Turkish Journal of
GERIATRICS
Volume: 21 • Number: 2 • Year: 2018

TURKISH JOURNAL OF GERIATRICS

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

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

INSTRUCTIONS FOR AUTHORS

www.geriatri.dergisi.org

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

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

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

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

1. Letter of submission written for the editor.

2. E-mail address as well as postal address, official telephone and mobile phone number of corresponding author.

3. Affiliations of all the authors.

4. Copy of "Ethical Committee Approval Document" (will also be sent via mail)

5. Signed "Informed Consent Form" for the case reports (will also be sent via mail)

6. "Copyright Transfer Form" signed by all the authors (will also be sent via mail)

7. "Author Contribution Form" signed by all the authors (will also be sent via mail)

8. "Certificate of Language Control and Correction" (will also be sent via mail)

9. Turkish and English heading

10. Structured Abstract (Both in Turkish and English) (250 words at maximum)

11. Keywords in accordance with "Medical Subjects Headings-MeSH" List (up to 6)

12. Article divided into appropriate sections (1500-3500 words)

13. All figures (with legends) and tables (with titles) cited

14. Complete and accurate references (all references cited in text by numbers in standard brackets; references should be 25 at maximum with the PMID numbers and written according to the rules of the journal)

6th GERIATRICS and GERONTOLOGY COURSE

Was Performed in 7-11 May, 2018
in Neva Palace Hotel   Ankara-Turkey.

The course was organized by Turkish Geriatrics Society and Hacettepe University Research Center of Geriatric Sciences-GEBAM by the support of International Institute on Ageing-INIA and United Nations. Distinguished scientists and clinicians who have contributed to this course provided a comprehensive overview of geriatrics and gerontology.

Multidimentional and multidisciplinary scientific programme was composed of the following subjects.

Population Ageing: A Global Perspective, Population Ageing in Turkey, The Madrid International Plan of Action on Ageing and Turkey National Plan of Ageing, Communication with Older Patients, Geriatric Syndromes, Geriatric Emergencies, Checkups for older persons, Dementia, Immobility in Later Life and Physical Activity Recommendations, Frail Older Persons, Neuropsychological Assessment for the Elderly, Falls in Later Life and Preventive Measures, Rationale Drug Use in Later Life, Drug and Food Supplement Interactions in Later Life, Ageing of the Five Senses PANEL (Vision problems, Skin and Tasting problems, Hearing and Smelling

problems), Quality of Life in Later Life, Basic Principles of Geriatric Rehabilitation, Age-Friendly Cities, Abuse and Neglect in Old Age, Standards of Social Services for Older Persons, Healthy Nutrition in Elderly, Oral and Dental Health in Later Life, Oral and Dental Signs of Systemic Diseases in Later Life, Sociological Perspective of Ageing, Basic Problems of Aged Consumers And Recommendations, Disability Concern and Prevention, Geriatric measures and tools, Pressure ulcers, Home Care for Older Persons, Ethical

Aspects of Ageing and Frequent Legal Issues for Older Persons.

The course provided several scientific source materials and a visit to a nursing home was also performed.

Trainees coming from various parts of Turkey were composed of family medicine practicioners, specialists of public health, residents, nurses, psychologists and social workers.

The attendees stated that this was a very successful event for all those who choose to address and deal with the ever-increasing number of elderly people in Turkey.

Contents

RESEARCH ARTICLE

- Sinan YENAL[1]
- Gökhan KESER[2]
- Aliye MANDIRACIOĞLU[3]
- Mehmet Akif YALÇIN[2]
- Başak BAYRAM[4]
- Fehmi AKÇİÇEK[2]

CORRESPONDANCE

Sinan YENAL
Dokuz Eylül University, Health Care Services
Vocational School, İzmir, Türkiye

Phone: 02324124734
Fax: 02322770739
e-mail: sinan.yenal@deu.edu.tr

[1] Dokuz Eylül University, Health Care Services
    Vocational School, İzmir, Turkey
[2] Ege University, Faculty of Medicine,
    Department of İnternal Medicine, İzmir, Turkey
[3] Ege University, Faculty of Medicine,
    Department of Public Health, İzmir, Turkey
[4] Dokuz Eylül University, Faculty of Medicine,
    Department of Emergency, İzmir, Turkey

THE DETERMINATION OF THE STATUS OF EMERGENCY DEPARTMENT USE BY ELDERLY PATIENTS AND OF THE INDICATORS FOR AMBULANCE USE

ABSTRACT

Introduction: This study was prepared with the objective of determining the ratio of use of ambulances by the patients 65 years of age and older who applied to emergency department and the indicators for the use of ambulances.

Materials and Method: This cross-sectional research study, enrolled patients at least 65 years of age or older, who applied to the emergency department in İzmir Dokuz Eylül University Hospital. Two measurement tools were prepared with the objective of gathering the study data. The first measuring tool was prepared with the objective of evaluating the indicators of ambulance use by the patients, whereas the second measuring tool was for the situations of using emergency department.

Results: 555 patients were included in the study. Only 34.2% of these patients reported that they came to the emergency department with an ambulance. It was observed that patients living with their families, and those with medical emergencies, i.e. who did not experience a trauma or an accident, used ambulances less frequently for going to the emergency department (p<0.05). Among patients who came to the emergency department with private vehicles, 59.2% stated that they did not call an ambulance because they thought that it would be quicker to come with their own resources. On the other hand, among patients who came to the hospital with an ambulance, a ratio of 67.4% replied that they called the ambulance because of emergency.

Conclusion: The results of this study suggest that public awareness about 112 ambulance systems should be increased, especially for elderly patients.

Keywords: Geriatrics; Ambulance; Emergency Medical Services; Emergency Service, Hospital

YAŞLI HASTALARIN ACİL SERVİS KULLANIM DURUMU VE AMBULANS KULLANIM BELİRLEYİCİLERİNİN SAPTANMASI

ÖZ

Giriş: Bu çalışma acil servise başvuran 65 yaş ve üzeri hastaların ambulans kullanım oranını ve ambulans kullanım belirleyicilerini saptamak amacıyla hazırlanmıştır.

Gereç Yöntem: Kesitsel tipte planlanan bu araştırmanın evrenini, İzmir Dokuz Eylül Üniversitesi Hastanesi'nin acil servis birimine başvuran 65 yaş ve üstü hastalar oluşturmuştur. Çalışmanın verilerini toplamak amacı ile iki adet ölçme aracı hazırlanmıştır. Birinci ölçme aracı hastaların ambulans kullanım belirleyicilerini, ikinci ölçme aracı ise AS kullanım durumlarını değerlendirmek amacıyla hazırlanmıştır.

Bulgular: Araştırmaya 555 hasta alınmıştır. Çalışmaya alınan hastaların %34.2'sinin acil servise ambulans ile geldiği bulunmuştur. Ambulans ile gelen hastalar ise, %67.4 oranında acil durum nedeni ile ambulansı aradıkları yanıtını vermiştir. Ailesi ile birlikte yaşayan ve non-travmatik hastaların, acil servise ulaşmak için daha az sıklıkta ambulans kullandığı görülmüştür (p<0.05). AS birimine özel araç ile gelen hastaların %59.2'lik kısmı, kendi olanaklarıyla gelmenin daha çabuk olacağını düşündükleri için ambulans aramadıklarını belirtmiştir.

Sonuç: Bu çalışma özellikle yaşlı hastalarda 112 Ambulans sistemi hakkında halkın bilinçlendirilmesi gerektiğini ortaya koymaktadır.

