute biliary pancreatitis was diagnosed with the presence of gallbladder lithiasis, elevated serum amylase level, and biliary pain. Choledocholithiasis was identified with the presence of biliary symptoms, jaundice, abnormal liver function test results, and gallbladder lithiasis. Following the definitive diagnosis, an oral regimen and analgesic treatment were initiated in all patients.

Contrast-enhanced, spiral CT was performed on patients with severe AP to detect edematous or necrotizing pancreatitis. Patients who were confirmed to have common bile duct stones with ultrasonography or MRCP underwent endoscopic retrograde cholangiopancreatography (ERCP).

Cholecystectomy was performed on patients who tolerated the oral regimen and who were clinically recovered during initial hospitalization, in accordance with the latest guidelines (11). Laparoscopic cholecystectomy (LC) and ERCP procedures were performed after the risks, complications, and alternatives had been discussed. All patients signed an informed consent form before the procedure.

LC was performed using a standard 3- or 4-port technique by an experienced surgical team. A Veress needle was inserted, and the abdominal cavity was insufflated with carbon dioxide, with the maximum insufflation pressure being 12 mm Hg. Calot's triangle was identified, and the cystic duct and cystic artery were clipped, taking care not to injure the common bile duct. The gall bladder was removed from the liver bed by laparoscopic surgical heat devices. When laparoscopic exploration was inefficient, cholecystectomy was performed by laparotomy. ERCP with endoscopic sphincterotomy was performed in patients who did not accept to undergo an operation to prevent recurrent pancreatitis (6,12).

Patients aged <65 years; those with necrotizing pancreatitis, primary sclerosing cholangitis, pseudocysts, non-biliary pancreatitis, intrahepatic lithiasis, primary biliary cirrhosis, gall bladder and biliary duct tumors, or drug-induced pancreatitis; and those who did not accept an operation were excluded from the study.

Patients who were aged >65 years, hospitalized for biliary pancreatitis, and underwent cholecystectomy during the initial hospitalization were included in the study. These patients were divided into two groups: group A (aged 65-75 years) and group B (aged >75 years). Patients' demographics, comorbidities, American Society of Anesthesiology (ASA) scores, his-

tory of previous abdominal operations, operation duration, postoperative morbidity and mortality, and length of hospital stay were analyzed.

Statistical Analysis

The findings were compared using IBM Statistical Package for the Social Sciences 21. The distribution of variables was analyzed using the Shapiro-Wilk test. For the comparison between the two groups, the Mann-Whitney U test was used. The results had a 95% confidence interval, and statistical significance was assessed as $p < 0.05$.

Results

In total, 782 patients with ABP were retrospectively analyzed. A total of 590 patients were aged <65 years and were excluded from the study; 192 patients were aged >65 years, 42 of which refused to undergo an operation.

A multidetector contrast-enhanced CT scan using a pancreatic protocol was performed in 51 patients who were diagnosed as having severe ABP, and necrosis or fluid collection was detected in 32. Elective cholecystectomy was suggested for patients with severe pancreatitis (Figure 1A-B).

Fourteen patients were a high surgical risk according to their ASA score and underwent ERCP to reduce the risk of recurrence. These high-risk patients and six other patients with incomplete data were excluded from the study. The remaining 79 patients underwent early LC for acute biliary pancreatitis during hospitalization. Four patients who were preoperatively diagnosed as having biliary tract stones underwent ERCP; stones were extracted from the common bile duct, after which cholecystectomy was performed (Figure 2A, B).

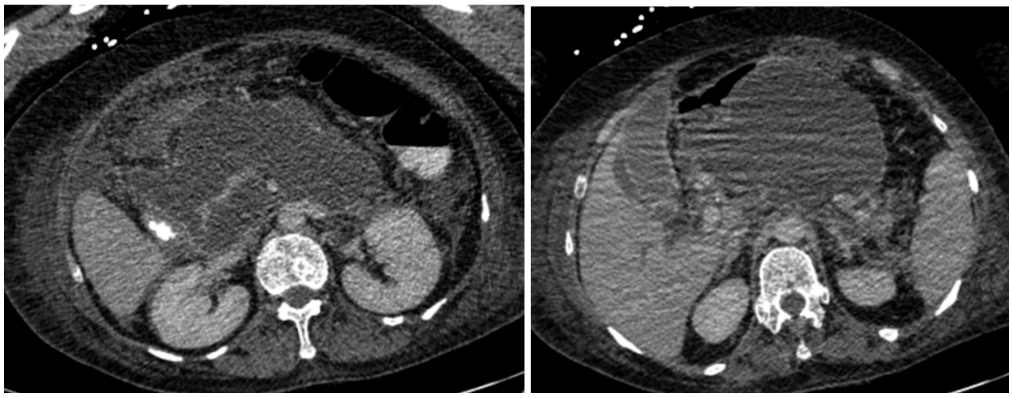


Figure 1— A man aged 72 years with acute pancreatitis. A coronal contrast-enhanced CT scan demonstrates multiple loculi of fluid. Almost the entire pancreas is non-enhancing and necrosed.

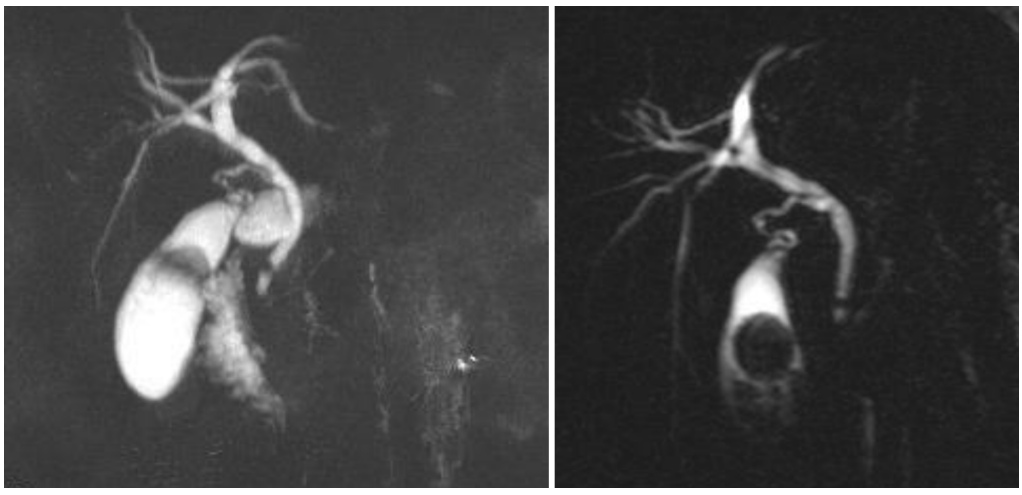


Figure 2— MRCP detected calculi in the gallbladder and bile duct. A woman aged 68 years with acute biliary pancreatitis who underwent cholecystectomy after extraction of stones from the common bile duct with ERCP.



Table 1— Distribution of Patients According to Group, Sex, Length of Hospital Stay, and Length of Stay in the Intensive Care Unit

	Preoperative Hospital Stay		Hospital Stay		Intensive Care Unit Stay			
	Mean±sd	p	Mean±sd	p	Mean±sd	p	N	%
GROUP A	3.01±0.78	0.573	5.83±1.52	0.575	0.86±0.90	0.982	58	73.5
GROUP B	2.90±0.76		6.05±1.56		0.86±0.72		21	26.5
Women	2.98±0.72	-	5.67±1.25-	-	0.73±0.75	-	45	56.9
Men	1.03±0.96		6.18±1.83		1.03±0.96		34	44.1
Total	2.99±0.77	-	5.89±1.52	-	0.86±0.85	-	79	100.0

N: Number of cases

Table 2— Distribution of Patients According to Ranson Criteria, Group, and Sex

Group	Sex	Ranson					Total
		1	2	3	4	5	
A	M	-	5	10	9	1	25
	F	4	7	11	8	3	33
	Total	4	12	21	17	4	58
B	M	-	1	4	3	1	9
	F	-	3	3	5	1	12
	Total	-	4	7	8	2	21
Total	M	-	6	14	12	2	34
	F	4	10	14	13	4	45
	Total	4	16	28	25	6	79

The mean age was 73.4 years (range, 65-96 years). Forty-five patients (56.9%) were women and 34 (44.1%) were men. The mean operation duration for group A and group B was 46 min (range, 25-115 min) and 47 min (range, 30-110 min), respectively. There were no significant differences in the operation duration and length of hospital stay between the two groups. The distribution of patients according to group, sex, length of hospital stay, and length of stay in the intensive care unit (ICU) is shown in Table 1.

The majority of patients (79%) were classified as 3-4 according to the Ranson criteria. According to Ranson criteria, no significant difference was detected between the groups length of hospital stay, operation duration, and complications. The Ranson criteria values of patients according to sex and group are shown in Table 2.

Patients were assessed with the ASA scoring system, but a statistically significant comparison could not be performed because of the low number of patients who were ASA 1. The groups were then classified into ASA 1-2 and ASA 3-4. There was no significant difference in the operation duration and length of hospital stay between the two groups. However, the length of stay in the ICU was greater in the ASA 3-4 group ($p = 0.301$). The ASA scores of patients according to sex and groups are shown in Table 3.

Hypertension was the most common comorbidity in both groups. Heart disease was more common in men, and diabetes mellitus was more common in women. The distribution of comorbidities according to group and sex is shown in Table 4.

One patient in group A with an ASA score of 4 died in the ICU of respiratory problems. One patient who underwent laparoscopic cholecyctectomy required conversion to laparotomy because of the inefficiency of laparoscopic exploration. There was no significant difference in mortality and morbidity rates between group A and group B. Postoperative oral intake started within 8 h in all cases.

Table 3— Relationship Between ASA Score and Complications Among the Groups

Group/Sex		ASA 1	ASA 2	ASA 3	ASA 4	Total
A	M	2	7	12	4	25
	F	3	10	16	4	33
	Total	5	17	28	8	58
B	M	2	2	1	4	9
	F	2	4	5	1	12
	Total	4	6	6	5	21
Total	M	4	9	13	8	34
	F	5	14	21	5	45
	Total	9	23	34	13	79

ASA scores of patients according to sex and groups

Table 4— Distribution of Comorbidities Among the Groups

Group/Sex		Hypertension		Lung Disease		DM		Renal Disease		Heart Disease	
		N	%	N	%	N	%	N	%	N	%
A	M	7	12	2	3	6	10	-	-	8	13
	F	16	27	1	1.7	8	13	2	3%	5	8
B	M	3	14	1	4	-	-	1	4	5	19
	F	7	33	3	14	3	14	-	-	2	9

DM: Diabetes Mellitus

Discussion

AP, which is the inflammation of the pancreas, can present in a large spectrum, from a self-limiting disease to a serious clinical picture, which can lead to sepsis and death. Acute biliary pancreatitis may present as a mild condition that can resolve in a few days, as well as a severe condition that requires hospitalization, presents with local and systemic complications, and can lead to death (13). The systemic inflammatory response and complications that accompany pancreatitis cause an increase in disease-related mortality rates (9,12).

A detailed history, physical examination, laboratory tests, and imaging are required for the diagnosis of acute biliary pancreatitis. The etiology of AP is gallstone pancreatitis in 35%-40% of cases worldwide, but it comprises the majority of cases in Turkey [13]. Biliary diseases are one of the most common reasons for acute gastrointestinal hospitalization. The number of elderly patients with symptomatic gallstones is increasing as life expectancy rises (14,15). Elderly patients who are referred to a hospital with gallstones are often hospitalized with the suspicion of AP. Advanced age is also associated with the presence of comorbid diseases and insufficient functional reserve (16).

Gallstone passage through the common bile duct and ampulla of Vater is the main cause of biliary AP. Biliary decompression can be performed with ERCP and endoscopic sphincterotomy (17,18). In our study, 14 patients were at high surgical risk according to the ASA score, and they underwent ERCP to reduce the risk of recurrence. These patients were excluded from our study. Four cases of stones in the biliary tract were confirmed preoperatively with MRCP; these patients underwent ERCP and stone removal from the common bile duct with ERCP, followed by cholecystectomy.

After biliary pancreatitis, patients may experience recurrence of biliary pancreatitis or other biliary events such as biliary colic, cholangitis, choledochal obstruction, and acute cholecystitis (13,20). Cholecystectomy or endoscopic sphincterotomy following biliary pancreatitis is advised according to the guidelines to prevent these recurrent biliary events (20). Taking this advice into consideration, early LC is performed after recovering from the first episode of mild biliary pancreatitis. Laparoscopic procedures provide the advantages of dec-



reased pain, shorter convalescence, reduced operative stress, and limited inflammatory process.

The safety and efficacy of LC in biliary AP have been accepted as a standard approach and become the standard of care for gallbladder removal, but the timing of LC remains controversial (21). Delayed cholecystectomy is associated with new biliary attacks and may even increase overall morbidity and length of hospital stay.

If there are local complications such as pancreatic necrosis and organ failure, cholecystectomy should be delayed until the complications resolve, typically after approximately 6 weeks (22). In our study, 51 patients were diagnosed as having severe ABP, and elective cholecystectomy was suggested for patients with severe pancreatitis who were discharged after clinical recovery.

There is an undeniable necessity for an evidence-based treatment protocol based on factors such as patient age, comorbidities, presence of complicated gall bladder disease, and previous operations. The current data are insufficient to support the routine use of LC in elderly patients, although the best evidence to date shows a stable tendency in favor of laparoscopic procedures in terms of mortality, morbidity, and cardiac and respiratory complications in selected cases (23).

In the literature, it has been reported that LC is safe in elderly patients, with low morbidity and mortality rates, and the perioperative outcomes in elderly patients depend on the severity of gall bladder disease rather than chronologic age (24). Early LC in patients who have acute cholecystitis is associated with lesser surgical stress and shorter hospital stays.

In conclusion, cholecystectomy is a definitive treatment for elderly patients with gallstone disease in the prevention of recurrent pancreatitis without increasing the surgical complication rate. Early LC can be indicated for elderly patients with mild acute biliary pancreatitis and acceptable morbidity and mortality risks. LC reduces the risk of complications caused by recurrent pancreatitis in elderly patients. Therefore, surgery should be performed at the first admission.

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RESEARCH

DOES PRIMARY TUMOR RESECTION AFFECT SURVIVAL IN ELDERLY PATIENTS WITH METASTATIC GASTRIC CANCER?