Anahtar sözcükler: Geriatri; Ambulans; Acil Tıp Hizmetleri; Acil Hizmet, Hastane

INTRODUCTION

Just as elderly patients present to health centres, they present more frequently to emergency departments (EDs) for acute and complex problems. They feel the need to receive more intensive service and to be subjected to more diagnostic procedures. Consequently, they remain in EDs for a longer time. Prior studies have observed that the ratio of patients aged 65 years and older presenting to EDs in Turkey varied between 9% and 18% (1-6). Studies in different countries have reported that this ratio varied between 15% and 47% (7-10).

Patients presenting to EDs have been evaluated in various studies conducted in Turkey and worldwide, and these evaluations were generally based on information obtained from hospital records. Although the number of patients arriving at hospitals via an ambulance has been quantified, the number of studies that examined the reasons for in detail this is limited (11-13). It is important to determine the reasons patients presenting to EDs call or do not call an ambulance so that the use of 112 emergency medical services (EMS) can be optimised.

In this study, we aimed to determine the ratio of the use of ambulances by patients aged 65 years and older who presented to the ED of Dokuz Eylül School of Medicine and evaluated the indicators of ambulance use.

MATERIALS AND METHOD

This cross-sectional research study comprised patients aged 65 years and older who presented to the ED of Izmir Dokuz Eylül University Hospital between 1 August 2015 and 31 August 2015. Sampling was not done, and the study targeted the entire population. Patients whose general condition was such that were not suitable to attend interviews, who were sent to EDs at other polyclinics and who died in EDs were excluded. The first arrivals of patients who presented to the

ED more than once within the study period were included. Of 9484 patients who presented to the ED of Dokuz Eylül University Hospital during the study period, 820 (8.6%) were 65 years and older. After excluding patients with repeat arrivals, 755 met the inclusion criteria. Of these, 84 (11.2%) refused to participate, 64 (8.4%) could not be contacted, 27 (3.5%) were in a poor general condition because of which information could not be obtained, 11 (1.5%) were excluded as they were directed from the ED to another polyclinic within the hospital and 14 (1.9%) died. Finally, 555 (73.6%) could be contacted and were included in this study.

By scanning the literature and obtaining the views of experts, two measurement tools were prepared that were suitable to the objective of the study. The first measurement tool determined the patients' individual attributes, economic status, social security information, educational status, reasons and conditions for presenting to the ED and reasons for calling an ambulance. The tool was filled through face-to-face interviews held with the patient or their relatives. The second measurement tool determined the outcome of elderly patients in the ED. In this tool, the reason (traumatic or nontraumatic) for patients presenting to the ED, status of care at the ED (outpatient or inpatient), time that patients remained in the ED, status of requesting a consultation and the unit (surgical or internal medicine unit) in which inpatients were admitted were obtained by entering the related information into the hospital computer system.

The elderyl patients in this study are divited in two groups. First is the ambulance group (112 EMS Ambulance, Private ambulance and Institution ambulance), the second it's the private vehicle group (own cars, taxies, public busses etc.).

Data were evaluated using SPSS for Windows 15.0 software. The "Chi-square (chi-sq)" test was used to compare the situations of patients presenting to the ED with their sociodemographic status and to compare variables that could influence

their presentation to the ED with their status of ambulance use. The independent samples *t*-test was used to compare the ages of patients presenting to the ED, distance travelled to present to the ED, onset of complaints that made presentation to the ED necessary and duration of ED stay with their status at presentation. Logistic regression analysis was used for variables that were significant at the end of single-variable analysis.

This study was approved by the Dokuz Eylül University, Noninterventional Research Ethics Committee dated 21 August 2015, protocol Number 2197-GOA and decision number 2015/19-43.

RESULTS

Of 190 patients (34.2%) who presented to the ED via an ambulance, most (*n*=177; 93.2%) presented via the 112 EMS (Table 1).

A comparison of the sociodemographic findings of patients presenting to the ED via an ambulance is shown in Table 2. Most elderly patients who preferred to present to the ED via a private vehicle were married (*P*=0.02) or lived with their families (*P*=0.01; Table 2).

Reasons for calling or not calling an ambulance by patients who presented to the ED via a private vehicle or an ambulance is shown in Table 3.

When the complaints of patients were considered, 468 (84.3%) presented to the ED due to nontraumatic complaints. The ratio of patients presenting to the ED via an ambulance was statistically significantly lower among those without traumatic complaints than among those with traumatic complaints (p=0.02; Table 4).

The comparison according to age, distance travelled for presenting to the ED, onset of complaints requiring presentation to the ED and duration of stay in the ED of patients coming via an ambulance or a private vehicle is shown in Table 5. Accordingly, patients who presented to the ED via an ambulance were statistically significantly older and remained in the ED for a significantly longer period than those who presented to the ED via a private vehicle (p<0.01 and p<0.01, respectively; Table 5).

Logistic regression analysis of the variables found to be significant after single-variable analysis is shown in Table 6. Accordingly, the rate of presenting to the ED via an ambulance was 13.07 (2.92–58.58)-fold higher for those living in a rest home and was 9.34 (6.20–14.06)-fold higher for those who called the 112 EMS within the past year. In contrast, the status of being married decreased the use of ambulances by 0.60 (0.40–0.93)-fold, and living together with family decreased it 0.57 (0.38–0.87)-fold.

Table 1. Status of patients presenting to the emergency department.

Status of presenting to the ED (*n*=555)	Total	
	n	%*
Via a private vehicle	365	65.8
Via an ambulance	190	34.2
Via an ambulance (*n*=190) 112 EMS ambulance	177	93.2
Private ambulance	6	3.1
Institution ambulance	7	3.7

* Column percentage

Table 2. Sociodemographic attributes of the patients and statuses of presenting to the emergency department.

Variable	Ambulance		Private vehicle		Total		χ²	p
	n	%*	n	%*	n	%**		
Gender (n=555)								
Female	94	36.0	167	64.0	261	47.1	0.69	0.40
Male	96	32.7	198	67.3	294	52.9		
Marital status (n=549)								
Married	142	32.1	300	67.9	442	80.5	5.31	0.02
Single	47	43.9	60	56.1	107	19.5		
Status of living (n=542)								
With family	135	31.8	289	68.2	424	78.2	6.97	0.01↓
With children	30	38.5	48	61.5	78	14.2	0.57	0.45
Rest home	13	86.7	2	13.3	15	3.0	18.40	0.01↓
Alone	9	39.1	14	60.9	23	4.2	0.21	0.65
Caregiver	1	50.0	1	50.0	2	0.4	0.21	0.57***
Monthly income (n=512)								
1000 TL or less	42	32.1	89	67.9	131	25.6	0.01	0.94
1001–2000 TL	104	34.8	195	65.2	299	58.4		
2001–3000 TL	22	32.8	45	67.2	67	13.1		
3001 or more	4	26.6	11	73.4	15	2.9		
Social security (n=555)								
Emekli Sandığı[a]	71	34.8	133	65.2	204	36.8	0.05	0.83
SSK[b]	72	35.1	133	64.9	205	36.9	0.11	0.74
BAĞ-KUR[c]	30	30.6	68	69.4	98	17.7	0.69	0.40
Private Insurance	1	14.2	6	85.8	7	1.3	1.25	0.24***
None	14	38.9	22	61.1	36	6.5	0.37	0.54
Other	2	40.0	3	60.0	5	0.9	0.07	0.55***
Educational status (n=548)								
Illiterate	23	29.5	55	70.5	78	14.2	0.78	0.37
Primary school graduate	79	39.5	121	60.5	200	36.5		
Middle school graduate	42	33.1	85	66.9	127	23.2		
High school graduate	29	35.8	52	64.2	81	14.8		
University graduate	16	25.8	46	74.2	62	11.3		
Status of health of family (n=461)								
Yes	11	33.3	22	66.7	33	7.2	0.01	0.92
No	139	32.5	289	67.5	428	92.8		
Status of calling 112 within the past year (n=552)								
Yes	120	67.6	57	32.4	177	32.1	130	0.01↓
No	69	18.4	306	81.6	375	67.9		

*Line percentage   ** Column percentage   ***Fisher's Exact Test was applied.
[a]Pension Fund [b]Social Security Institution   [c]Pension Fund for Artisans and Self-employed

Table 3. Reasons for calling or not calling an ambulance by patients who presented to the emergency department via a private vehicle or an ambulance.