ABSTRACT

Introduction: In this study, the effect of primary tumor resection (PTR) on the survival of patients with metastatic gastric carcinoma (mCG) aged over 65 years was aimed to be searched.

Materials and Method: In total, 98 patients with mCG from the Akdeniz University, Necmettin Erbakan University, and Antalya Training and Research Hospital databases who were aged over 65 years were retrospectively evaluated. The patients were divided into two groups based on PTR: PTR (+) and PTR (-).

Results: The median progression-free survival in the PTR (+) group was 10.2 months (95% confidence interval [CI] 6.6–13.7) and in the PTR (-) group was 5.9 months (95% CI 2.6–9.3) (p=0.054). When we evaluated the overall survival (OS) of the groups, the median OS was significantly higher in the PTR (+) group (11.5 months, 95% CI 8.4–14.6) than in the PTR (-) group (7.2 months, 95% CI 4.3–10.0) (p=0.001). In the final multivariate analysis, none of the parameters studied were independent prognostic factors.

Conclusion: PTR may be beneficial for the survival of patients with mGC aged over 65 years.

Kew Words: Stomach Neoplasms; Geriatrics; General Surgery; Mortality.

ARAŞTIRMA

PRİMER TÜMÖR REZEKSİYONU YAŞLI METASTATİK GASTRİK KANSERLİ HASTALARDA SAĞKALIMI ETKİLER Mİ?

ÖZ

Giriş: Bu araştırmada 65 yaş üstü metastatik gastrik kanserli (mGK) hastalarda tanıda primer tümör rezeksiyonunun (PTR) sağ kalıma etkisinin araştırılması amaçlanmıştır.

Gereç ve Yöntem: Altmış beş yaş üstü mGK'lı 98 hasta verisi Akdeniz Üniversitesi, Necmettin Erbakan Üniversitesi ve Antalya Eğitim ve Araştırma Hastanesi veritabanlarından retrospektif olarak incelendi. Hastalar PTR'ye gore PTR (+) ve PTR (-) olarak iki gruba ayrıldı.

Bulgular: PTR (+) grupta medyan progresyonsuz sağkalım 10.2 [95% CI 6.6-13.7] ay iken, PTR (-) grupta 5.9 [95% CI 2.6-9.3] aydı (p=0.054). Genel sağkalım açısından incelendiğinde PTR (+) grubun sağkalım süresi anlamlı olarak daha yüksek bulundu (p=0.001). PTR (+) grubun sağkalımı 11.5 [95% CI 8.4-14.6] ay iken, PTR (-) grubun sağkalımı 7.2 [95% CI 4.3-10.0] aydı. Çok değişkenli analizde hiç bir parametre bağımsız prognostik faktör olarak bulunamadı.

Sonuç: Altmış beş yaş üstü tanıda MGC hastalarda primer tümörün cerrahisinin sağ kalıma faydası olabilir.

Anahtar Sözcükler: Gastrik Neoplaziler; Geriatrik, Cerrahi; Sağkalım.

Introduction

The incidence and mortality of gastric cancer (GC) has decreased in the last two decades. However, 40% of all GC cases are stage IV cancers (1). The 5-year survival in patients with metastatic gastric cancer (mGC) rarely exceeds 5%, and the prognosis for these patients is poor (2). Palliative chemotherapy is the treatment of choice for mGC, although the effect of non-curative gastric resection remains contentious, apart from in emergency surgical treatment.

The effect of primary tumor resection (PTR) on survival is currently being researched and has been shown to increase survival in patients with advanced-stage colon, breast, and renal cancers (3-5). Some studies on mGC have also shown that PTR has a positive effect on survival (6-10).

The incidence of GC increases with age, with the median age being 70 years for men and 74 years for women (11). Despite incidence increasing with age, most GC studies focused on patients under 70 years. Although the role surgery in patients with mGC is a matter of debate, it is known that age is an important factor for morbidity and mortality, even in the setting of curative GC surgery (12). Therefore, we studied the effect of PTR on the survival of elderly patients with mGC.

Materials and Method

Between February 2008 and March 2015, 98 patients with mGC from Akdeniz University, Necmettin Erbakan University, and Antalya Training and Research Hospital were retrospectively evaluated. Ethical approval was obtained from Akdeniz University Medical Faculty Clinical Investigations Ethics Committee. The patients were divided into two groups based on PTR: PTR (+) and PTR (-). Patients in the PTR (+) group received emergency or elective surgery due to tumor-related complications. Metastases were detected preoperatively, intraoperatively, or postoperatively in these patients.

All patients had histologically confirmed gastric adenocarcinoma, aged over 65 years, with ECOG performance ≤2, without any organ dysfunction, and were diagnosed with stage IV carcinoma (any T, any N, or M1; as listed in the American Joint Committee on Cancer, 7th ed.) by imaging or laparotomy. Gastric resections were total, subtotal, or distal gastrectomy without the removal of other metastatic lesions. Patients who had underwent non-resectional operations such as bypass surgery, jejunostomy, and gastrostomy; patients receiving neoadjuvant chemotherapy, radiotherapy, combination therapy, or who had relapsed or recurrent gastric carcinomas, and other synchronous tumors were excluded from analysis.

We retrospectively obtained patients' age, sex, comorbidities, smoking status, tumor grade, cerbB2 status, metastatic area, first-line chemotherapy, and radiologic M-stage from the medical archives of the participating hospitals. The date of diagnosis, date of progression under first-line chemotherapy, and date of death for the patients were also obtained. Overall survival (OS) was defined as the time from the beginning of treatment to death.

Statistical analyses were performed using SPSS version 16.0 (SPSS for Windows, Version 16.0. Chicago, SPSS Inc.). To determine the properties of the groups and compare patient and tumor characteristics between them, frequency analysis, chi-square tests, and two independent samples *t*-tests were used. The effect of PTR on the OS of patients with mGC was investigated using a log-rank test. Kaplan–Meier survival estimates were calculated. Multivariate analysis was performed with a Cox proportional hazards regression model. Factors with p values of <0.150 were included in the multivariate analysis. A p value of <0.05 was considered statistically significant.

Results

Patient Characteristics

A total of 98 patients with mGC (aged over 65 years) from the Akdeniz University, Necmettin Erbakan University, and Antalya Training and Research Hospital were included in the analysis. The PTR (+) group comprised 32 patients who underwent PTR and the PTR (-) group included 66 patients who did not undergo surgery. Patient characteristics are presented in Table 1. The mean age of patients in the PTR (+) group was 74.1 years (±5.7 years) and that of patients in the PTR (-) group was 71.8 years (±4.6 years). Both groups had male predominance, and 50% of those in the PTR (+) group had other comorbid diseases. Both PTR (+) and (-) patients had similar histological grades (p=0.038) and metastatic areas (p=0.237). Cerb-B2 positivity was dominant in the PTR (-) group, but this was not statistically significant (p=0.800). More patients in the PTR (+) group had not received first-line chemotherapy, although this was not statistically significant (p=0.187).

Survival Analysis

Patient clinic and pathological characteristics were similar for the two groups. Some patients (18.8%) were diagnosed radi-



Table 1— Properties of the Patients According to Primary Tumor Resection (PTR)

	PTR (-) (n:66)	PTR (+) (n:32)	P value
Age (mean)	71,8±4,6	74,1±5,7	0.038
Sex			0.330
Female	24,2% (16)	15,6% (5)	
Male	75,5% (50)	84,4% (27)	
Comorbidity			0.672
Yes	54,5% (36)	50% (16)	
No	45,5% (30)	50% (16)	
Smoking			0.866
Yes	42,4% (28)	40,6% (13)	
No	57,6% (38)	59,4% (19)	
Grade			0.038
1	12,5% (5)	19,2% (5)	
2	20% (8)	34,6% (9)	
3	27,5% (11)	38,5% (10)	
Unknown	40% (16)	7,7% (2)	
CerbB2 Positivity			0.800
Yes	10,4% (5)	5,3% (1)	
No	29,2% (14)	31,6% (6)	
Unknown	60,4% (29)	63,2% (12)	
Metastatic area			0.237
Only Liver	45,5% (30)	28,1% (9)	
Only Lung	0% (0)	6,2% (2)	
Only Peritoneal	19,7% (13)	28,1% (9)	
Only Bone	1,5% (1)	3,1% (1)	
Other	10,6% (7)	12,5% (4)	
≥2 organs	22,7% (15)	21,9% (7)	
First-line CT			0.187
Yes	83,3% (55)	71,9% (23)	
No	16,7% (11)	28,1% (11)	
Radiologic M stage			0.002
Local Disease	1,5% (1)	18,8% (6)	
Metastatic Disease	98,5% (65)	81,2% (26)	

ologically as having localized disease; however, they were intraoperatively diagnosed with stage IV gastric carcinoma.

The median progression-free survival (PFS) was 10.2 months (95% confidence interval [CI] 6.6–13.7) in the PTR (+) group, and 5.9 months (95% CI 2.6–9.3) in the PTR (-) group (p=0.054). The PFS curves are shown in Figure 1. We also found that the median OS was significantly higher in the PTR (+) group at 11.5 months (95% CI 8.4-14.6) than the PTR (-) group (7.2 months, 95% CI 4.3-10.0) (p=0.001). The OS curves are shown in Figure 2.

Patient age, sex, comorbidities, smoking status, grade, cerbB2 status, metastatic area, first-line chemotherapy, radiologic M-stage, and PTR were included the univariate analysis. The p values for these factors are presented in Table 2. Following this factors with p values of <0.150 were included in the multivariate analysis: cerbB2 status, first-line chemotherapy, radiologic M-stage, and PTR. In the final multivariate analysis, none of the parameters were found to be independent prognostic factors.

Discussion

Patients with stage IV GC are treated with palliative chemotherapy, and survival rates are low. Surgery in these patients is reserved for tumor related complications such as blee-

Table 2— Results of Univariate Analysis

	p value
Age	0.657
Sex	0.319
Comorbidity	0.749
Smoking	0.930
Grade	0.542
CerbB2	0.026
Metastatic area	0.523
First-line CT (yes or no)	0.087
Radiologic M Stage	0.008
Primary Tumor Resection	<0.001

ding, perforation, and obstruction. Approximately 50% of patients with mGC receive surgery for these complications during their disease course (13). However, survival benefits obtained with gastrectomy for the remaining 50% of patients with mGC have been reported recently.

The hypothesis for the survival benefit of PTR in patients with mGC is a reduction of tumor load, which may also act as an immunosuppressant, removal of the main source for further metastases, and alleviation of symptoms related to gastric tumor.

Some previous studies have shown the importance of an increased risk of postoperative mortality in palliative surgery for patients aged over 70 years (14-16). The effect of PTR on survival of older adult patients, are available only as subgroup analyses in retrospective or prospective trials.

A retrospective Dutch gastric cancer trial (17) evaluated 285 patients with metastatic GC. The median survival of patients who underwent tumor resection (partial or total) was 8.1 months versus 5.4 months for surgery without resection (explorative or gastroenterostomy) ($p < 0.001$). Prognostic factors such as unresectable tumor, hepatic metastasis, peritoneal metastasis, and distant lymph node metastasis were evaluated, median survival was in favor of resection in the presence of one factor (10.5 months vs. 6.7 months) ($p=0.034$). However, in the presence of two or more factors, statistically significant survival benefit was not observed. Survival benefit of tumor resection did not differ in age stratification of the resection group (8.0 months in younger than 70 years old vs. 8.1 months in older than 70 years old). Significantly higher surgical morbidity and longer hospital stay was reported in resection group. Although mortality was also higher (20% vs. 9%), difference was not significant ($p=0.06$). The trial results revealed that age is an important factor, together with the metastatic site in patients undergoing PTR. Authors hypothesized that PTR is potentially beneficial for patients younger than 70 years with limited metastatic disease (17).

We found a two-fold increase in PFS and an increase in the median OS of 4.5 months in patients who underwent PTR; even though the mean age of patients who underwent PTR was over 70 years. In addition, there were no differences in metastatic areas between the two groups in our study; however, there was a relatively high proportion of patients with two or more visceral organ metastases (21.9%). Although our patients had more metastatic sites, survival was 3.5 months longer when compared with the Dutch gastric cancer trial.

In a retrospective trial with 63 patients with mGC who received palliative gastrectomy (18), the median age at diagnosis was 64 years (range 21–7 years), and the median survival was 12 months in patients aged over 60 years. This result is consistent with our results for median survival (11.5 months), although the patients who received PTR in our study were older (mean age 74 years, ±5.7 years). In addition, peritoneal metastases were present in 48% of the patients in the previous trial, whereas 56% of our patients had visceral metastases inappropriate for surgery (28.1% hepatic, 6.2% lung, 21.9% two or more). Only 28% of our patients had peritoneal metastases.

In a multicenter study that reported survival of non-curative surgery for mGC (19), the median survival of patients aged over 70 years (n=183) was 5.5 months; our patients survived two-fold longer. However, the previous analysis included both PTR and non-resectional surgery, whereas our analysis did not include non-resectional surgery.

In another study including 48 patients with mGC undergoing surgery (13), non-curative resection was shown to increase survival when compared with non-resectional surgery (15 months vs. 5 months). Our results showed similar benefits; however, that study was conducted with a relatively younger patient group (aged over 50 years). Survival was not affected by sex, peritoneal carcinomatosis, or hepatic metastatis but was effected by postoperative chemotherapy and multiple visceral metastases. We did not find that any of these factors affected survival in our study.

In a Turkish study with 236 patients receiving non-curative gastrectomy (20), the PFS results for patients who received surgery versus patients who did not were similar to those in our study (10 months vs. 6 months). In that study, the OS was 14 months for those who received surgery and 9 months for those that did not. However, in the surgery group, 20 pa-



tients underwent metastasectomy; patients who had surgery predominantly had peritoneal metastases, whereas patients who did not receive surgery predominantly had visceral metastases. Single hepatic metastasis was common in the surgery group ($p<0.001$), and first-line chemotherapy was higher in the non-operative group ($p=0.01$). The mean age of patients in that study was 56 years; however, no differences in PFS and OS were seen when patients aged over 50 years were compared with patients younger than 50 years. In our study, none of the patients received metastasectomy, there were no differences in metastatic sites between the groups, and both groups had similar percentages of first-line chemotherapy.