Reason	Total n	%*
Patients who presented to the ED via a private vehicle (n=363)		
1- Thought it would be quicker to come with their own resources	215	59.2
2- Thought that it was not an emergency that warranted calling an ambulance	113	31.1
3- Did not think to call an ambulance	13	3.6
4- The fact that the ambulance may not go to the hospital he/she wanted	5	1.4
5- To not pay a fee	4	1.1
6- Because the hospital was close	3	0.8
7- Other	10	2.8
Patients who presented to the ED via an ambulance (n=181)		
1- Due to an emergency situation	122	67.4
2- To transport the patient	25	13.8
3- Thought that they would come to the hospital quicker	13	7.2
4- Since it was an institutional ambulance	7	3.9
5- Since oxygen support was needed	4	2.2
6- Other	10	5.5

* Column percentage

Table 4. Variables that could influence patients presenting to the emergency department with the relationship of ambulance use.

Factor	Ambulance n	Ambulance %*	Private vehicle n	Private vehicle %*	Total n	Total %**	X^2	p
Reason for presenting to the ED (n=555)								
Non-traumatic	151	32.2	317	67.8	468	84.3	5.14	0.02
Traumatic	39	44.8	48	55.2	87	15.7		
Status of ED care (n=555)								
Outpatient	131	32.8	268	67.2	399	71.9	1.24	0.26
Inpatient	59	37.8	97	62.2	156	28.1		
Inpatient (n=156)								
Internal medicine unit (n=113)	39	34.5	74	65.5	113	72.4	1.91	0.16
Surgical unit (n=43)	20	46.5	23	53.5	43	27.6		
Status of requesting a consultation (n=555)								
Yes	128	38.5	204	61.5	332	59.8	6.85	0.01↓
No	62	27.8	161	72.2	223	40.1		

*Line percentage   ** Column percentage

Table 5. Comparison according to some characteristics of the patients.

Characteristics	Ambulance (n=190) X ±sd	Private vehicle (n=365) X ±sd	t	p
Age (years)	78.2±7.9	76.0±7.3	−3.24	0.01↓*
Distance travelled for presenting to the ED (km)	20.8±25.7	19.1±18.2	0.79	0.43
Time from when the complaints started and to presenting to the ED (min)	21.8±38.4	26.5±36.0	−1.38	0.16
Duration of stay in the ED (min)	752.2±872.9	581.0±780.7	−3.44	0.01↓*

*The z value has been given.

Table 6. Significant variables that influence presentation to the emergency department via an ambulance and the logistic regression model.

Variable	Beta	p	OR[a]	95% CI[b]
Age (continuous)	0.038	0.01↓	1.04	1.02–1.06
Marital status (married)	−0.504	0.02	0.60	0.40–0.93
Living together with family	−0.557	0.01↓	0.57	0.38–0.87
Living in a rest home	2.571	0.01↓	13.07	2.92–58.58
Calling the 112 service within the past year	2.234	0.01↓	9.34	6.20–14.06
Reason for presenting to the ED (trauma)	0.478	0.02	1.61	1.01–2.57
Request for consultation	0.488	0.01↓	1.63	1.13–2.35

[a]Odds ratio   [b]Confidence interval

DISCUSSION

To the best of our knowledge, our study is the first in Turkey to examine the reasons for patients 65 years and older presenting to the ED via an ambulance. The most basic reason for using ambulances was the thought that the patient was in an emergency situation. However, patients who presenting to the ED via private vehicles stated that they did not call an ambulance because they thought that it would be quicker to come via their own resources.

Among our study patients, 34.2% presented to the ED via ambulance. In various studies conducted in Turkey, the ratio of patients 65 years and older presenting to the ED via an ambulance varies between 5.6% and 40.0% (2,5,6,14,15).

Individuals who were married came to the hospital ED less frequently with an ambulance (OR=0.60). In the study made in Australia by Clark et al. in 1999, they found that in persons 65 years of age and older, being married decreased to a significant extent the use of an ambulance (PR=0.69) (11). In the

study made in Australia by Kerr et al. in which they evaluated the situations of coming to the hospital with an ambulance of all age group patients who had had a heart attack, it was found that 59% of the married patients came to the hospital with an ambulance (16). This difference can be explained with societal understanding. It was thought that the presence in Turkey of persons who would assist the patient would sometimes be the reason for paying insufficient attention to the other aid choices. It was found to be statistically significant that individuals who lived in a rest home came to the ED more frequently with an ambulance. It was thought that the result was also influenced by using institutional ambulances for persons living in a rest home.

It was observed that within the past year, the request for an ambulance in the situation of requesting aid from the 112 EMS had increased to a significant extent (OR=9.34). These known behaviors can be explained as a repetition. It was observed that persons who had requested help from the Ambulance services would also increase the probability of requesting an ambulance later in their lives.

Most patients who presented to the ED via private vehicles thought that 'it would be quicker to come with their own resources'. If they can provide for this with their own resources, they present to the ED as soon as possible without requesting aid.

The most important reason for preferring to present patients to the hospital ED via an ambulance is the thought that the patient is in an emergency. This situation can be interpreted in two ways. First, they could request ambulance assistance as they really think that their situation is an emergency. Second, they believe that the hospital would take more interest in patients who present to the ED via an ambulance or that they would not experience problems when being admitted to the hospital.

When the complaints of patients were evaluated, 84.3% presented to the ED due to nontraumatic complaints. The ratio of nontraumatic patients

presenting to the ED via an ambulance was statistically significantly lower and the frequency of ambulance use by patients with trauma was high (OR=1.61). In 1999, Clark et al. found that the use of ambulances for trauma in people 65 years and older significantly increased (11).

Of the patients who came to the ED, consultations were requested from various units for 59.8% of the patients during treatment. It was found that more consultations were requested for patients who came to the hospital with an ambulance (OR=1.63). In the study made by Loğoğlu et al., consultations were requested for 43.4% of the elderly patients who came to the ED. It was observed that has the age increased, there was also an increase in the ratios of requesting consultations (17). In the study made by Sinoff et al., it was found that of all the consultations requested in the ED, 49.3% were requested for patients in the geriatric age group (18). The results found in this study were generally found to be in conformity with the other studies.

When the times remaining in the ED of patients who came to the ED were examined, it was observed that the patients who came with an ambulance remained for a longer time to a significant extent in the ED. In the study made by Loğoğlu et al., the time of remaining in the ED was found to be 2.9 hours (17). In the study made by Young et al., the time of elderly patients remaining in the ED was found to be 3.5 hours (9). In the study made by Kennelly et al., the time of elderly patients remaining in the ED was found to be 9.2 hours (12). In the study made by Ross et al., the time of elderly patients remaining in the ED was found to be 6.53 hours (19). In this study, the average time of elderly patients remaining in the ED was found to be 10.8 hours. In general, the time of remaining in the ED was in harmony with the other studies. The patients who came with an ambulance remained in the EU for a longer time in a statistically significant manner compared to the patients who came with a private vehicle. The reason for this could be that the health conditions of the patients who came with an ambulance could

be more severe compared to the others. More help is requested from the 112 EMS for patients who are more severe and in worse condition.

The fact that our study included a fixed period (only one month) and that it coincided with the summer season could be a limitation from the aspects of period and time. The study was conducted using data from patients presenting to only the ED of the Dokuz Eylül University Hospital. Consequently, generalisations related to the results are unsuitable. Furthermore, as the study was cross-sectional, the results were limited in the explanation of the relationships.

According to the conclusions of this study,

the main reason for calling an ambulance by the patients who came to the ED with an ambulance was the thought that "there was an urgent situation". The main reason for not calling an ambulance by the patients who did not come with an ambulance was the thought that "it would be quicker to come with their own resources". It was found that married patients and those with medical emergencies, i.e. without history of accidents and traumas used ambulances less frequently for coming to the ED. The results of this study suggest that public awareness about 112 EMS should be increased, especially for elderly patients.

REFERENCES

1. Satar S, Sebe A, Avcı A, Karakuş A, İçme F. Emergency department and elderly patient. Çukurova University, Journal of Medicine School 2004;29:43-50. (in Turkish).

2. Akpınar O, Türkdoğan KA, Kapçı M, Duman A. Use of emergency department by elderly patients. J Clin Anal Med 2014;6(152):310-4. (in Turkish).

3. Mert E. Use of emergency departments by elderly patients. Turk J Geriatrics 2006;9(2):70-4. (in Turkish).

4. Ünsal A, Çevik AA, Metintaş S, Arslantaş D, İnan OÇ. Emergency department visits by elder patients. Turk J Geriatrics 2003;6(3):83-8. (in Turkish).

5. Şahin S, Boydak B, Savaş S, Yalçın MA, Akçiçek F. Characteristics of patients aged 65 and over in the emergency department. Akad Geriatri 2011;3(1):41-6. (in Turkish).

6. Zenginol M, Al B, Genç S, et al. Characteristics of patients aged 65 and over in the emergency department. J Emerg Med 2011;10:27-32. (in Turkish).

7. Schumacher JG, Deimling GT, Meldon S, Woolard B. Older adults in the emergency department: predicting physicians' burden levels. J Emerg Med 2006;30(4):455-60. (PMID:16740465).

8. Rutschmann OT, Chevalley T, Zumwald C, Luthy C, Vermeulen B, Sarasin FP. Pitfalls in the emergency department triage of frail elderly patients without specific complaints. Swiss Med Wkly 2005;135(9-10):145-50. (PMID:15832233).

9. Young JO. Ambulance and Public Hospital Emergency Department Utilisation by Elderly People in Perth Western Australia [e-book]. The University of Western Australia; 2009 pp 110 [Internet] Available from: NetLibrary Database.http://research-repository.uwa.edu.au/files/3217105/Young_Jeanne_Olivia_2009.pdf. Accessed:20.4.2016..

10. Hu SC, Yen D, Yu YC, Kao WF, Wang LM. Elderly use of the ED in an Asian metropolis. Am J Emerg Med 1999;17(1):95-9. (PMID:9928713).

11. Clark MJ, Purdie J, FitzGerald GJ, Bischoff NG, O'Rourke PK. Predictors of demand for emergency prehospital care: an Australian study. Prehosp Disaster Med 1999;14(3):167-73. (PMID:10724741).

12. Kennelly SP, Drumm B, Coughlan T, Collins R, O'Neill D, Romero-Ortuno R. Characteristics and outcomes of older persons attending the emergency

department: a retrospective cohort study. QJM 2014;107(12):977-87. (PMID:24935811).

13. Dracup K, Moser DK, McKinley S, et al. An international perspective on the time to treatment for acute myocardial infarction. J Nurs Scholarsh 2003;35(4):317-23. (PMID:14735673).

14. Kaldırım Ü, Tuncer SK, Ardıç Ş, et al. Analysis of elderly patients present to the emergency department via ambulance. Turk J Emerg Med 2013;13(4):161-65. (in Turkish).

15. Nur N, Demir ÖF, Çetinkaya S, Tirek N. Evaluation of the 112 emergency service used by older people. Turk J Geriatr 2008;11(1):7-11. (in Turkish).

16. Kerr D, Holden H, Smith J, et al. Predictors of ambulance use in patients with acute myocardial infarction in Australia. Emerg Med J 2006;23(12):948-52. (PMID:17130609).

17. Loğoğlu A, Ayrık C, Köse A, et al. Analysis of non-traumatic elderly patient presentations to the emergency department. Tr J Emerg Med 2013;13(4):171-9. (in Turkish).

18. Sinoff G, Clarfield AM, Bergman H, Beaudet M. A two-year follow-up of geriatric consults in the emergency department. J Am Geriatrics Soc 1998;46(6):716-20. (PMID:9625187).

19. Ross MA, Compton S, Richardson D, Jones R, Nittis T, Wilson A. The use and effectiveness of an emergency department observation unit for elderly patients. Ann Emerg Med 2003;41(5):668-77. (PMID:12712034).

PREDICTING MORTALITY AND MORBIDITY OF GERIATRIC FEMORAL FRACTURES USING A MODIFIED FRAILTY INDEX AND PERIOPERATIVE FEATURES: A PROSPECTIVE, MULTICENTRE AND OBSERVATIONAL STUDY

Abstract

Introduction: Femoral fracture is associated with high geriatric mortality. Frailty is the increased vulnerability to stressors resulting from aging-associated decreases in physiological reserve. We aimed to predict 30-365-day postoperative mortality and morbidity rates using modified frailty index and perioperative characteristics in geriatric femoral fractures.

Materials and Method: Using a prospective observational design, data were collected from patients >65 years undergoing femoral fracture surgery from 13 different hospitals in 2016 and 2017. Post-discharge follow-up periods were 30, 90, 180, and 365 days. Age, sex, modified frailty index and anaesthesia types used during surgery were recorded. Renal markers, troponin I and haemoglobin levels were examined preoperatively and postoperatively at 24 and 72 hours.

Results: We included 392 patients in this study. The age of the patients were between 65 and 101 (mean, 79±11.9). Median modified frailty index was 5 (interquartile range, 2–7). Increase in modified frailty index increased mortality rate. Mortality rate at postoperative 30 days was 9.8%, while overall study mortality rate was 23%. Spinal anaesthesia was administered in 205 patients (52.3%, most frequent), followed by general in 110 (28.1%), peripheral nerve blocks in 21 (5.4) and spinal-epidural in 43 (11%). Anaesthesia type affected both intensive care unit (p<0.001) and total hospitalization (p<0.012) duration. A logistic regression model revealed that frailty index, preoperative creatinine and centre type were independent mortality predictors.

Conclusion: Increased modified frailty index was associated with higher postoperative mortality risk, thus providing an additional way for improving risk stratification. Preoperative creatinine increase and centre types are determining factors in mortality.