There were some limitations in our study. In particular, access to technical surgery data, and data for surgical mortality and morbidity, hospital stay, quality of life, total tumor load in metastatic areas, primary tumor localization, and regimen of first-line chemotherapy was either limited or inaccessible. Even so, the two study groups were evenly distributed, and we found a survival benefit of PTR (PFS of 10.2 months and an OS of 11.5 months) in older adult patients with mGC (aged over 65 years). Further prospective randomized studies with larger sample sizes are needed to confirm these findings.

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RESEARCH

A STUDY WHICH INVESTIGATES THE RELATIONSHIP OF AGE, TRUNK STRENGTH, AND BALANCE PARAMETERS WITH FALL RISK

ABSTRACT

Introduction: Age-related neural and sensory deteriorations and decline of the musculoskeletal systems affect balance and increase the risk of fall. Our objective in this study is to determine how balance and the risk of fall are affected by increasing age, and search the role of trunk muscle strength on balance.

Materials and Method: A total of 90 female voluntary participants were divided into the age groups of 20–39, 40–59 and ≥60 years (n = 30 for each group). Static balance abilities and the fall risks of the subjects were determined using a computer-aided static posturography device and their trunk muscle strength at 60°/s and 120°/s were assessed using the isokinetic dynamometer equipment.

Results: When the 20–39 age groups are compared with 40–59 and ≥60 age groups regarding the balance measurements, higher index values at low and medium frequency oscillations were detected. Assessment of the correlation between age and Fourier indexes showed that more balance scores were found to deteriorate with increasing age. The deterioration in the balance parameters was observed to be correlated with the trunk flexor and extensor muscle strength, reducing with increasing age.

Conclusion: It was determined that static balance parameters tend to deteriorate and the risk of falls increases with increasing age. The decreasing trunk muscle strength was found to be related to the decline in balance ability and an increased risk of falling.

Kew Words: Aged; Postural Balance; Accidental Falls.

ARAŞTIRMA

YAŞ, GÖVDE KAS KUVVETİ VE DENGE PARAMETRELERİ İLE DÜŞME RİSKİ ARASINDAKİ İLİŞKİYİ İNCELEYEN BİR ARAŞTIRMA

ÖZ

Giriş: Yaşla ilişkili nöral, sensoriyal ve/veya kas iskelet sistemlerindeki bozulmalar dengeyi etkilemekte ve düşme riskini arttırmaktadır. Bu çalışmanın amacı; artan yaşla birlikte dengenin ve düşme riskinin nasıl etkilendiğini saptanması ve gövde fleksör ve ekstansör kas kuvvetinin denge üzerindeki rolünün araştırılmasıdır.

Gereç ve Yöntem: Yaş dağılımı 20-39, 40-59, 60 yaş ve üzerinde olan üç yaş grubundan, her gruptan 30'ar kişi olmak üzere toplam 90 kadın gönüllü çalışmaya alınmıştır. Katılımcıların statik denge yetenekleri ve düşme riskleri bilgisayar destekli statik postürografi cihazı, 60 ve 120 derece/saniyedeki gövde ekstansör ve fleksör kas kuvveti izokinetik dinamometre cihazı kullanılarak değerlendirilmiştir.

Bulgular: Denge ölçümlerinde 20-39 yaş grubu 40-59 ve 60 yaş ve üzeri grupları ile karşılaştırıldığında düşük ve orta salınım frekanslarda yüksek indeks değerleri saptanmıştır. Yaş ve Fourier indeks değerleri arasındaki korelasyonu değerlerlendirildiğinde ilerleyen yaşla birlikte daha fazla denge skorunda bozulma olduğu görülmüştür. Denge parametrelerindeki bu bozulmanın yaşla birlikte azalan gövde fleksör ve ekstansör kas kuvveti ile ilişkili olduğu tespit edilmiştir.

Sonuç: İlerleyen yaşla birlikte statik denge parametrelerinin bozulma eğilimde olduğu ve düşme riskinde artış olduğu saptanmıştır. Azalan gövde kas gücünün azalan denge kabiliyeti ve düşme riskinde artış ile ilişkili olduğu bulunmuştur.

Anahtar Sözcükler: Yaşlı; Postural Denge; Düşme Riski.

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INTRODUCTION

As a part of life, ageing is a progressive process in which physiological changes in several organ systems occur along with an increase in the incidence of acute and chronic diseases. Maintaining trunk balance in old age is essential to perform many physical functions and for the functional independency of the ageing individual. Loss of function in afferent and efferent mechanisms that maintain balance occurs with ageing. In a previous study, it was reported that the balance was deteriorated in 13% of individuals of ages between 65–69 years and in over 46% of individuals of ≥85 years of age (1). Additionally, adequate trunk control is necessary for postural control, to achieve stability (balance) during the posture changings and perform daily life activities and normal mobility. The decreases in muscle mass, strength and durability that occur with ageing also adversely affect the balance. In a study carried out on the old, it was reported that the balance protection capacities of the patients whose ankle dorsiflexion muscle strength was increased via electrostimulation of the ankle dorsiflexor muscles was also increased. (2). It is also known that a balance disorder constitutes a risk factor for falling, especially in older individuals (3). The purpose of this study is to determine the effect of age on static balance parameters and risk of falls, as well as examining the role of trunk flexor and extensor muscle strength in balance.

MATERIALS AND METHOD

A total of 90 female participants who had applied to outpatient rehabilitation clinic, between the age of 20–82 years with an average age and standard deviation (sd) of 49.47±17.61 years were included in this study. The participants were divided into three age groups of 20–39, 40–59 and ≥60 years, with 30 participants in each group. The average ages and SD of each of these age groups were 28.63±3.96, 50.33±5.40 and 69.46±6.57 years, respectively.

Participants who were found fit to perform the balance tests and capable of ambulating independently without the use of any assistive device were included in the study. Those who had neurologic, psychiatric and cognitive disorders, visual impairments, hearing difficulties, or acute diseases that cause balance disorder were excluded from the study. Demographical data (age, height, weight, smoking status, background and family history) of the participants were collected. All subjects provided written informed consents.

This study was approved by Baskent University Institutional Review Board and Ethics Committee (Project no: KA09/385) and supported by Baskent University Research Fund and all subjects provided written informed consent.

Assessment of Balance and Risk of Fall

Static balance abilities and fall risks of the participants were assessed through a computer-aided static posturography device (Tetrax, Sunlight Medical Ltd.). This device is made up of a single platform, four independent sensors that measure the vertical pressure changes from the fingertips and heels of both feet and a computer that processes the digital data derived from the sensors. Tests were carried out by having the participants stand on the platform in eight different postures: normal posture, eyes open (NO); normal posture, eyes closed (NC); on pillow, eyes open (PO); on pillow, eyes closed (PC); head turned right, eyes closed; head turned left, eyes closed; head tilted 30° back, eyes closed and head tilted 30° down, eyes closed. The tests lasted 32 s per posture. Each participant's fall index was calculated by considering the oscillation rates from the posturographic software, general stability index (ST) for each of four postures (i.e. NO, NC, PO and PC) and the measurements made in F1–8 frequencies within a range of 0.01–3 Hz were assessed. The stability index and general stability expressed by static posturography are the indicators of the oscillation on four plates and the steady posture of the participants. The stability index (ST) measured by static posturography is a mathematical and numerical result that expresses the extent of posture oscillation. Static posturography stability index is the numerical expression of the patients' posture disorders, controls and remedies that cannot be observed clinically. Moreover, this index is independent of the weight and height of the individual. A Fourier frequency within the range of 0.01–0.1 Hz is referred to as a low frequency (F1), and it is related to the visual control, normal posture and undisturbed posture. The frequencies within the range of 0.1–0.5 Hz are referred to as a low-medium frequency (F2–4) band and are sensitive to vestibular stress and disorders. The frequencies within the range of 0.5–1 Hz are considered to be in the medium-high frequency (F5–6) band and reflect the somatosensory activity and postural reflexes related to the lower extremities. Frequencies >1 Hz (F7–8) originate from central nervous system dysfunctions (4). The general stability index in the assessed posture fall index and the high scores in the F1–8 Fourier analyses were assessed as higher instability. Fall Index Assessment with static posturography is designed to assess the individual's risk of falling. The static posturography fall index was obtained from the balance measurements of patients and is an indicator of the balance disorders in patients. Individuals with a fall index of 0–36 are classified as having a low risk of falling; 36–56 as a medium risk and 56–100 as a high risk. There have been some articles that have used the fall index as an indicator for the risk of falling in the literature (5).

Assessment of Trunk Muscle Strength

Trunk extensor and flexor muscle strengths of the participants were assessed through the use of Cybex 770 Norm (Lumex Inc., Ronkom Koma, RY, USA) equipment. Measurements were carried out at times when the participants felt fine and were fully motivated. The participants stood with an upright posture with both of their feet touching the foot support of the waist unit, with their back leaning against the scapular support of the equipment. Moreover, their chest was supported by a chest pillow, the abdomen was fastened with a safety belt and the use of special stabilisers was aligned with both the lower extremities of the femur and the knees. The participants' anatomic neutral postures while standing in the upright position were determined. Trunk extension and flexion gaps were entered into the device in degrees. The trunk extension was limited to 15°, whereas flexion was limited to 95°. Measurements were carried out using the isokinetic modes available in the software of the Cybex Norm 700 device. The isokinetic measurements were tested at the rates of 60°/s and 120°/s, with five repetitions for each set and 30 s of rest time between each set. The device and the procedures to be followed were introduced to the participants three to four times in advance. It was also ensured that the participants were motivated and familiarised with the device, and the tests were conducted afterwards. Verbal warnings were made to motivate the participants, and the maximum muscle strength was achieved by encouraging the participants. The peak torque values [Nm] were obtained in consequence of all the measurements, and recorded as the foot/pound (ft/lb), as the default unit of measure used by the device.

Statistical Analysis

Data analyses were conducted on SPSS for Windows 11.5 program. The point whether the distribution of continuous variables was normal was examined with the Shapiro–Wilks' test. Descriptive statistics were set forth as median (interquartile range). The importance of the differences among age groups, in terms of fall index, Fourier index in different postures, general stability measurements and body muscle strength indicators was assessed by means of the Kruskal–Wallis test. In the case that the result of the Kruskal–Wallis test statistic was found important, the multiple comparison test was utilized in order to determine the cases that lead to significant differences. The point whether there was a significant correlation between the continuous variables was examined by the Spearman's correlation test. $p<0.05$ was considered statistically significant.

Results

The increase in the fall index values with increasing age was found to be statistically significant ($p<0.05$). Additionally, there was a statistically significant difference in terms of the fall index values between the age groups of 20–39 and ≥60 years, as well as 40–59 and ≥60 years ($p<0.05$) (Table 1).

Table 1— Fall Index Values by Age Group. Correlation Coefficients and Significance Levels Between Age, Fall Index Values and Trunk Muscle Strength Indicators

Variables			**Fall Index**	
Age			**Median (IR)**	
20–39 years (n = 30)			25.0 (30.0)*	
40–59 years (n = 30)			28.0 (30.5)†	
?60 years (n = 30)			41.0 (39.0)*,†	
P			0.029	
Trunk strength	Age		Fall Index	
	r	**p**	**r**	**p**
Flexion at 60 d/s	-0.479	<0.001	-0.262	0.012
Flexion at 120 d/s	0.009	0.933	0.004	0.969
Extension at 60 d/s	-0.464	<0.001	-0.210	0.047
Extension at 120 d/s	-0.087	0.417	-0.154	0.146

IR, Interquartile range

*Statistically significant difference between the age groups of 20–39 and ?60 years (p = 0.010)

†Statistically significant difference between the age groups of 40–59 and ?60 years (p = 0.012)



Table 2— Examination of the Fourier Indexes for Different Postures and General Stability Values by Age Group

Variables	20–39 years		40–59 years		≥60 years		p
	Median	IR	Median	IR	Median	IR	
F1NO	15.88	13.68	13.10	8.71	13.27	9.87	0.131
F2NO	9.67	7.29	10.55	4.28	9.48	5.33	0.591
F3NO	5.97	3.69	7.46	4.50	6.15	3.09	0.403
F4NO	4.45	2.27	4.86	2.79	4.83	2.04	0.751
F5NO	2.81	1.07	2.97	1.23	2.72	1.66	0.478
F6NO	1.70	1.14	1.84	1.32	1.78	1.29	0.863
F7NO	0.65	0.46	0.67	0.35	0.74	0.39	0.869
F8NO	0.16	0.20	0.18	0.15	0.17	0.15	0.639
F1NC	11.06	5.49	13.53	8.58	12.10	8.88	0.358
F2NC	10.15‡	2.79	13.31‡	7.08	12.71	4.60	0.007
F3NC	7.99	3.75	8.61	5.69	9.11	5.14	0.408
F4NC	6.28	3.50	6.24	3.92	6.67	3.22	0.625
F5NC	3.46	1.86	3.95	2.20	3.92	3.59	0.180
F6NC	2.16	1.13	2.96	2.12	3.33	3.12	0.058
F7NC	0.79	0.49	0.83	0.51	0.98	0.92	0.312
F8NC	0.19	0.14	0.16	0.12	0.15	0.18	0.520
F1PO	18.13	10.77	14.38	8.50	15.71	12.67	0.419
F2PO	8.76	4.64	10.75	6.75	10.52	6.73	0.681
F3PO	5.69§	3.04	6.71	4.20	7.54 §	3.45	0.011
F4PO	4.08	1.93	4.86	1.78	5.09	2.73	0.097
F5PO	3.18	1.09	3.29	1.16	3.45	1.93	0.711
F6PO	2.40	1.67	2.49	0.87	2.11	1.30	0.453
F7PO	0.79	0.38	0.83	0.28	0.87	0.39	0.563
F8PO	0.18	0.11	0.17	0.15	0.18	0.14	0.814
F1PC	15.31	12.01	18.99	12.36	14.44	9.71	0.138
F2PC	13.41	6.16	13.84	9.78	14.92	5.67	0.578
F3PC	10.92	6.31	11.43	6.95	9.24	5.56	0.326
F4PC	6.99	4.04	8.01	4.23	8.27	6.40	0.263
F5PC	5.34	2.23	5.57	2.27	4.90	2.72	0.690
F6PC	3.82	2.48	4.27	2.22	3.34	2.36	0.370
F7PC	1.23	0.76	1.32	0.53	1.30	1.06	0.452
F8PC	0.21	0.25	0.18	0.09	0.19	0.11	0.405
NOST	10.85	4.16	12.08	5.82	11.29	5.52	0.557
NCST	15.94§	6.25	16.98	8.40	21.15 §	12.48	0.037
POST	14.14	5.53	14.46	4.63	13.72	6.67	0.792
PCST	22.35	10.24	25.95	9.41	23.75	15.92	0.127

IR, Interquartile range

‡Statistically significant difference between the age groups of 20–39 and 40–59 years (p = 0.006)

§Statistically significant difference between the age groups of 20–39 and ≥60 years (p<0.01).