Keywords: Frail elderly; Geriatrics; Femoral fractures; Anesthesia; Mortality; Morbidity

Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2018240413
2018;21 (2):118-127

- Fatma SARICAOĞLU[1]
- Şemsi Mustafa AKSOY[2]
- Aysun YILMAZLAR[3]
- Derya ÖZKAN[4]
- Elif ÇOPUROĞLU[5]
- Eser Özlem ÜNLÜSOY[6]
- Perihan EKMEKCİ[7]
- Mehmet Anıl SÜZER[8]
- Güldeniz ARGUN[9]
- Hasibe SUNUL[10]
- İsmail DEMİREL[11]
- Ahmet EROĞLU[12]
- Filiz Solmaz ALKAYA[13]
- Deniz YÜCE[14]
- Mutlu HAYRAN[15]

CORRESPONDANCE

Fatma SARICAOĞLU
Hacettepe University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Turkey

Phone: 0312 3051264
e-mail: fatmasaricao@yahoo.com

Received: 09/02/2018
Accepted: 18/04/2018

1   Hacettepe University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Turkey
2   Ankara Yıldırım Beyazıt University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Turkey
3   Private Medicabil Hospital, Anesthesiology and Reanimation, Bursa, Turkey
4   University of Health Sciences, Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Turkey
5   Trakya University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Edirne, Turkey
6   İstanbul University, Cerrahpaşa Faculty of Medicine, Department of Anesthesiology and Reanimation, İstanbul, Turkey
7   Ufuk University, Rıdvan Ege Hospital, Department of Anesthesiology and Reanimation, Ankara, Turkey
8   Cankaya Hospital, Anesthesiology and Reanimation, Ankara, Turkey
9   Dr Abdurrahman Yurtaslan Ankara Onkology Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Turkey
10   University of Health Sciences, Haseki Training and Research Hospital, Department of Anesthesiology and Reanimation, İstanbul, Turkey
11   Fırat University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Elazığ, Turkey
12   Karadeniz Technical University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Trabzon, Turkey
13   Süleyman Demirel University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Isparta, Turkey
14   Hacettepe University, Cancer Institute, Department of Preventive Oncology, Ankara, Turkey
15   Hacettepe University, Cancer Institute, Department of Preventive Oncology, Ankara, Turkey

PERİOPERATİF ÖZELLİKLER VE MODİFİYE KIRILGANLIK İNDEKSİ İLE GERİATRİC FEMORAL KIRIKLARINNIN MORBİDİTE VE MORTALİTELERİNİN ÖNGÖRÜLMESİ: PROSPEKTİF, ÇOKMERKEZLİ, GÖZLEMSEL ÇALIŞMA

Öz

Giriş: Femur kırığı geriatrik popülasyonda yüksek mortalite ile ilişkili ciddi bir durumdur. Kırılganlık, yaşlanmayla ilişkili fizyolojik rezerv azalmalarından kaynaklanan savunmasızlığın klinik olarak artmasıdır. Bu çalışmada geriatrik femur kırığı ameliyatı sonrası 30-365 günlük postoperatif mortalite ve morbidite oranlarını, modifiye kırılganlık indeksi ve perioperatif özellikleri kullanarak öngörmeyi amaçladık.

Gereç ve Yöntem: Prospektif, gözlemsel, çok merkezli çalışmada, 2016 ve 2017 yıllarında 13 farklı hastaneden femur kırığı ameliyatı geçiren 65 yaş üstü hastalardan veri toplandı. Taburculuk sonrası belirlenen izlem aralıkları 30, 90, 180 ve 365 gündü. Yaş, cinsiyet, mFİ ve uygulanan anestezi yöntemi kaydedildi. Böbrek belirteçleri, troponin I ve hemoglobin düzeyleri preoperatif ve postoperatif 24 ve 72. saatlerde incelendi.

Bulgular: Araştırmaya 392 hasta dahil edildi. Hastaların yaşları 65-101 yıl idi (ortalama 79±11.9). Medyan modifiye kırılganlık indeksi 5 (interquartile range, 2-7) idi. 7); ve artışı ile mortalite oranını yükseldi. Postoperatif 30 günlük mortalite hızı %9.8 iken genel mortalite %23 bulundu. En sık uygulanan anestezi yöntemi 205 hastada (%52.3) spinal, 110 hastada (%28.1) genel anestezi, periferik sinir blokları 21 hastada (5.4), spinal-epidural 43 hastada (%11) olarak belirlendi. Anestezi tipi hem yoğun bakımda (p<0.001) hem de toplam hastane yatış süresini (p<0.012) etkiledi. Bir lojistik regresyon modeli, modifiye kırılganlık indeksi, preoperatif kreatinin ve uygulama merkezlerinin mortalitenin bağımsız belirleyicileri olduğunu ortaya koydu.

Sonuç: Medyan modifiye kırılganlık indeksi artışı, postoperatif morbidite ve mortalite riski ile ilişkili olup, risk belirlemede kliniğe destekleyici bilgi sunmaktadır. Preoperative kreatinin yüksekliği ve uygulama merkezleri mortalite için belirleyici faktörlerdir.

Anahtar sözcükler: Kırılgan yaşlılar; Geriatri; Femur kırıkları; Anestezi; Mortalite; Morbidite

INTRODUCTION

The incidence of geriatric femoral fractures is expected to exceed 6 million patients worldwide by 2050 because of an increase in the geriatric population (1,2). These procedures have significant 6- and 12-month morbidity and mortality rates. Presently, mortality rates associated with hip fractures are 37.1% in men and 26.4% in women (3-5). Despite numerous risk stratifications and preoperative indicators of postoperative mortality and morbidity, adequate preoperative risk assessments are crucial for enabling clinicians to accurately estimate the types of complications that patients may face.

The American Society of Anesthesiologists (ASA) physical status classification is among the most popular tools; however, it remains insufficient. A standard frailty index can therefore be used as an independent predictor for postoperative mortality and morbidity as an adjunct to ASA (1,6). The term frailty is widely used for denoting a multidimensional syndrome of the loss of reserves (energy, physical ability, cognition, health) that leads to vulnerability to adverse outcomes (7,8). Patel et al. reported that the modified frailty index (mFI) was associated with mortality in patients aged >60 years with femoral fractures at 1 and 2 years and that this predictive model may be quick and easy to use (7). However, these authors also cautioned that further explorations in larger prospective studies are required.

Thus, our primary objective was to assess the predictive value of the mFI on postoperative mortality and morbidity rates associated with geriatric femoral fracture surgery. Our secondary objective was to examine the perioperative factors associated with mortality and morbidity in the geriatric population including the anaesthesia type used during surgery and renal function measured at multiple centres.

MATERIALS AND METHOD

This prospective, observational, multicentre study included data collected from 13 centres between February 2016 and March 2017. Patients > 65 years undergoing surgery for femoral fracture were enrolled. Patients who had pathological fractures and multiple traumas and whose medical records did not include at least 1-year follow-up were excluded from this study. Patient data included age, sex, anaesthesia type, intensive care unit (ICU) and hospitalization duration and blood transfusion requirement during surgery and the ICU stay. Renal markers (blood urea nitrogen [BUN] and creatinine), cardiac troponin I, and haemoglobin levels were measured preoperatively and 24 and 72 hours postoperatively.

The mFI was based on 19 of the potential 70 Canadian Study of health and Aging clinical deficits (Table 1). Zero points were given for the absence of a deficit and 1 point for the presence. A total of 19 clinical deficits were identified with the potential for maximum and minimum modified frailty levels of 20 and 0, respectively.

Statistical analysis

The numerical variables of the study are presented as either mean and standard deviation (SD) or median and interquartile range (IQR). Mann–Whitney U and Kruskal–Wallis tests were used for comparing two independent groups and more than two independent groups, respectively. Comparisons between two and more than two dependent groups were analysed using Wilcoxon signed-rank and Friedman non-parametric analysis of variance tests, respectively. Bonferroni's adjustment was applied in *post-hoc* analyses of multiple group comparisons to avoid type-I error inflation. Categorical variables were presented as frequency and percentage and were compared using the chi-squared test. Correlations were analysed using Spearman non-parametric correlation analysis. A logistic regression model was used for evaluating the independent predictors of mortality. A type-I error level of 5% was considered the statistically significant. All statistical analyses were performed using SPSS 21 software (IBM Inc., Armonk, NY, USA).