Examining the general stability values and Fourier indexes of different postures by age group, a statistically significant difference between the age groups of 20–39 and 40–59 years was determined for the F2NC values (p<0.05). On the other hand, between the age groups of 20–39 and ≥60 years, statistically significant differences were found for the NCST and F3PO values (p<0.05) (Table 2).

In the examination of the trunk flexor and extensor muscle strength values at the rates of 60°/s and 120°/s by age group were, it was found out that there was a statistically signi-

Table 3— Examination of Trunk Muscle Strength Values (nm) By Age Group

Variables	20–39 years		40–59 years		≥60 years		p
	Median	IR	Median	IR	Median	IR	
Flexion at 60 d/s	64.50‖	31.00	55.50¶	31.50	28.50‖,¶	49.25	<0.001
Flexion at 120 d/s	28.00	17.75	30.00	23.75	30.50	25.25	0.717
Extension at 60 d/s	33.50‖,#	19.75	27.50¶,#	17.00	18.50‖,¶	18.25	0.003
Extension at 120 d/s	11.50	9.75	12.00	10.50	11.50	12.75	0.767

IR, Interquartile range

‖Statistically significant difference between the age groups of 20–39 and ≥60 years (p<0.001)
¶Statistically significant difference between the age groups of 40–59 and ≥60 years (p<0.05)
#Statistically significant difference between the age groups of 20–39 and 40–59 years (p<0.05)

ficant decrease in the trunk flexor muscle strength at a rate of 60°/s between the age groups of 20–39 and ≥60 years (p<0.05). In addition, statistically significant differences were detected for the trunk extensor muscle strength at 60°/s between the age groups of 20–39 and ≥60 years, 20–39 and 40–59 years, as well as 40–59 and ≥60 years (p<0.05) (Table 3).

The correlation coefficients and levels of significance between age and fall indexes, as well as the different posture Fourier indexes and general stability values, exhibited statistically significant differences in F2NC, F3NC, F5NC, F6NC, F3PO, F4PO and NCST stability scores according to age (p<0.05). Statistically significant differences were also found between all balance scores and fall index values (p<0.05) (Table 4).

Examination of the correlation coefficients and significance levels between the trunk muscle strength indicators and Fourier indexes for different postures and general stability showed statistically significant relations between F4NO, F2NC, F4NC, F5NC, F4PO, NOST, NCST and PCST balance scores and body flexor muscle strength at 60°/s (p<0.05). While a statistically significant relationship between the F3PO, F4PO, NCST and PCST balance scores and extensor muscle strength at 60°/s was found (p<0.05). Moreover, the extensor muscle score at 120°/s was determined to be statistically significant with only F4PO (p<0.05) (Table 5).

Examination and comparison of the correlation coefficients and significance levels between age and fall index, as well as the trunk muscle strength indicators, revealed the presence of a statistically significant difference between the flexor and extensor muscle strength indicators and the age and fall index values (p<0.05) (Table 1).

Table 4— Correlation Coefficients and Significance Levels Between The Fall Index and Fourier Indexes for Different Postures and General Stability

Variables	Age		Fall Index	
	r	p	r	p
F1NO	-0.204	0.053	0.237	0.024
F2NO	-0.071	0.505	0.305	0.003
F3NO	0.069	0.517	0.264	0.012
F4NO	0.110	0.301	0.366	<0.001
F5NO	0.016	0.883	0.400	<0.001
F6NO	0.075	0.484	0.470	<0.001
F7NO	0.042	0.691	0.482	<0.001
F8NO	-0.103	0.332	0.305	0.003
F1NC	0.045	0.675	0.289	0.006
F2NC	0.219	0.038	0.394	<0.001
F3NC	0.230	0.029	0.446	<0.001
F4NC	0.155	0.144	0.392	<0.001
F5NC	0.220	0.037	0.437	<0.001
F6NC	0.242	0.021	0.424	<0.001
F7NC	0.151	0.155	0.443	<0.001
F8NC	-0.096	0.367	0.309	0.003
F1PO	-0.136	0.200	0.256	0.015
F2PO	0.157	0.140	0.474	<0.001
F3PO	0.317	0.002	0.432	<0.001
F4PO	0.313	0.003	0.570	<0.001
F5PO	0.123	0.250	0.402	<0.001
F6PO	-0.090	0.401	0.252	0.016
F7PO	0.127	0.233	0.474	<0.001
F8PO	0.077	0.471	0.398	<0.001
F1PC	-0.077	0.472	0.228	0.031
F2PC	0.146	0.170	0.363	<0.001
F3PC	-0.040	0.710	0.358	<0.001
F4PC	0.199	0.060	0.412	<0.001
F5PC	0.051	0.631	0.396	<0.001
F6PC	0.085	0.427	0.235	0.026
F7PC	0.141	0.184	0.387	<0.001
F8PC	-0.072	0.500	0.338	<0.001
NOST	0.122	0.251	0.434	<0.001
NCST	0.294	0.005	0.501	<0.001
POST	0.085	0.427	0.501	<0.001
PCST	0.187	0.078	0.384	<0.001



Table 5— Correlation Coefficients and Significance Levels Between Trunk Muscle Strength Indicators and Fourier Indexes for Different Postures and General Stability

Variables	Flexion at 60 d/s		Flexion at 120 d/s		Extension at 60 d/s		Extension at 120 d/s	
	r	p	r	p	r	p	r	p
F1NO	0.037	0.731	0.040	0.709	0.084	0.433	0.148	0.164
F2NO	-0.185	0.080	-0.149	0.160	0.022	0.839	0.030	0.779
F3NO	-0.144	0.177	-0.026	0.806	-0.056	0.603	-0.092	0.387
F4NO	-0.269	0.010	-0.021	0.846	-0.127	0.232	-0.105	0.325
F5NO	-0.038	0.726	-0.004	0.972	-0.033	0.756	-0.059	0.580
F6NO	-0.100	0.346	-0.008	0.943	-0.015	0.889	-0.012	0.907
F7NO	-0.144	0.177	-0.141	0.185	-0.061	0.571	-0.013	0.902
F8NO	-0.066	0.536	-0.099	0.355	-0.036	0.739	0.015	0.887
F1NC	-0.144	0.177	-0.103	0.333	-0.029	0.785	-0.112	0.294
F2NC	-0.274	0.009	-0.008	0.942	-0.130	0.220	-0.161	0.130
F3NC	-0.184	0.083	0.021	0.847	-0.089	0.402	-0.008	0.938
F4NC	-0.318	0.002	-0.025	0.812	-0.187	0.077	-0.049	0.645
F5NC	-0.271	0.010	0.086	0.421	-0.196	0.064	-0.046	0.665
F6NC	-0.155	0.144	0.195	0.065	-0.108	0.310	0.011	0.917
F7NC	-0.153	0.151	0.078	0.467	-0.121	0.254	-0.028	0.796
F8NC	-0.043	0.690	0.067	0.533	0.072	0.497	0.039	0.712
F1PO	0.040	0.711	-0.005	0.960	0.000	0.998	-0.043	0.686
F2PO	-0.097	0.363	0.017	0.875	-0.156	0.141	-0.050	0.643
F3PO	-0.139	0.191	0.114	0.284	-0.274	0.009	-0.061	0.566
F4PO	-0.306	0.003	0.015	0.890	-0.353	<0.001	-0.216	0.041
F5PO	-0.121	0.256	-0.002	0.982	-0.147	0.167	-0.078	0.467
F6PO	0.079	0.457	0.028	0.794	0.035	0.745	-0.125	0.239
F7PO	-0.139	0.192	-0.022	0.838	-0.158	0.136	-0.059	0.583
F8PO	-0.027	0.798	0.006	0.952	-0.104	0.331	-0.067	0.530
F1PC	-0.053	0.620	-0.040	0.711	0.172	0.105	0.005	0.960
F2PC	-0.178	0.094	-0.054	0.611	-0.159	0.134	-0.008	0.944
F3PC	-0.070	0511	0.038	0.720	-0.110	0.301	-0.039	0.715
F4PC	-0.205	0.052	0.151	0.156	-0.138	0.195	0.072	0.499
F5PC	-0.194	0.067	0.069	0.516	-0.171	0.107	-0.058	0.590
F6PC	-0.134	0.209	0.017	0.871	-0.145	0.172	-0.050	0.642
F7PC	-0.140	0.187	-0.093	0.383	-0.183	0.084	-0.109	0.306
F8PC	-0.029	0.785	-0.082	0.443	-0.017	0.874	-0.174	0.102
NOST	-0.233	0.027	-0.056	0.599	-0.130	0.222	-0.108	0.310
NCST	-0.265	0.011	0.046	0.667	-0.228	0.031	-0.077	0.473
POST	-0.133	0.213	-0.027	0.803	-0.146	0.169	-0.156	0.143
PCST	-0.244	0.020	0.000	0.999	-0.264	0.012	-0.110	0.302

Discussion

There are lots of studies in the literature that focus solely on the effect of age on balance and as a distinct factor. These studies exhibit a common finding that balance deteriorates with ageing and that age is an important factor affecting balance (6-8). Moreover, in our study, a comparison of the measurements of the balance parameters obtained through static posturography between the different age groups indicated that the age group of 20–39 years produced superior F2NC, NCST and F3PO balance scores to those of the other age groups. A statistically significant correlation was found to exist between age and F2NC, F3NC, F5NC, F6NC, F3PO, F4PO

and NCST balance scores. This finding indicates that a decrease in balance performance associated with age was found during the eyes closed condition and altered proprioception was found when standing on the pillows. In a previous study, participants whose eyes were closed performed worse on all balance tests than did sighted individuals (9). The more pronounced deficiency in the postural controls during this condition was suggested to exist due to the remaining sensory input systems being more challenged in the absence of visual feedback (10). Extremely accurate vestibular control is required for postural control while standing on pads. Alpini et al. found that in elderly persons, the pads provoke unsteadiness. Thus, under pad conditions, there is a positive correlation between stability and chronological age (8). Unsteadiness and balance disorders depend on the effectiveness of the sensorial cues (e.g. proprioception, somatosensation and vision). The combination of the sensory deficits with advancing age is likely responsible for the postural instability (11).

In a study including 163 healthy controls, Fujimato et al. evaluated the effect of age on postural control. In this study, there was an apparent increase in age-related postural oscillation in 7 patient groups classified using 10-year age increments, with a marked change in the group aged ≥75 years; however, the differences were less prominent in the middle-aged groups (12). The same study acknowledged that there is insufficient knowledge regarding the changes of postural oscillation during the middle-aged individuals. In our study, a greater disruption in the balance parameters was evident in the group aged ≥60 years, but differences between the 40–59- and ≥60-year age groups were not determined. This result highlights the need of using sensitive force platforms to reveal differences in the middle-aged group.

In studies where muscle strength increasing exercise programs are implemented, enhanced balance scores and a decrease in falling frequencies was manifested in line with the increased muscle strength (13,14). Trunk stabilisation is essential for maintaining static and dynamic balance. The apparently simple act of standing motionless is a continuing process of minute adjustments in body position to maintain the centre of gravity over the base of support (15). Attenuation of the trunk paraspinal and abdominal muscles was a significant predictor of standing balance in older adults (16).

In the systematic review of Granacher et al. when the data of the six sectional studies were examined it was reported that there was a small to moderate correlation between muscle composition and balance, functional performance and fall (17). At the same time, although age related lower limb was targeted in the treatment attempts of mobility, balance problems and fall, recently the role of the core stabilization detected in daily activities or/and movements related to sport have also been taken into consideration. Differently from the study we didn't perform postural evaluation in this collection it was detected that the body extensors of the elderly individuals in the kyphotic position proved to be particularly important in terms of balance and mobility. However, the results of our study, in which we found out that trunk flexor and extensor muscle strength and fall risk were related, were consistent with the results emphasizing the importance of trunk muscle strength.

Pradeep et al. demonstrated that the balance and mobility performances of elderly individuals are related to trunk muscle strength and endurance (18). In another study examining the relationship between balance and trunk muscles associated with core stability, it was reported that seated balance performance and trunk muscle responses are the best indicators of core stability (10). In our study, the relationship between trunk muscle strength and balance was assessed on the basis of standing postures.

In our study, it was determined that as age increases, the trunk flexor and extensor muscle strengths at 60°/s decreases, and the trunk flexor muscle strength at 60°/s was statistically significantly correlated with the F4NO, F2NC, F4NC, F5NC, F4PO, NOST, NCST and PCST balance scores. Statistically significant correlations were also found between the extensor muscle strengths at 60°/s and F3PO, F4PO, NCST and PCST balance scores and between the extensor muscle strength at 120°/s and the F4PO balance score. In line with these data and consistent with the findings provided in the literature, it is observed that the decreases in trunk extensor strength and particularly the flexor muscle strength are related to the deterioration in balance parameters. Previously, it was found that at least two control systems: a short-term mechanism and a long-term mechanism, operated during quiet standing (19). Trunk flexor and extensor strength are important for the long-term postural control mechanism. It has also been found that trunk extensor strength training led to an increase in body sway by causing a (neuro)muscular imbalance between the predominantly trained back and hip extensors and the abdominal trunk and hip flexors; thus increasing the open loop central control effort to maintain postural stability (20).

Gemalmaz et al. reported a serious and medium fall risks in 41 (40.6%) and 23 (22.8%) elder subjects, respectively, out of a total of 101 elder subjects (21). In our study, while



the fall index values were determined to increase with age, there were also statistically significant differences in the fall index values found between the age groups of 20–39 and ≥60 years, as well as between the age groups of 40–59 and ≥60 years. The prevailing opinion in the literature is that muscle strength decreases with age and results in an increased risk of falling (22). Moreover, in our study, an increase in the risk of falling was determined in relation to the age-related decrease in the body extensor and flexor muscle strength.

When evaluating these data and the results obtained in our study, there were some limitations. Negligence of the status of the lower extremity muscles of the subjects has been a major drawback of this study. The assessment of the trunk muscle strength and balance measurements conducted in our study is limited. When compared with the studies included in the literature, the sample size was relatively small. In addition, with the consideration that there are many factors that affect the risk of falling, the factors that are not included within the scope of our study, including the exercise histories of the participants, their environmental factors, genetic factors and the fear of falling limit our generalisation of the obtained findings.

In conclusion, our findings indicate that progressive deteriorations occur in balance parameters with ageing and that the changes in the somatosensorial and vestibular systems have important effects on balance. Furthermore, increases in fall risk were observed with ageing, and these changes were in line with the decreasing trunk muscle strength, particularly for the trunk flexors.

Older individuals are specific populations who are at the risk of experiencing a large number of factors that may be related to balance disorders and increasing risk of falling. However, it should be noted that apart from the other factors, advancing age and declining trunk muscle strength are associated with balance disorder and the increasing risk of fall. Therefore, in exercise programmes for older individuals to improve balance and increase stabilization, in the targeted muscle groups there should be trunk flexor and extensor muscles.

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RESEARCH

MICROBIOLOGICAL EVALUATION OF URINARY TRACT INFECTIONS IN ELDERLY MEN WITH BENIGN PROSTATIC HYPERPLASIA

ABSTRACT

Introduction: Elderly men with benign prostatic hyperplasia have a higher risk of urinary tract infections. With advanced age, an increased prostate gland results in altered bladder emptying and increased urine retention and rates of urinary tract infections. Here, we aimed to determine the uropathogens and their antimicrobial susceptibility isolated from elderly men with benign prostatic hyperplasia to create baseline data for active surveillance and empiric antimicrobial regimens.

Materials and Method: Urine cultures from 506 elderly men with benign prostatic hyperplasia were retrospectively evaluated. Distribution of the bacteria causing urinary tract infections and their antimicrobial susceptibility test results were examined using automated identification and antimicrobial susceptibility testing system.

Results: No growth was reported in 69.8% (n=353) of the whole cultures. Contamination constituted 13.6% (n=69) of the reports. Urinary tract infection was reported in 16.6% (n=84) of the samples. Gram-negative bacteria (79.8%) were the major cause of urinary tract infection among elder men with benign prostatic hyperplasia; *Escherichia coli* (53.4%) was the most common cause. Among the elderly men, contamination rates in the >85 years group was significantly higher (p<0.005). The most susceptible antimicrobials were determined as carbapenems for the Gram-negative bacteria and glycopeptides for the Gram-positive bacteria, which are the last resort and parenteral only antibiotics.

Conclusion: Gram-negative bacteria, predominantly *Escherichia coli*, are the major causes of urinary tract infections in elderly men with benign prostatic hyperplasia. High resistance to frequently used drugs such as first generation cephalosporins and quinolones is an alerting situation. Also, contamination rates increase with advancing age; thus, urine sampling from these patients should be revised. Antimicrobial treatment should depend on local antimicrobial susceptibility testing results.

Key Words: Aged; Urinary Tract Infection; Prostatic Hyperplasia; Drug Resistance, Microbial; *Escherichia coli*

ARAŞTIRMA

BENİGN PROSTAT HİPERPLAZİLİ YAŞLI ERKEKLERDE ÜRİNER SİSTEM ENFEKSİYONLARININ MİKROBİYOLOJİK YÖNDEN DEĞERLENDİRİLMESİ

ÖZ

Giriş: Benign prostat hiperplazili yaşlı erkeklerde idrar yolu enfeksiyonlarının görülme riski daha yüksektir. İlerleyen yaş ile birlikte, büyüyen prostat bezi idrar retansiyonunda artışa, mesane boşaltımında değişikliklere ve sonuçta üriner sistem enfeksiyonlarında artışa neden olur. Bu çalışmada, aktif sürveyansa ve ampirik antimikrobiyal rejimlerine temel veri oluşturmak için, benign prostat hiperplazili yaşlı erkeklerden izole edilen üropatojenlerin ve bunların antimikrobiyal duyarlılıklarının belirlenmesi amaçlanmıştır.

Gereç ve Yöntem: Benign prostat hiperplazisi olan 506 yaşlı erkek hastanın idrar kültürleri retrospektif olarak değerlendirildi. İdrar yolu enfeksiyonlarına yol açan bakteriler ve bunlara ait antibiyotik duyarlılık test sonuçlarını otomatize identifikasyon ve antimikrobiyal duyarlılık tespit sistemi kullanılarak incelendi.

Bulgular: Değerlendirmeye alınan kültürlerden %69.8'i (n=353), üreme saptanmadı olarak rapor edildi. Kültürlerin %13.6'sı (n=69) kontaminasyon olarak değerlendirildi. Numunelerin %16.6'sında (n=84), üriner sistem enfeksiyonu etkeni saptandı. Gram-negatif bakteriler (%79.8), benign prostat hiperplazili yaşlı erkek hastalarda üriner sistem enfeksiyonlarının en sık nedeniydi. Bunların içinde *Escherichia coli* (%53.4) en fazla tespit edilen bakteri oldu. Yaşlı erkeklerde arasında, 85 yaş üstü grubunda kontaminasyon oranları anlamlı derecede yüksek bulundu (p <0.005). En duyarlı antibiyotikler tedavide son seçenekler olan ve parenteral uygulanabilen gram-negatif bakteriler için karbapenemler, gram-pozitifler için glikopeptidler olarak saptandı.

Sonuç: Gram negatif bakteriler, bunların arasında da *Escherichia coli* benign prostat hiperplazisi olan hastalarda üriner sistem enfeksiyonlarının en sık saptanan nedenleridir. Sıklıkla kullanılan birinci kuşak sefalosporinlere ve kinolonlara direnç oranlarının yüksekliği düşündürücü bir durumdur. Ayrıca yaşla birlikte kontaminasyon oranları artmaktadır; bu nedenle bu hastalardan idrar örneklerinin alınması dikkatle gözden geçirilmelidir. Antimikrobiyal tedavi o bölgeye ait antimikrobik duyarlılık test sonuçlarına göre planlanmalıdır.

Anahtar Sözcükler: Yaşlı; Prostat Büyümesi; Üriner Sistem Enfeksiyonu; Antibiyotik Direnci; *Escherichia coli.*

Introduction

Urinary tract infections (UTI) have been determined to be the most prevalent cause of infection in elderly populations (1, 2). In particular, obstruction of the normal urine flow due to benign prostatic hyperplasia (BPH) is a common cause of urinary retention in elderly men (3). BPH is briefly defined as the proliferation of smooth muscle cells and epithelial cells located in the prostate gland, which is primarily related to testosterone levels (4). It is so common that >70% of the men aged between 60 and 69 years have BPH, and its prevalence rises up to 80% in men >70 years of age (5). Increasing age is associated with decreased resistance to bacterial colonization, altered bladder emptying, poor perianal hygiene and urinary incontinence, which enhances the likelihood of developing a UTI. The high amount of post-void residual urine and urinary retention are additional risk factors for UTI in elderly men (3).

The most common isolated bacteria responsible for both community-acquired and healthcare-associated UTI are members of the *Enterobacteriaceae* family. *Escherichia coli* is the most commonly associated bacteria, followed by other enteric bacilli, such as *Klebsiella pneumoniae, Enterobacter species, Pseudomonas aeroginosa, Proteus mirabilis* and *Providencia* species, in elderly population (3, 6). Gram-positive bacteria are less commonly isolated from the urine samples of elderly patients, but they are reported with a higher frequency as a result of increased hospitalization and increased use of indwelling catheters within this population. *Staphylococcus* and *Enterococcus* species constitute the major Gram-positive uropathogens (7). However, most clinicians fail to prescribe appropriate antimicrobial treatment for UTI in elderly populations. It is remarkable that 40%–75% of antimicrobials used to treat such infections are inappropriate (6, 8). Because elderly patients can easily deteriorate and are more prone to complications, inadequate treatment may lead to more complicated conditions, such as urosepsis, or the overuse of antimicrobials that may cause liver and renal insufficiencies in this population. Inappropriate antimicrobial treatment may also cause difficult-to-treat circumstances, such as *Clostridium difficile* infection and the emergence of multi-drug resistance microorganisms. Thus, the assessment of urine cultures with reliable reporting, together with accurate identification and susceptibility testing is particularly important for the elderly (3).

In this surveillance study, we evaluated the contamination rates, possible causes of UTI and their antimicrobial susceptibilities, isolated from outpatients >65 years of age with BPH, to provide a baseline data for experts dealing with forementioned elderly men for setting appropriate empirical treatments in such patients in our region.

Materials and Method

Patients

The study was conducted at in 750-bed Sakarya University Research and Training Hospital, serving patients from mainly Sakarya province and Eastern Marmara region, during a one-year period from January 2015 to December 2015. We retrospectively evaluated the urine cultures of outpatients with BPH >65 years of age with the preliminary diagnosis of UTI. Patients without the preliminary diagnosis of UTI were excluded. Patients were grouped into the following three groups: 1) 65–74, 2) 75–84 and 3) >85 to compare the urine culture results according to age group. The patients' data were obtained from the hospital records. The study was approved by Sakarya University Non-Invasive Ethics Committee with the acceptance number 050.01.04.87.

Determination of the Isolates

Clean-catch, mid-stream urine samples from the patients were obtained and processed within 2 h of collection. The samples were inoculated onto the Tryptic Soy agar containing 5% sheep blood and Eosin Methylene Blue agar plates using standardized 10 mL loops. The plates were incubated at 35°C for 18–24 h. The predominant growth of the microorganisms ($>10^4$ CFU/mL) was further evaluated as a possible cause of infection. When three or more types of bacterial colonies, without predominance of one kind were detected, these samples were considered as contaminated. A *VITEK® 2* automated system (*bioMerieux, Marcy l'Etoile, France*) was used for identification and antimicrobial susceptibility testing. The results were interpreted according to the CLSI 2015 criteria (9).

Statistical Analyses

Comparisons between groups were made using *Chi-square* or *Fisher's exact test* for categorical variables. A p value<0.05 was considered to be significant. Comparisons between age groups and urine culture reports were analysed. Statistical evaluations were performed using commercial statistical software *SPSS* version 21.0 (*SPSS Inc., Chicago, IL, USA*).

Results

The total numbers of 506 urine samples from male geriatric patients with BPH were evaluated during the study



Table 1— Urine Culture Results of the Elderly Geriatric Patients with BPH According to Age Group

Results	65-74 years		75-84 years		>85 years		Total	
	n	%	n	%	n	%	n	*p*
No growth	235	74.8	106	63.9	12	46.2	353	**0.008**
Contamination	37	11.8	26	15.7	6	23.1	69	
UTI	42	13.4	34	20.5	8	30.8	84	
Total	314		166		26		506	

Table 2— Distribution of Pathogens Causing UTI in Elderly Patients with BPH

Isolate	n	%
Escherichia coli	44	52.4
Klebsiella pneumoniae	10	11.9
Acinetobacter baumanni	2	2.4
Serratia marcescens	1	1.2
Proteus vulgaris	1	1.2
Enterobacter cloaca complex	4	4.8
Pseudomonas aeruginosa	3	3.6
Citrobacter freundii	2	2.4
Enterococcus faecalis	9	10.7
Staphylococcus epidermidis	4	4.8
Staphylococcus haemolyticus	1	1.2
Streptococcus agalactiae	3	3.6
Total	**84**	**100.0**
Gram negatives	67	79.8
Gram positives	17	20.2
Total	**84**	**100.0**

period. The patients were aged between 65 and 90 years, and the mean age of the patients was 73.5 years. *No growth* was reported in 69.8% (n=353) of the whole cultures included in the study. *Contamination* was present in 13.6% (n=69) of the reports. A positive UTI was reported in 16.6% (n=84) of the samples. When the overall urine culture reports were evaluated according to age group, significant differences were determined for the age groups and the culture reports (p<0.05) (Table 1). The significant difference emerged from the rates in the >85 age group. Contamination and UTI rates were significantly higher in the >85 age group (p<0.05). Gram-negative bacteria (79.8%) were isolated more frequently than gram-positive bacteria (20.2%). *E. coli* was identified as the most predominant microorganism (52.4%), followed by *K. pneumoniae* (11.9%) and *E. faecalis* (10.7%). The list of the pathogens causing UTI according to the age groups in elderly patients with BPH is presented in Table 2. Antimicrobial susceptibility testing results of the uropathogens revealed that some susceptible isolates were lower for the commonly used empiric antimicrobials for UTI (e.g. ciprofloxacin, trimethoprim–sulfamethoxazole, gentamicin, ampicillin and cephazolin). The majority of the susceptible antimicrobials were determined to be carbapenems for the Gram-negative bacteria and glycopeptides for the Gram-positive bacteria as expected (Table 3).

Discussion

Socioeconomic advances and developments in medical fields have enabled longer life expectancies in humans. The relative population of elderly individuals is constantly increasing; thus, problems regarding medical issues due to ageing are also increasing. Physiological and anatomical changes inevitably occur with increasing age. These changes, together with decrease in immunity, increase the risk of infections for elderly populations (10).