Table 1. Modified frailty index.

Cerebrovascular accident or transient ischemic stroke
Impaired cognition (dementia, Alzheimer's dementia)
History of recurrent falls
Diabetes mellitus (except diet-controlled)
History of syncope or blackouts
Ambulatory with no assistive devices or
      Ambulatory with walker or cane or
      Non-ambulatory or use of scooter/wheelchair
Psychotic disorder (post-traumatic stress syndrome, bipolar disease, paranoia, schizophrenia)
Thyroid disease
History of seizures
Congestive heart disease
Depression
History of malignancy
Decubitus ulcers
Cardiac disease (coronary artery disease, arrhythmia, mitral valve prolapse, aortic stenosis)
Urinary incontinence
Parkinson's disease
Renal disease (acute or chronic)
Respiratory problems (COPD*, emphysema, OSA*, chronic bronchitis)
History of myocardial infarction

Abbreviations: Chronic obstructive pulmonary disease; OSA, obstructive sleep apnea

RESULTS

Among the 480-screened patients, 392 were included in this study. Patients' general characteristics are presented in Table 2. Eight university hospitals, three training and research hospitals and two private hospitals followed up 60.7%, 24.2% and 15.1% of the patients, respectively.

Anaesthesia types used during surgery are shown in Table 2. Anaesthesia types significantly differed among study centres (p<0.001) and impacted both ICU stay (p<0.001) and total hospitalization (p<0.012) duration but did not affect complication or mortality rates. Patients who received general anaesthesia stayed longer at the centre than patients who received the other types (p<0.001). Complication rates were higher

as well, but were not noted to be statistically significant.

The mFI distribution is shown in Table 2. Median mFI was 5 (IQR, 2–7); 127 patients (27.6%) had mFI ≥7. mFI predicts mortality, particularly at 180 days' follow-up. Increased mFI was associated with increased mortality rate. The correlation analysis between mFI and postoperative follow-up revealed weak correlations, which suggests that the patient's clinical condition worsened as the mFI increased in each follow-up evaluation (r-value range, 0.15–0.23; all statistically significant, p<0.05). Thus, frailty plays a crucial role in the assessment of patients with femoral fracture; higher mFI had a higher odds ratio for mortality.

Mean ICU stay duration differed among centres: university hospitals, 7 days (min-max,

2–70 days); training and research hospitals, 5 days (2–35 days); and private hospitals, 4 days (1–19 days) (p<0.001). Patients who received general anaesthesia stayed longer than patients who received other anaesthesia types (p<0.001). Mean complication rates, although not statistically significant, were higher in patients who received general anaesthesia. ICU duration was significantly correlated with preoperative BUN (r=0.153, p<0.003), intraoperative bleeding (r=0.170, p <0.001), erythrocyte suspension usage (r=0.157, p<0.002), postoperative decrease in BUN (p=0.116, p<0.022), increased creatinine (r=0.113, p<0.032) and troponin I (r=0.389, p<0.001) levels. The most frequent hospital stay complications are presented in Table 2. The rate of hospital death was 3.8%. The overall mortality rate was 23% (Table 3). The patients' outcomes at each follow-up are presented in Table 3.

Independent predictors of mortality were evaluated using a logistic regression model (Table 4). Accordingly, the frailty index, preoperative creatinine and centre type were the independent predictors of mortality. Each increase in frailty index had an OR of 1.3 (95% CI, 1.2–1.5), each per-unit increase in preoperative creatinine had an OR of 1.6 (95% CI, 1.03–2.5), and health-care facility type (research vs. training hospital vs. university hospital) had an OR of 2.5 (95% CI, 1.3–4.8).

DISCUSSION

The findings of this large multicentre prospective study indicate that mFI is a valid and useful predictor of mortality and hospital stay following a femoral fracture surgery. The type of anaesthesia affected both ICU stay and total hospitalization but not complication or mortality rates. Patients who received general anaesthesia stayed longer than other patients, and preoperative creatinine and centre type were the independent predictors of mortality. An adequate tool for objective perioperative risk stratification is required to afford

patient education regarding expected surgical complications and to aid in the reasonable and fair comparison different practitioners and health systems.

Frailty is the decrease in one's physiological reserves as well as multisystem impairments that are separate from the normal process of aging (9). Frailty is a known independent factor associated with postoperative mortality and morbidity as well as the length of hospital stay and has been shown to increase the risk of mortality. Patients with femoral fracture represent an elderly group with varied levels of frailty (10-12). In our patient population, 127 (27.6%) had mFI≥7. Remarkably, mFI predicts mortality, especially at 180-day follow-up, which suggests that patient condition worsens as mFI increases at each follow-up evaluation.

Frailty represents a state of increased vulnerability to adverse outcomes, and mFI expresses the number of clinical deficits identified in an individual as a proportion of the total number of deficits. mFI>5 has been proposed as the demarcation between fitness and frailty in community-dwelling elderly people. mFI≥7 describes elderly people who are completely dependent for their activities of daily living and are at a higher risk of mortality (8). mFI can be used for different high-risk surgeries. For example, Ali et al. (13) showed that the use of mFI predicted 30-day mortality and morbidity in spine surgery. They demonstrated the successful application of mFI for predicting postoperative mortality and morbidity in 18,294 patients who underwent spine surgery. mFI can thus be considered as a useful tool for risk stratification and can serve as an objective measure for describing the potential risk of spine surgery to patients and their families. In the present study, mFI predicted mortality, particularly at 180 days' follow-up. An increased mFI was correlated with an increased mortality rate, which suggests that patient condition worsens as the mFI increases in each follow-up evaluation.

Table 2. Patients' general characteristics.

Sex, n (%)	
Male	149 (38)
Female	243 (62)
Age (years), mean±sd*	79±11.9
Age group, n (%)	
≤75	115 (29.3)
76-85	144 (36.7)
≥86	133 (33.9)
Frailty index, median (IQR)*	5 (2-7)
Frailty Index distribution, n (%)	
0	14 (3.6)
1	31 (7.9)
2	54 (13.8)
3	39 (9.9)
4	43 (11)
5	35 (8.9)
6	49 (12.5)
7	41 (10.5)
8	27 (6.9)
9	19 (4.8)
10	19 (4.8)
11	11 (2.8)
12	9 (2.3)
14	1 (0.3)
Type of anaesthesia, n (%)	
Spinal	205 (52.3)
Epidural	13 (3.3)
Spinal-epidural	43 (11)
Peripheral nerve block	21 (5.4)
General	110 (28.1)
ICU hospitalization days, mean±sd	1.4±3.5
Total hospitalization days, mean±sd	8.6±8.3
Hospital complication, n (%)	
CVE*	2 (0.5)
ARF*	11 (2.8)
Infection	17 (4.3)
Mechanical ventilation > 24 h	5 (1.3)
ICU* hospitalization > 24 h	36 (9.2)
Death	15 (3.8)

Abbreviations: SD, standard deviation; IQR, interquartile range; ICU, intensive care unit; CVE, Cerebrovascular event; ARF, acute renal failure

Table 3. Patient outcomes during follow-up.

	Postoperative follow-up			
	30-day	**90-day**	**180-day**	**365-day**
	n (%)	n (%)	n (%)	n (%)
Walking, doing own duties	123 (39)	129 (45.4)	131 (49.4)	132 (50.8)
Walking with crutches	50 (15.9)	40 (14.1)	41 (15.5)	35 (13.5)
Cannot get up without help	25 (7.9)	25 (8.8)	15 (5.7)	13 (5.4)
Bedbound	58 (18.4)	53 (18.7)	42 (15.8)	35 (14.6)
Unconsciousness, dementia, bedbound	28 (8.9)	18 (6.3)	20 (7.5)	21 (9.2)
Death	31 (9.8)	19 (6.7)	16 (6)	17 (6.5)

Table 4. Logistic regression model.