UTI are common in elderly populations, and they are commonly misdiagnosed because of prevalent asymptomatic bacteriuria (11). When UTI becomes complicated with bacteremia, mortality increases up to 33% (12). Diagnosis of UTI in elderly is particularly challenging and primarily depends on the presence of bacteria together with classical symptoms of the genitourinary system (e.g. fever, frequency, urgency, dysuria and pain) (11, 13). Men with BPH also suffer from urinary frequency and urgency that mimic UTI (14). Aging men have an additional risk for UTI because of the increasing volume of prostate gland-*BPH*, which causes an obstruction of the urinary pathway. In this study, we attempted to select BPH patients pre-diagnosed to have UTI. Nevertheless, we did not detect any bacterial growth in 69.8% of the urine cultures of these selected patients. One of the remarkable findings of this study was a high rate of contamination among

Table 3— Antibiotic Susceptibility Test Results of the Uropathagens in Elderly Patients with BPH

Gram Negative	Number of Susceptible Isolates												
Bacteria	n	AMP	KZ	GN	AK	AMC	CFX	CRO	CIP	IMP	MEM	SXT	NF
E. coli	44	23	24	35	36	34	30	34	29	44	44	30	37
K. pneumoniae	10	4	7	8	9	7	7	7	8	10	10	8	7
A. baumanni	2	-	-	1	1	1	1	1	1	2	2	-	1
S. marcescens	1	1	1	1	1	1	1	1	1	1	1	1	1
P. vulgaris	1	1	1	1	1	1	1	1	1	1	1	-	1
E. cloaca complex	4	-	1	4	4	1	2	3	4	4	4	4	3
P. aeruginosa	3	-	-	2	3	2	1	1	2	3	3	-	1
C. freundii	2	1	-	1	2	2	2	2	1	2	2	1	1
Gram Positive	**Number of Susceptible Isolates**												
Bacteria	**n**	**P**	**AMP**	**OX**	**E**	**CIP**	**GN**	**HLAR**	**FOS**	**SXT**	**LNZ**	**VA**	**TEC**
E. faecalis	9	NA	9	NA	-	3	1	9	7	NA	9	9	9
S. epidermidis	4	-	NA	3	4	1	4	NA	NA	4	4	4	4
S. haemolyticus	1	-	NA	1	1	-	1	NA	NA	1	1	1	1
S. agalactiae	3	-	3	3	3	3	3	NA	NA	3	3	3	3

AMP: Ampicillin; KZ: Cefazolin; GN: Gentamicin; AK: Amikacin; AMC: Amoxicillin clavulonate, CFX: Cefuroxime; CRO: Ceftriaxone; CIP: Ciprofloxacin; IMP: Imipenem; MEM: Meropenem; SXT: trimethoprim-sulfamethoxazole; NF: Nitrofurantain; P: Penicillin; OX: Oxacillin; E: Erythromycin; HLAR: High-level aminoglycoside resistance; FOS: Fosfomycin LNZ: Linezolid; VA: Vancomycin; TEC: Teicoplanin; NA: Not available

the patients in the >85 years age group. Poor self-hygiene and diminished cognitive abilities may contribute to the increased rate of contamination among the very elderly population. Highly descriptive information together with special and proper precautions regarding urine sampling should be provided to such patients to obtain optimal clean catch midstream urine samples. An increase in the UTI rates through the increasing age groups was an expected finding because of an enlargement of the prostate gland, which in turn causes a high amount of post-void residual urine and urinary retention (3, 15).

Gram-negative bacteria, *most probably because of faecal contamination and poor self-hygiene of the elderly population*, are commonly detected in elderly people (10, 14, 15). We also found that the gram-negative bacteria (79.8%) were the most common causative agents of UTI ($p<0.05$). In addition, uropathogenic *E. coli* was the most common gram-negative bacterial species isolated from elderly men and women, responsible for 80%–90% of the cases (15). In one recent study, *E. coli* was the most commonly isolated uropathogen among elderly men living in nursing homes (30.6%) and living at home (39.9%) (16). We determined the rate of *E. coli* to be as high as 52.4%, followed by other enteric bacilli, such as *K. pneumoniae* (11.9%) and *E. cloaca complex* (4.8%). Gram-positive bacteria are less commonly isolated, with rates of approximately 10%–20%. *Enterococcus* spp. and *Staphylococcus* spp. are interchangeably detected as the most prevalent Gram-positive bacteria in several different studies (8, 15-17). *E. faecalis* (10.7%) and *Staphylococcus* spp. (6.0%) were detected in concordance with previous studies (8, 15-17).

Antimicrobial susceptibility results obtained in this study revealed that quinolones, first generation cephalosporins and trimethoprim–sulfamethoxazole, which were commonly prescribed for UTI, may be questioned because of a relative decrease in susceptibility rates. Other words, first generation cephalosporins were ineffective in half of the gram negative isolates and quinolones were useless in one third of the isolates. On the other hand, nitrofurantoin appears to be a good choice. However, its use is very limited and should be very carefully ordered because it is not suitable for the patients with a glomerular filtration rate <60 mL/min. Third and fourth generation cephalosporins and carbapenem are used via the intravenous route (except cefixime) and should be reserved for more complicated infections. In addition, ciprofloxacin resistance was remarkable for *E. faecalis*; therefore, quinolones should be prescribed cautiously in cases of UTI caused by *E. faecalis*.

Turkey is under particular risk for multi-drug and pan-drug resistant microorganisms. Well-documented studies ha-



ve demonstrated that our country is a reservoir for various types of extended spectrum beta-lactamases such as AmpC and CTX-M and many carbapenamases such as OXA-48 and NDM-1 (18, 19). Distribution of pathogens causing UTI in elderly may not change over time, but it is obvious that their resistance patterns do change. This results in treatment failures and unsuccessful patient management, which in turn causes emerge and spread of antimicrobial resistance. We even struggle with pan-resistant microorganisms where we have no antibiotics as a treatment choice. We can overcome this unfavourable condition by successful antibiotic stewardship and the first step towards this way is the knowledge of the distributions and resistance patterns of the microorganisms causing infections, namely the surveillance studies aimed at specific patient groups.

As a limitation, we have retrospectively evaluated the causative microorganisms and their susceptibility test results, so comorbidities and other risk factors in the elder population were not assessed in this study, but such factors may be subject of future multidisciplinary prospective studies.

As a result, the domination of Gram-negative bacteria in UTI in elderly patients is the cornerstone of empirical treatment. Inadequate treatment for UTI among elderly patients is often associated with worsened clinical outcomes, and empirical antimicrobial therapy may have a positive effect on prognosis (8). First line drugs *(i.e. quinolones, aminoglycosides and trimethoprim–sulfamethoxazole)* may alternately be used to avoid further development of resistance among elderly patients with BPH. Urine cultures and antimicrobial susceptibility testing should be requested in case of UTI in the elderly for the correct diagnosis and appropriate antimicrobial treatment.

Conflict of Interest

The authors declare that they have no conflict of interest.

Financial Disclosure

The authors declare that this study has received no financial support.

Ethical Committee Approval

Sakarya University Non-Invasive Ethics Committee, 050.01.04.87

Declaration

All the authors declare that they have obeyed the rules in "Helsinki Declaration", "Good Medical Practice Guidelines", and "Good Laboratories Practice Guidelines".

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RESEARCH

UTILIZATION OF HOME HEALTH CARE SERVICES PROVIDED BY GOVERNMENT AMONG ELDERLY INDIVIDUALS BETWEEN 2010 AND 2015 IN DIYARBAKIR, TURKEY

ABSTRACT

Introduction: Home health care is an important service for dependent individuals, particularly elderly; increasing the effectiveness of this system is imperative, considering the increased demographic ageing worldwide.

Materials and Method: This study focused on home health care services provided by the Diyarbakır Directorate of Health Services and the Secretary General of the Association of Public Hospitals between 2010 and 2015 . Data from 850 elderly from public hospitals in Diyarbakır were analyzed. Elderly were divided into three age groups 64-74 years (n=215, 25%), 75-84 years (n=400, 47%) and 85+ years (n=235, 31%). The groups were compared based on sex, most common diseases, hospitals and years. In total 558 females (%65) and 292 males (%38) were included.

Results: Comparison of three age groups by frequency of diseases showed that, neurological diseases and diabetes (χ^2=38.742, p<0.001) were more widespread accross age group 74-85 years. All hospitals were more efficient in 2014 and 2015 (χ^2=143.65, p<0.001) and most of them were in the city center. No significant sex-based differences were found in the frequency of common diseases, in years and hospitals. On the other hand home health care use by women of age group 85 and over was significantly different from that by men in the same group (χ^2=18.415, p<0.001).

Conclusion: Our findings show that measures taken by The Turkish Ministry of Health have been succesful because home health care use has improved in the last two years and the goverment of Turkey is trying to respond to the increased need for home health care by elderly individuals

Kew Words: Aged; Home Health Nursing; Geriatrics.

ARAŞTIRMA

2010-2015 YILLARI ARASINDA DİYARBAKIR, TÜRKİYE'DE YAŞLI BİREYLERİN KAMU KURULUŞLARI TARAFINDAN SAĞLANAN EVDE SAĞLIK HİZMETLERİNDEN FAYDALANMA DÜZEYİ

ÖZ

Giriş: Dünyada yaşlanan nüfusun her yıl biraz daha artış göstermesi yaşlı hastalıkları ile ilgili ciddi önlemler alınmasını ve evde bakım hizmetlerinin yaygınlaştırılmasını gerektirmektedir.

Gereç ve Yöntem: Bu çalışmada 2010-2015 yılları arasında Diyarbakır Halk Sağlığı Müdürlüğü ve Kamu Hastaneler Birliği Sekreterliği tarafından verilen evde bakım hizmetleri ele alınmıştır. Diyarbakır merkez ve beş ilçesindeki hastane değerlendirilmiş, bu kurumlarda evde bakım hizmeti alan 850 yaşlı birey üç yaş grubuna ayrılarak, cinsiyet, yaşlılıkta en fazla görülen hastalıklar, hastaneler ve yıllara göre ve kendi aralarında karşılaştırılmıştır. Hastaların 215 (%25)'i 65-74 yaş, 400 (%47)'ü 75-84 ve 235 (%31)'i 85 ve üzeri yaş grubuna ait olup, 558'i kadın (%65), 292'si erkektir (%38).

Bulgular: Evde bakım hizmeti alan hastalar yaş gruplarına göre kıyaslandığında, 74-85 yaş grubu hastalarda nörolojik hastalıkların ve diyabetin (χ^2=38.742, p<0.001) daha çok görüldüğü belirlenmiştir. Tüm hastaneler 2014 ve 2015 yılında daha fazla hizmet verirken (χ^2=143.65, p<0.001), şehir merkezindeki hastaneler daha çok hizmet vermiştir. Kadın-erkek grupları karşılaştırıldığında hastalıkların görülme sıklığı, yıllar ve hastaneler açısından önemli bir fark bulunamazken, evde bakım hizmeti alan hastalar arasında 85 ve daha büyük yaş grubunda daha çok kadın olduğu görülmüştür (χ^2=18.415, p<0.001).

Sonuç: Türkiye'de Sağlık Bakanlığı'nın evde bakım hizmetlerine verdiği önem ve ciddi önlemler alınması sonucunda evde bakım hizmetlerinde önemli bir şekilde artış görülmüş ve yaşlı bireylerin bu hizmetten giderek artan düzeyde yararlanmalarına neden olmuştur.

Anahtar Sözcükler: Yaşlı; Evde Bakım Hizmeti; Geriatri.

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Introduction

Home health care is provided by professional health professionals to people at their homes. Home health care includes a comprehensive range of servicesincluding medical and social services, physical therapies, nursing care, and speech-language theraphy (1). It also covers various care functions including catheters, injections, psychological assessments, wound care, disease education, oxygen therapy, medication reminders, pain management and nutritional evaluation. These services are provided by skilled professionals including doctors, nurses, physical therapists and home health aides, who work for private home health agencies, municipalities or private and public institutions (2, 3). The objective of home health care is to help patients to live with greater independence, assist them to continue their life at home, and promote the patient's health. Sometimes this care is recommended by physicians but is generally requested by family members or the patient (1,4).

Since the 1990s, home health care has increased in developed countries and has become an important aspect of their health services. However it wasn't seriously considered by the Turkish government until 2010. In Turkey, health services are provided by public and private sectors. Public health services were initially administered by the Ministry of Health and supplied by the Social Security Institution. After restructure of health programs, these services also began to be provided by the private sector. As the Ministry of Health is the main provider of primary and secondary health care, it is responsible for national health services and policies including amendments for home health care services. The most serious regulation defining the delivery of home health care services was established by Law 2551 in March 2005 (5). This was followed by Directive 3895 " The Implementation of Health Care Services at Home" in February 2010 which detailed different types of home care services, responsible staff, necessaries and tools (6).

After 2010, public health hospitals began to provide home health care services and this led to an increase in the number of people using these services. In Diyarbakır, Turkey, home health care services were provided by the Diyarbakir Directorate of Health Service and the Secretary General of the Association of Public Hospitals. The Coordination Center of Home Health Care Services was established within the Diyarbakır Public Health Center to coordinate these services. Five and seven hospitals in the Diyarbakır city center and districts, respectively are connected to this center. Six practitioners, 21 nurses, and 27 other skilled staff are employed.

The literature highlights that some diagnoses are common among elderly individuals, such as arthritis, cardiovascular diseases (high blood pressure, high cholesterol levels), cancer (lung, cervical, colorectal, mouth, throat, skin, prostate), respiratory diseases (chronic obstructive pulmonary disease [COPD], asthma, chronic bronchitis), neurological disorders (Alzheimer's disease, dementia, Parkinson's disease), musculoskeletal disorders (falls, fractures, osteoporosis), diabetes, obesity, and depression. Disabilities are also common among elderly individuals. Causes of disability have been related to illnesses such as cancer, heart attacks, diabetes, arthritis, injuries and paralysis, mental disorders, cardiovascular diseases and neurological disorders (7-12).

The present study reviewed the utilization of home health care services provided by goverment among elderly individuals from 2010–2015. Comparisons were made based on common diseases, sex, hospital, and years.

Materials and Method

In the present study, home health care services provided by the Diyarbakır Directorate of Health Services and the Secretary General of the Association of Public Hospitals from 2010–2015 were reviewed. Data were obtained over a 6-month period from the Ministry of Health and the Diyarbakır Directorate of Health Services, after getting formal permission. Ethics committee approval was obtained from Dicle University Hospital on the request of the Ministry of Health.

Data for 850 elderly individuals who used home health care services between 2010–2015 in the city center and five districts of Diyarbakır were obtained. Since elder patients were included heavily in two city center hospitals and five district hospitals, only data of these seven hospitals were analyzed. Elderly individuals were divided into three age groups (65-74, 75-84, and 85 and over years) and compared by sex, most common diseases, hospitals, and years. Descriptive statistics were calculated and chi-square tests were performed using SPSS Version 21. As a wide range of diseases were recorded by health staff; diseases were classified into seven groups for the purpose of the present analysis. The seven diseases groups were:

1. Neurological diseases (Multiple sclerosis, stroke, spinal cord injuries, all kinds of motor neuron diseases, brain injuries, Parkinson's disease);
2. Advanced neurodegenerative diseases (Dementia, Alzheimer's disease, ALS);



3. Muskuloskeletal diseases (Fractures, rheumatoid arthritis, postmenopausal and post-traumatic osteoperosis)
4. Cardiovascular diseases (Hypertension, heart diseases, high cholesterol);
5. Respiratory diseases (Asthma, chronic bronchitis);
6. Diabetes;
7. Other (Cancer, eye diseases, mental diseases)

The hospitals that provided home health care services in Diyarbakır were: Gazi Yaşargil Education and Research Hospital and Selahaddin Eyyubi Public Hospital in city center, Ergani Public Hospital, Bismil Public Hospital, Çermik Public Hospital, Çınar Public Hospital, and Dicle Public Hospital in districts.