	P	OR*	95% CI* for EXP (B)	
			Lower	**Upper**
Frailty index	<0.001	1.32	1.19	1.46
Sex (ref. female)	0.14	1.54	0.86	2.76
Age group (ref. ≤75)	0.40			
76-85	0.22	1.56	0.77	3.17
≥86	0.77	1.12	0.53	2.39
Anaesthesia type (ref. general)	0.082			
Spinal	0.031	0.49	0.25	0.94
Epidural	0.12	0.24	0.04	1.48
Spinal-epidural	0.56	1.33	0.52	3.41
Peripheral nerve block	0.44	0.61	0.17	2.15
Preoperative haemoglobin	0.73	0.97	0.83	1.14
Preoperative blood urea nitrogen	0.86	1	0.99	1.006
Preoperative creatinine	0.035	1.62	1.04	2.54
Study centre type (ref. university)	0.024			
Research and training hospital	0.009	2.46	1.26	4.80
Private hospital	0.78	0.84	0.26	2.79
Constant	<0.001	0.06		

Abbreviations: OR, odds ratio; CI, confidence interval

Femoral fracture is associated with a substantial risk of mortality and morbidity with approximately 1%–6% of patients dying within 30 days of admission (10,11). In this study, the hospital mortality rate was 3.8%, and the 30-day mortality rate was 9.8%. Several factors can affect this outcome, including

the anaesthesia type. Numerous reports have compared the anaesthesia type with mortality and morbidity in femoral fracture surgery in the geriatric population and found that some had no significant effectiveness at regional anaesthesia and mortality while other investigations report significant effectiveness at reducing mortality rates using regional anaesthesia.

Neuman et al. (12) found lower mortality and pulmonary complication rates among all regional anaesthesia patients when compared with general anaesthesia patients. They retrospectively investigated more than 18,000 patients who underwent femoral fracture surgery and found that regional anaesthesia was associated with a 25%–29% reduction in major pulmonary complications and death. The mortality rates were 2.5% for general anaesthesia and 2.1% for regional anaesthesia. If sicker patients were more likely to receive general anaesthesia, this finding of a lower odds ratio of mortality and complications with regional anaesthesia might reflect selection bias because of the retrospective data of the study. Thus, the authors could not determine the exact anaesthesia type but instead had to assume the use of regional anaesthesia.

Patrono et al. (4) investigated 73,284 adults undergoing hip fracture surgery and found that mortality risk did not differ significantly between anaesthesia types. Hospital deaths occurred in 1,362 (2.2%) patients receiving general anaesthesia and in 144 (2.1%) patients receiving regional anaesthesia. Specific advantages associated with the different anaesthetic techniques may play a part in this effect. Regional anaesthesia negates the need for airway management, decreases blood loss, reduces the risk of deep venous thrombosis, and improves postoperative analgesia. Conversely, general anaesthesia may be associated with a more stable hemodynamic state than regional anaesthesia. However, when regional anaesthesia

is administered, clinicians must be aware of the hypotensive effects because intraoperative hypotension leads to critical organ hypoperfusion and postoperative ischemic complications including delirium, dysthymia, and acute kidney injury, which are independently associated with poor outcomes (14).

In the present study, we found that mortality risk did not significantly differ by anaesthesia type unlike the findings by Paterno et al. (4) but it affected both ICU stay and total hospitalization. Patients who received general anaesthesia had a longer hospital stay than other patients. We studied the statistical data again for determining whether frailer people were administered regional anaesthesia, which could have altered the results, and observed no correlation between frailty and anaesthesia type. In this regard, the administration of regional anaesthesia to frail patients will have a beneficial effect on hospital stay, complications and mortality.

We also found that preoperative creatinine was an independent predictor of mortality. Several studies have investigated the effect of routine blood tests for predicting mortality. In a recent meta-analysis of 15 studies, Laulund et al. (15) concluded that high plasma creatinine levels had a prognostic value for mortality in patients with femoral fractures. Sayedi et al. (16) reported an association between plasma BUN and creatinine levels and mortality rates following hip fractures in elderly patients. Purvis et al. (17) reported that patients with high creatinine levels have an increased rate of morbidity following lumbar fusion. They used creatinine levels as a complementary measure to the glomerular filtration rate to show the association between preoperative kidney function and postoperative complications. Collectively, we must improve renal function and carefully monitor patients during the perioperative period to decrease patient mortality and morbidity in high-risk surgeries, particularly in the geriatric population.

We found that patient outcome varies across care centres, which seems to play a crucial role in mortality rates which make location an independent risk factor. University hospitals had lower mortality rates than did training hospitals. There is compelling evidence from different studies suggesting that high-risk patients, particularly those who recently underwent cancer surgery, have superior outcomes when surgery is performed in hospitals with a large volume of cases (18). Schrag et al. (19) compared the surgeon volume to hospital volume, used the metric as a predictor of outcomes of colon cancer resection and reported that both impacted patient outcomes but that hospital volume may exert a stronger effect. Also, Bach et al. (20) reported that high-volume hospitals (67–100 procedures/year) had higher survival rates (11%) following lung resection surgeries. Regarding hospital factors, hospital care quality is associated with skills of the surgeon, anaesthesiologist and other medical staff such as interventional radiologists, intensive care staff and infection control team. Frail patients can be sent to a high-volume university hospital to decrease their perioperative mortality.

This study had several limitations. We could not determine the precise reasons for selecting the anaesthesia types for the patients, and anaesthesia type differed significantly among the centres. Our findings also provide no information about specific anaesthetic agents, monitoring or administration. Lastly, the current data source does not include detailed information regarding the fracture type or surgical time after emergency room arrival. Operative delays may increase mortality and morbidity (21). One of the strengths of our study was its large representative sample of patients, surgeons and hospitals from all around the country. Because of the community-based setting of this large integrated health-care system, which was the framework, the large number of patients in this study covered all hospital types (university, training, research and private hospitals). This makes our findings potentially representative of other patients in the country with different surgeons, anaesthetists and hospitals.

Another strength of this study was its prospective design. We followed up the patients individually at every step. The registry prospectively collected information about the patients and mFI scores used in this study, strengthening the internal validity of the presented data. Furthermore, we reported 30-, 90-, 180-, and 365-day mortality, which represent important time extensions. This is one of the largest prospective multicentre studies aimed at determining short- and long-term mortality rates associated with femoral fracture surgeries in Turkey. In this study, we compared the renal markers, haemoglobin levels and troponin levels preoperatively as well as at 24 and 72 hours' postoperative. Thus, we can suggest that anaemia, renal insufficiency and an increased cTI are risk factors for an increased hospital stay.

In conclusion, the findings of our study showed that frailty is independently associated with poorer outcomes and that mFI may be useful for further preoperative risk stratifying geriatric patients undergoing femoral fracture surgery. In addition, the preoperative creatinine level plays a significant role in postoperative mortality, so clinicians must protect renal function during the perioperative period. Further consideration of the addition of these parameters may be an important avenue for further studies for developing a better understanding and deeper insight into patient prognosis after femoral fracture surgery to help develop screening tools for mortality outcomes.

Conflict of interest

The authors declare no conflicts of interest associated with this study.