RESULTS

As can be seen in Table 1, comparison of the three age groups by sex showed that there were more female patients in age group 85 and over (χ^2=18.415, p<0.001). In all of hospitals use of home health care by age group 74-85 was more than that of other groups and this was statistically significant (χ^2=10.751, p<0.05).

The comparison of the prevalence of the most common diseases according to age groups showed that neurological diseases (Multiple sclerosis, stroke, spinal cord injuries, all kinds of motor neuron diseases, brain injuries, Parkinson's disease) advanced neurodegenerative diseases (Dementia, Alzheimer's disease) and diabetes (χ^2=38.742, p<0.001) were significantly widespread across age group 74-85.

Table 2 shows that there were no significant sex-based differences between years (χ^2=3.104, p>0.05), hospitals (χ^2=1.405, p>0.05), and prevalence of the most common diseases.

Table 3 shows that in 2014 and 2015, there was an increase in the use of home health care services in all hospitals (χ2=143.65, p<0.001). A significant difference was found when the frequency of common diseases were compared based on years. Neurological diseases (Multiple sclerosis, stroke, spinal cord injuries, all kinds of motor neuron diseases, brain injuries, Parkinson's disease) and advanced neurodegenerative diseases (Dementia, Alzheimer's disease) (χ2=143.65, p<0.001) significantly increased in 2015. An increase in frequency of diabetes and cancer was found but this wasn't significant.

Table 1— Distribution of Socidemographic Parameters by Age Groups

	65-74 Years n (%)	74-85 Years n (%)	+85 Years n (%)	Total	χ^2	p
Sex						
Male	93 (31.9)	142 (48.6)	57 (19.5)	292 (100)	18.415	**<0.001**
Female	122 (21.9)	258 (46.2)	178 (31.9)	558 (100)		
Years						
2010-2013	22 (14.5)	84 (55.3)	46 (30.2)	152 (100)	15.760	**<0.01**
2014	46 (30.7)	57 (38.0)	47 (31.3)	150 (100)		
2015	147 (26.8)	259 (47.3)	142 (25.9)	548 (100)		
Hospitals						
Selahaddin Eyyubi Public Hospital	89 (25.0)	151 (42.4)	116 (32.6)	356 (100)	10.751	**<0.05**
Gazi Yaşargil Education and Research Hospital	55 (22.5)	130 (53.3)	59 (24.2)	244 (100)		
Others	71 (28.4)	119 (47.6)	60 (24.0)	250 (100)		
Frequency of diseases						
Neurological diseases	63 (30.1)	104 (49.8)	42 (20.1)	209 (100)	38.742	**<0.001**
Advanced neurodegenerative diseases	40 (17.7)	101 (44.6)	85 (37.6)	226 (100)		
Muskuloskeletal diseases	25 (26.4)	38 (40.0)	32 (33.6)	95 (100)		
Cardiovascular diseases	39 (24.5)	83 (52.2)	37 (23.3)	159 (100)		
Respiratory diseases	20 (33.3)	24 (40.0)	16 (26.7)	60 (100)		
Diabetes	21 (40.4)	25 (48.1)	6 (11.5)	52 (100)		
Others	7 (14.3)	26 (53.1)	16 (32.6)	49 (100)		

Table 2— Sex Based Differences in the Study Parameter

	Male n (%)	Female n (%)	Total	χ^2	p
Years					
2010-2013	43 (28.3)	109 (71.7)	152 (100)	3.104	>0.05
2014	52 (34.7)	98 (65.3)	150 (100)		
2015	198 (36.1)	350 (63.9)	548 (100)		
Hospitals					
Selahaddin Eyyubi Public Hospital	116 (32.6)	240 (67.4)	356 (100)	1.405	>0.05
Gazi yaşargil Education and Research Hospital	83 (34.0)	161 (66.0)	244 (100)		
Others	93 (37.2)	157 (62.8)	250 (100)		
Frequency of diseases					
Neurologic diseases	79 (37.8)	130 (62.2)	209 (100)	5.561	>0.05
Advanced neurodegenerative diseases	73 (32.3)	153 (67.7)	226 (100)		
Muskuloskeletal diseases	30 (31.6)	65 (68.4)	95 (100)		
Cardiovascular diseases	50 (31.4)	109 (68.6)	159 (100)		
Respiratory diseases	24 (40.0)	36 (60.0)	60 (100)		
Diabetes	15 (28.8)	37 (71.2)	52 (100)		
Others	21 (42.9)	28 (57.1)	49 (100)		

Table 3— Differences Between Parameters by Year

	2010-2013 n (%)	2014 n (%)	2015 n (%)	Total	χ^2	p
Hospitals						
Selahaddin Eyyubi Public Hospital	84 (23.6)	89 (25.0)	183 (51.4)	356 (100)	143.65	<0.001
Gazi Yaşargil Education and Research Hospital	63 (25.8)	53 (21.7)	128 (52.5)	244 (100)		
Others	5 (2.0)	8 (3.2)	237 (94.8)	250 (100)		
Frequency of diseases						
Neurologic diseases	51 (24.4)	32 (15.3)	126 (60.3)	209 (100)	143.65	<0.001
Advanced neurodegenerative diseases	45 (19.9)	59 (26.10)	122 (54.0)	226 (100)		
Muskuloskeletal diseases	12 (12.6)	13 (13.7)	70 (73.7)	95 (100)		
Cardiovascular diseases	23 (14.5)	27 (17.0)	109 (68.5)	159 (100)		
Respiratory diseases	8 (13.4)	11 (18.3)	41 (68.3)	60 (100)		
Diabetes	7 (13.5)	4 (7.7)	41 (78.8)	52 (100)		
Others	6 (12.2)	4 (8.2)	39 (79.6)	49 (100)		

Discussion

In all age groups, home health care was used more by women but we found a significant difference between female and male patients in 85 and over age group in terms of use of home health care services. While this result was consistent with the findings of several previous studies (13-16), other studies have reported conflicting results (17-19).

In literature, some studies found that women suffer more from musculoskeletal disorders, osteoperosis, fractures, and metabolic diseases, whereas men suffer from problems, such as cardiovascular diseases and respiratory diseases (13-16). Our findings are inconsistent with these studies, but are consistent with other studies that found no sex-based differences in the prevalence of diseases (17-19).

When the use of home health care services was compared by year, our findings were consistent with other studies that reported home health care services were increasing annually (12,19,20). We also found that the prevalence of neurological diseases increased in 2015. This is inconsistent with previous studies (13,14 and 20).



When we compared the three age groups, we found differences in the prevalence of diseases. Neurological diseases, muskuloskeletal and respiratory diseases were more often seen in the younger group of elderly individuals (65–74 and 74-85 years). This is consistent with some studies (13,16) but conflicting with some others (14,17).

Selahattin Eyyubi Public Hospital was significantly used more regarding home health care services. As district hospitals had only been providing home care services for approximately one year, their services may not yet be as widespread as hospitals in the city center.

According to the World Health Organization publication *World Health Statistics* (2014), people around the world are living longer (21). In 2013, life expectancy in Europe was 80.6 years and in Turkey was 76.3 years; however, life expectancy is increasing every year (22-23). Ageing brings many problems, including decline in cognitive ability, social capability, and psychological condition, related to changes in anatomical structures and health status (24). As the elderly population increases in Turkey annually, improving the physical and mental health of this population should be an important goal for health care workers (25).

In Turkey, elderly individuals face many difficulties in maintaining their quality of life as factors such as age, gender, location, education, and socioeconomic levels may be barriers in using health services. Governments are responsible for providing health services for elderly individuals through public health organizations and social security systems. In Turkey, this service is provided by the Ministry of Health, and improvements have been observed every year.

Home health care is an essential health service, especially in the last years of life, as elderly individuals may have difficulty in accessing health institutions because of levels of dependence. Our findings indicate that the Turkish Ministry of Health is trying to respond to the increased need for home health care by elderly individuals.

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RESEARCH

EVALUATION OF HOME ACCIDENTS AND FALL BEHAVIORS OF ELDERLY

ABSTRACT

Introduction: This study was conducted to evaluate home accidents sustained by the elderly in previous year by using the questionnaire develop by the researcher and also evaluate the fall behavior of the elderly using the "falls behavioral scale" included 175 elderly residents in the Ovacık district of Kırıkkale province, Turkey.

Materials and Method: The "Falls Behavioral Scale for the Elderly" was employed as the data collection tool. Data were analyzed using standard deviation, arithmetic mean, and the student's t-test to compare the two groups and analysis of variance to compare multiple groups.

Results: More than half of the elderly (59.4%) sustained home accidents in the previous year, and elderly who sustained fall accidents (70.2%) and those who sustained accidents in the kitchen (31.7%) ranked in first place. The mean score of the elderly' fall behavior was 2.85 points on a four-point scale. The falls behavior of the elderly indicated significant differences in terms of the type and place of accidents ($p<0.05$). When group averages were evaluated, the elderly that sustained cuts or home accidents in the kitchen had higher scores on the Falls Behavioral Scale compared with other groups.

Conclusion: The mean score on the Falls Behavioral Scale was higher for women, college graduates, have single child, and those living alone.

Kew Words: Aged; Accident, Home; Accidental Falls

ARAŞTIRMA

YAŞLILARIN EV KAZASI GEÇİRME DURUMLARININ VE DÜŞME DAVRANIŞLARININ DEĞERLENDİRİLMESİ

ÖZ

Giriş: Yaşlıların son bir yıl içerisinde ev kazası geçirme durumlarını belirlenmesi ve düşme davranışlarının düşme davranışları ölçeğine göre değerlendirilmesini amaçlayan bu çalışmaya Kırıkkale ili, Ovacık mahallesinde ikamet eden 175 yaşlı katılmıştır.

Gereç ve Yöntem: Çalışmada veri toplama aracı olarak "Yaşlılar İçin Düşme Davranışları Ölçeği" kullanılmıştır. Verilerin çözümlenmesinde standart sapma, aritmetik ortalama, ikili gruplar için t testi, ikiden daha fazla grup için ise varyans analizi kullanılmıştır.

Bulgular: Yaşlıların yarıdan fazlasının (%59.4) son bir yıl içinde ev kazası geçirdiği, düşme kazası geçirenlerin (70.2) ve mutfakta kaza geçirenlerin (%31.7) ilk sırada yer aldığı belirlenmiştir. Yaşlıların düşme davranışlarının ortalaması 4'lü ölçekte 2,85 olarak belirlenmiştir. Yaşlıların düşme davranışlarının kaza tipi ve kaza alanı değişkenlerine göre anlamlı bir farklılık göstermiştir ($p<0,05$). Grup ortalamaları incelendiğinde kesik sonucu yaralananların ve mutfakta kaza geçirenlerin düşme davranışları ortalamasının diğer gruplara göre daha yüksek olduğu belirlenmiştir.

Sonuç: Kadınların, yüksekokul mezunlarının, tek çocuğu olanların, yalnız yaşayanların düşme davranışlarının ortalaması diğer gruplara göre daha yüksek bulunmuştur.

Anahtar Sözcükler: Yaşlı, Ev kazası, Düşme

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INTRODUCTION

The increase in life standards due to advances in science and technology; decreases in fertility rates, preventable diseases, and mortality; more independence in activities; increase in the quality of life; and an increase in the life expectancy after birth have led to an increase in the elderly population worldwide (1). Due to changes occurring in this process, an elderly individual becomes more likely to encounter health problems and risks more frequently and differently than those encountered at younger ages (2).

Physical, psychological, and social deficiencies; problems in muscular and skeletal systems; and a decrease in sensory and motor functions are all factors that contribute to the elderly's dependence on other people. These factors also increase the risk of accidents in this specific population (3). In particular, the population aged 65 years and over is at an increased risk of sustaining home accidents. Falls are a serious health concern in the elderly population (4), and one-third of the elderly people experience fall accidents once or more in a year (5,6).

The risk of falls, increases with the increasing number of individual risk factors. Older bones are often less dense, more brittle, and break more easily. A simple fall can become a serious, disabling injury that limits independence (7,8).

Research has revealed that many home accidents are preventable (10,11). Therefore, this study was conducted to evaluate home accidents sustained by the elderly in previous year by using the questionnaire develop by the researcher and also evaluate the fall behavior of the elderly using the "falls behavioral scale".

MATERIALS AND METHODS

With the goal of evaluating home accidents according to the Falls Behavioral Scale people 65 years and over, residing in the Ovacık district of Kırıkkale, are included. 1300 elderly people in the neighborhood where the information was obtained from the Ovacık district Headman. Ovacik district is Kırıkkale center and socio-economic status is above the middle level. A maximum of 1300 elderly people were identified residing at the study site, and thus, sample size was calculated using the formula ($n=N.s^2.Z.^2/((N-1).d^2+ s^2.Z.^2$) that is recommended for quantitative studies and finite population (12). In this formula, population size (N) was 1300, standard deviation calculated with the first 30 questionnaires was s=0,7; effect size was d=0.10; theoretical value corresponding to s=0.05 significance level was z0.05=1.96; and minimum sample size calculated with this formula was 165 people. Considering missing and not returning questionnaires, a total of 180 questionnaires were distributed and 175 questionnaires were evaluated. Only five elderly individuals refused to participate in the study. People who reserve list were included in the sample.

Information on names, addresses, etc. of the 1300 elderly people was obtained from the records of the Ovacık district headman. Systematic sampling, a probability sampling method, was employed to create a study sample that comprised 175 elderly people. 1300 a list was prepared giving a number to each of the elderly. Individuals with systematic sampling within the framework of sample rate in the list and addresses have been determined taking into account the record numbers. This is a cross-sectional study evaluating home accidents in Ovacık district of Kırıkkale.

A questionnaire was used as the data collection tool. The questionnaire included questions about gender, age, education level, income, home accident status, the type of accident, the area of accident, and the "Falls Behavioral Scale for the Elderly," which was originally developed by Clemson et al. (13) and adapted to the case of Turkey by Uymaz Eksi and Nahcivan, was utilized (14).

Falls Behavioral Scale for the Elderly

This scale comprises 30 items and 10 dimensions. These include Cognitive Adaptations (6 items), Protective Mobility (5 items), Avoidance (5 items), Awareness (4 items), Pace (2 items), Practical Strategies (3 items), Displacing Activities (1 items), Being Observant (1 item), Changes in level (2 items), and Getting to the phone (1 item). Each expression is rated on a four-point Likert scale (from 1 to 4), anchored at 1=never, 2=sometimes, 3=often, and 4=always. The scores obtained from the subscales and total scores range between 1 and 4 points, where in high scores indicate safe and protective behaviors and low scores indicate risky behaviors. Six items (7, 8, 9, 10, 19, and 23) in this scale are in reverse order and thus need to be recoded before calculation. The scores of an individual on each item are summed and divided by the total number of items to yield a total scale score ranging between 1 and 4 points.

The comparison between scale items and individual characteristics and activities of daily living was conducted using the t-test for two groups and analysis of variance between more than two groups. The analysis of variance as a result of the presence of significant differences fort he source of differ-



ence in a binary Comparison Test (post-hoc tests) Tukey'stest was applied. On the other hand, the scale's reliability was determined using Cronbach's Alpha coefficient, which was calculated as 0.858.

Study data were collected from through face-to-face interviews with elderly from community by considering the questionnaire form developed by the study team between 8 April and 8 May 2015.

Data obtained through questionnaires were analyzed using SPSS 18.0 for Windows software.

The study protocol was approved by the Hacettepe University Research Ethics Committee and informed consent was obtained from all individuals who agreed to participate the study

Results

Distribution of the elderly according to various individual characteristics is presented in Table 1. Accordingly, females comprise slightly more than half (56.6%) of the elderly (n=175). People in the 71–75 age group (33.1%), primary school graduates (38.9%), people with an income of 892–1500 TL (44.6%), people having three children (29.7%), those living with their spouses (40.6%), homeown-

Table 1— Distribution of the Participants According to Individuals Characteristics.

Variable	Group	Number (f)	Percentage (%)
Gender	Female	99	56.6
	Male	76	43.4
Age	65–70	43	24.6
	71–75	58	33.1
	76–80	41	23.4
	81–85	23	13.1
	86 and above	10	5.8
Education status	Primary School	68	38.9
	Secondary School	55	31.4
	High school	27	15.4
	College	25	14.3
Monthly income (TL)	891 and below (minimum wage)	34	19.4
	892–1500	78	44.6
	1501–2250	29	16.6
	2251–3000	19	10.9
	3001 and above	15	8.5
Number of children	None	4	2.3
	One	18	10.3
	Two	36	20.6
	Three	52	29.7
	Four	33	18.8
	Five and above	32	18.3
People living together	Alone	33	18.8
	With spouse	71	40.6
	Spouse and children	28	16.0
	With children	43	24.6
House property	Homeowner	134	76.6
	Tenant	41	23.4
Health insurance	Health Card for Uninsured People in Turkey (HCUPT)	12	6.9
	Retirement Fund	69	39.4
	Social Security Institution for Self-employed	35	20.0
	Social Security Institution for Employee	59	33.7
Total		**175**	**100.0**

ers (76.6%), and the elderly covered under the insurance of the government retirement fund (38.0%) constituted the major groups.

More than half of the elderly participating in the study (59.4%) sustained home accidents in the previous year. The elderly who sustained home falls (70.2%) ranked first among the elderly who sustained home accidents followed by accidents due to a slippery floor 20.2% of the elderly. In terms of the causes of accidents, carelessness (54.8%) ranked first among other causes. The kitchen was reported as the accident location by 31.7% of the elderly. Most elderly people did not visit any health center after the accident (43.3%), and the majority reported spontaneous recovery (76.0%).

According to which the mean score of the elderly was 2.85 points on a four-point scale. Older people from "cognitive adaptation" dimensions =3.34, the protective mobility subscale =2.77, the Avoidance subscale =2.99, the Awareness subscale =3:19, pace sub-dimension =2.04 practical strategies sub-dimension =2.32, the displacing activities=1.79, being observent subscales =2.68, =2.68 changes in level dimensions, the dimensions getting to the Phone =2.24 the average score received. The lowest average among the subscales "dis-

Table 2— Comparison of the Participants' Falls Behaviors with Various Individual Characteristics

Variable	Group	$\bar{X}$	s.d.	t/F	p
Gender	Female	2.91	0.39	2.666	**0.009***
	Male	2.74	0.45		
Age	65–70	2.89	0.46	0.393	0.814
	71–75	2.81	0.39		
	76–80	2.79	0.45		
	81–85	2.88	0.39		
	86 and above	2.87	0.47		
Education status	Primary school	2.81[b]	0.41	7.869	**<0.001**
	Secondary school	2.72[b]	0.41		
	High school	2.84[b]	0.50		
	College	3.19[a]	0.19		
Monthly income (TL)	891 and below (minimum wage)	2.76	0.35	1.915	0.110
	892–1500	2.80	0.43		
	1501–2250	2.90	0.41		
	2251–3000	2.83	0.52		
	3001 and above	3.09	0.38		
Number of children	None	2.68[b]	0.49	2.519	**0.031***
	One	3.09[a]	0.26		
	Two	2.94[a]	0.39		
	Three	2.74[b]	0.46		
	Four	2.80a[b]	0.43		
	Five and above	2.80a[b]	0.43		
People living together	Alone	3.06[a]	0.32	4.125	**0.007***
	With spouse	2.79[b]	0.46		
	Spouse and children	2.85[b]	0.44		
	With children	2.74[b]	0.39		
House property	Homeowner	2.87[b]	0.43	1.521	0.133
	Tenant	2.75[b]	0.40		
Health insurance	Health Card for Uninsured People in Turkey (HCUPT)	2.72	0.26	0.443	0.723
	Retirement Fund	2.85	0.47		
	Social Security Institution for Self-employed	2.81	0.36		
	Social Security Institution for Employee	2.86	0.44		

*<0.05 a.b.c: the differences between groups with different letters are important. (p<0.05)

The between-group differences in average is made arrangements giving the letter a group which is the largest

placing activities " dimension of (=1.79), the highest average "cognitive adaptation" size (=3.34) was found.

The highest scores were observed on the following items: "I hold onto a handrail when I climb stairs" (=3.53); In contrast, the lowest scores were observed on the following items: "To reach something up high, I use the nearest chair, or whatever furniture is handy, to climb on" (=1.79); "I go out on windy days" (=1.79).

Results of the student's t-test and analysis of variance for comparison of various individual characteristics on items in the Falls Behavioral Scale are presented in Table 2. Accordingly, gender, educational status, number of children, and people living together indicated significant influence ($p<0.05$). When group averages were evaluated, the mean score on the Falls Behavioral Scale was higher for women, college graduates, have single child and those living alone.

Results of the student's t-test and analysis of variance comparing the elderly's falls behaviors with home accidents are presented in Table 3. Accordingly, falls behavior significant differences were noted in terms of the type and place of accident ($p<0.05$). When group averages were evaluated, those who sustained cuts or home accidents in the kitchen had higher scores on the Falls Behavioral Scale compared with other groups.

Discussion

The determination of risky behaviors that cause home accidents and falls in elderly is important for raising individual awareness regarding home accidents and implementing preventive measures.

Thinking that it would be easy to remember questions about home accidents in the last year were asked in the study. More than half of the study participants (59.4%) sustained home accidents in the previous year. This rate was 29.0% in the study by Tortumluoğlu et al. (15). In his study, Tortumluoğlu (15) stated that the memory factor might be the reason for the low rate of home accidents. This rate was 34.3% in the study by Şahbaz and Tel (3), 20.6% in that by Doğan et al., (16) and 32.1% in that by Yörük (17). Different frequency rates recorded for home accidents can be attributed

Table 3— Comparison of the Participants' Falls Behaviors with Various Parameters Related to Home Accidents

Variable	Group	$\bar{X}$	s.d.	t/F	p
Home accident history in the last year	Yes	2.84	0.42	0.017	0.998
	No	2.85	0.44		
Type of accident	Falls	2.78[b]	0.40	3.259	0.043*
	Cuts	3.08[a]	0.36		
	Burns-scalds	2.93[a]	0.45		
Cause of accident	Carelessness	2.72	0.37	0.988	0.418
	Slippery floor	2.90	0.45		
	Insufficient illumination	2.78	0.45		
	Presence of objects on the floor	2.87	0.34		
	Lack of handrails in the bathrooms-toilets	2.65	0.37		
Place of accident	Kitchen	2.97[a]	0.34	4.090	0.002*
	Bedroom	2.40[c]	0.42		
	Bathing	2.76b	0.34		
	Hallway	2.47[c]	0.48		
	Stairs	2.76[b]	0.36		
	Using toilet	2.96[a]	0.44		
Place of admission after the accident	None	2.84	0.41	0.013	0.987
	Health care facility	2.83	0.43		
	Neighbors, relatives, friends, etc.	2.85	0.44		
Consequence of accident	Full recovery	2.86	0.41	0.742	0.479
	Treatment is continuing	2.81	0.38		
	Disability	2.58	0.76		

*<0.05 a.b.c:the differences between groups with different letters are important: ($p<0.05$)

The between-group differences in average is made arrangements giving the letter a group which is the largest

to environmental rearrangements to reduce accidents, educational status, socioeconomic status, and individual differences. Information regarding home injuries was obtained from self-reports from elderly people, and the true prevalence of home injuries in the elderly population is unknown (16). Some national studies have reported wide variations in home injury rates, ranging between 23.8% and 65.3% in elderly people in Turkey (16,18).

Fall accidents are common and constitute a serious health problem (19). Fall accidents also ranked first among the study population who sustained home accidents (70.2%). Studies in the literature also mentioned falls as the most common type of accident in the elderly (15,18,20-23). These studies support the current findings. These findings also indicate that falls are widespread problems among the elderly.

Although bedrooms and living rooms are the most common locations for accidents in general, the most serious accidents involving older people usually occur in the kitchen or on the stairs (23). Indeed, the accident location was the kitchen in 31.7% of elderly people who sustained home accidents. A higher rate of accidents in the kitchen can be explained by the fact that people spend more time in the kitchen while performing daily activities and use sharp objects that could cause accidents. According to a study by Clemson et al. (13), in which they analyzed home accidents and falls in people aged 65 and older, elderly people experienced falling mostly in bathrooms and restrooms.

In this study, most elderly did not visit any health center after the accident (43.3%), and the majority reported spontaneous recovery (76.0%). In the study by Tortumluoğlu (15) more than half of the elderly who sustained home accidents (56.6%) visited a healthcare facility. When descriptive statistics related to the elderly's opinions regarding items in the Falls Behavioral Scale are evaluated, the mean score was =2.85 points on a four-point scale. The lowest average among the subscales "displacing activities " dimension of (=1.79), the highest average "cognitive adaptation" size (=3.34) was found. This finding suggests that elderly people "sometimes" or "often" exhibit safe behaviors that could prevent falls. This value was 2.66 in the study by Uymaz Ekşi and Nahcivan (14). When statistics related to items were evaluated in this study, the highest scores were observed in the following items: "I hold onto a handrail when I climb stairs" (=3.53) Adoption of safe behaviors and focus on potential accidents would reduce the likelihood of sustaining home accidents. The lowest scores were observed in the following items that expressed unfavorable behavior compared with other items: "To reach something up high, I use the nearest chair, or whatever furniture is handy, to climb on" (=1.79); "I go out on windy days" (=1.79). Raising awareness among elderly people regarding fall risk behavior would positively impact fall prevention at home.

When group averages were evaluated, the mean score on the Falls Behavioral Scale was higher for women, college graduates, have single child, and those living alone. These findings suggest that women, college graduates, and elderly people living alone should significantly focus on fall accidents. Previous studies suggested that gender was a risk factor for falls and that females more frequently sustained fall accidents than males (16,24). That's why women are more anxious than men about fall. This result gives rise to thought that women get higher points from fall scale than men. The fact that elderly with higher education level get higher points from the scale can be resulted from they are more conscious on the subject due to their education level. It is known that elderly people who live alone experience more fall accident as then other people (25). That's why it can be thought that elderly people living alone realize that fact and try to be more careful about fall and also get higher points relatively to others from the scale. In some studies, elderly people living alone more commonly sustained home accidents (16,18). The finding that females and those living alone had higher mean scores on the Falls Behavioral Scale suggests that this group of elderly people are aware of home accidents and exert greater attention. Additional research is also needed to determine why women, college graduates, have single child, and those living alone had higher mean scores than others. According to the results of the student's t-test and analysis of variance comparing falls behavioral scores and parameters related to home accidents significant differences were observed in terms of the type and place of accident ($p<0.05$). When group averages were evaluated, the elderly who sustained cuts or home accidents in the kitchen had higher scores on the Falls Behavioral Scale compared with other groups. This finding indicates that people having sustained cuts or accidents in the kitchen focus more on fall risk behaviors compared with other groups.

Limitations of the study are its lack of generalizability due to small sample size in categories. Further research is needed with a larger sample size of elderly people. Recall bias was another limitation because participants had to report home accidents experienced in the previous 12 months.

This study has drawn a number of conclusions. More than half of the elderly sustained home accidents in the previous year. Overall, the mean score of the elderly on the Falls Behavioral Scale was = 2.85 points on a four-point scale. The falls behavior of the elderly indicated significant differences in

terms of the type and place of accidents ($p<0.05$). The mean score on the Falls Behavioral Scale was higher for women, college graduates, have single child, and those living alone.

Based on these findings; a few words could have been said for the future work. Home accidents happen frequently in old age, and home conditions must be arranged to prevent accidents. Improve environmental conditions against fall accidents, and thereby reduce the risk of such falls occurring in the home. In addition, elderly individuals and caregivers must be informed and educated regarding home accidents. Periodic safety checks might help identify risk factors and thus eliminate causes of many home accidents. Initial intake assessments should be conducted by those with training in assessing and screening for level of fall risk and contributing factors to prior falls. We suggest that a cohort study design could be employed in future research. We should consider the participation of all old people who are housebound. Further studies evaluating home accidents and falls behavior on larger groups can be encouraged in Turkey.

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✓ **A Study Which Investigates the Relationship of Age, Trunk Strength, and Balance Parameters with Fall Risk**

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✓ **Utilization of Home Health Care Services Provided By Government Among Elderly Individuals Between 2010 and 2015 in Diyarbakir, Turkey**

Rojan GÜMÜŞ, Seyfettin SARIBAŞ

✓ **Evaluation of Home Accidents and Fall Behaviors of Elderly**

Hande ŞAHİN, Sibel ERKAL