REFERENCES

1. Maggi S, Siviero P, Wetle T, Bestine RW, Saugo M, Crepaldi G. A multicenter survey on profile of care for hip fracture: predictors of mortality and disability. Osteoporos Int 2010;21:223-31. (PMID:19415372).

2. Dayama A, Olorunfemi O, Greenbaoum S, Stone ME Jr, McNelis J. Impact of frailty on outcomes in geriatric femoral neck fracture management: An analysis of national surgical quality improvement program dataset. Int J Surg 2016;28:185-90. (PMID:26926088).

3. Smith T, Pelpola K, Ball M, Ong A, Myint PK. Preoperative indicators for mortality following hip fracture surgery: a systematic review and meta-analysis. Age Aging 2014;43:464-71. (PMID:24895018).

4. Patorno E, Neuman MD, Schneeweiss S, Mogun H, Bateman BT. Comparative safety of anesthetic type for hip fracture surgery in adults: retrospective cohort study. BMJ 2014;348:q4022. (PMID:24972901).

5. Karaman O, Ozkalkanlı G, Orak MM, et al. Factors affecting postoperative mortality in patients older than 65 years undergoing surgery for hip fracture. Ulus Travma Acil Cerrahi Derg 2015;21:44-50. (PMID:25779712).

6. Erçin E, Bilgili MG, Sari C, et al. Risk factors for mortality in geriatric hip fractures: a comparison study of different surgical procedures in 785 consecutive patients. Eur J Orthop Surg Travmatol 2017;27:101-06. (PMID:27577731).

7. Patel KV, Brennan KL, Brennan ML, Jupiter DC, Shar A, Davis ML. Association of modified frailty index with mortality after femoral neck fracture in patients aged 60 years and older. Clin Orthop Relat Res 2014;472:1010-17. (PMID:24166073).

8. Rockwood K, Song X, MacKnight C, et al. global clinical measure of fitness and frailty. CMAJ 2005;173:489-95. (PMID:16129869).

9. Krishnan M, Beck S, Havelock W, Eeles E, Hubbard R, Johansen A. Predicting outcome after hip fracture: using a frailty index to integrate comprehensive geriatric assessment results. Age Aging 2014;43:122-26. (PMID:28659127).

10. Van Waesberghe J, Stevanovic A, Rossaint R, Coburn M. General versus neuraxial anesthesia in hip fracture patients: a systematic review and meta-analysis. BMC Anesthesiol 2017;17:87. (PMID:28659127).

11. Guay J, Parker MJ, Gajendragadkar PR, Kopp S. Anesthesia for hip fractures surgery in adults. Cochrane database of Systematic Reviews 2016 Feb 22;2:CD000521. doi: 10.1002/14651858. CD000521. (PMID:26899415).

12. Neuman DM, Silber JH, Elkassabany NM, Ludwig JM, Fleisher LA. Comparative effectiveness of regional versus general anesthesia for hip fracture surgery in adults. Anesthesiology 2012;117:72-92. (PMID:22713634).

13. Ali R, Schwalb JM, Nerenz DR, Antoine HJ, Rubinfeld I. Use of the modified frailty index to predict 30-day morbidity and mortality from spine surgery. J Neurosurg Spine 2016;25:537-41. (PMID:27153143).

14. White SM, Moppett IK, Griffiths R, et al. Secondary analysis of outcomes after 11,085 hip fracture operations from prospective UK Anesthesia Sprint Audit of Practice (ASAP-2). Anesthesia 2016;71:506-14. (PMID:26940645).

15. Laulund AS, Lauritzen JB, Duus BR, Mosfeldt M, Jorgensen HL. Routine blood tests as predictors of mortality in hip fracture patients. Injury 2012;43:1014-20. (PMID:22236368).

16. Seyedi HR, Mahdian M, Khosravi G, et al. Prediction of mortality in hip fracture patients: Role of routine blood tests. Arch Bone Jt Surg 2015;3:51-55. (PMID:25692170).

17. Purvis TE, Kessler RA, Boone C, Elder BD, Goodwin CR, Sciubba DM. The effect of renal dysfunction on short-term outcomes after lumber fusion. Clin Neurol Neurosurg 2017;153:8-13. (PMID:27992823).

18. Wang TY, Martin JR, Loriaux DB, et al. Risk assessment and characterization of 30-day perioperative myocardial infarction following spine surgery: a retrospective analysis of 1346 consecutive adult patients. Spine 2016;41:438-44. (PMID:26693673).

19. Schrag D, Panageas KS, Riedel E, Hsieh L, Bach PB, Guillem JG, Begg CB. Surgeon volume compared to hospital volume as a predictor of outcome following primary colon resection. J Surg Oncol 2003;83:68-79. (PMID:12772198).

20. Bach PB, Cramer LD, Schrag D, Downey RJ, Gelfand SE, Begg CB. The influence of hospital volume on survival after resection for lung cancer. N Engl J Med 2001:345:181-88. (PMID:11463014).

21. de Palma L. Torcianti M, Meco L, Catalani A, Marinelli M. Operative delay and mortality in elderly patients with hip fracture: an observational study. Eur J Orthop Surg Traumatol 2014;24:783-8. (PMID:23712671).

■ Feriha TEMİZEL[1]
■ Serkan UÇKUN[1]
■ Tamer KUZUCUOĞLU[1]
■ Gülten ARSLAN[1]
■ Banu ÇEVİK[1]

CORRESPONDANCE

Feriha TEMİZEL
University of Health Sciences, Kartal Dr. Lütfi Kırdar Training and Research Hospital, Department of Anesthesiology and Reanimation İstanbul, Turkey

Phone: 0216 458 30 00
e-mail: ferihatemizel@gmail.com

¹ University of Health Sciences, Kartal Dr. Lütfi Kırdar Training and Research Hospital, Department of Anesthesiology and Reanimation İstanbul, Turkey

RESEARCH

THE EFFECTS OF COMORBIDITIES ON INTENSIVE CARE ADMISSION IN ELDERLY PATIENTS UNDERGOING HIP SURGERIES

Abstract

Introduction: We aimed to compare patients aged ≥75 in the intensive care unit with those in orthopedics clinic following hip replacement with respect to age, preoperative comorbidity, anesthesia types, length of hospital stay, and mortality.

Materials and Method: Patients aged ≥75 who underwent hip replacement at our hospital due to intertrochanteric femoral fracture in 2011–2016 were evaluated. Patients aged <75 with severe organ failure and hemorrhagic diathesis were excluded. Age, sex, comorbidity, anesthesia types, length of stay in the hospital before surgery and in the intensive care unit, and mortalities were evaluated in 130 patients. Patients were divided into two groups: patients in postoperative intensive care unit and those in postoperative orthopedic clinic. A p-value of <0.05 was considered statistically significant.

Results: Mean age and the prevalence of hypertension, diabetes mellitus, congestive heart failure, and chronic obstructive pulmonary disease were significantly higher in patients in the intensive care unit than in those in postoperative orthopedic clinic. No difference was observed between the groups in anesthesia types. Length of hospital stay was significantly longer in patients in the intensive care unit. In logistic regression analysis, older age and presence of chronic obstructive pulmonary disease had significant effect on admission to the intensive care unit.

Discussion: We believe that detailed preoperative evaluation, optimization of patient condition using current treatments when necessary, and postoperative intensive care unit monitoring are beneficial for patients with hip fracture aged ≥84 with comorbidities, such as hypertension, diabetes mellitus, congestive heart failure, and chronic obstructive pulmonary disease.

Keywords: Orthopedics; Hip fractures; Critical care; Comorbidity

ARAŞTIRMA

KALÇA CERRAHİSİ GEÇİREN İLERİ YAŞ HASTALARDA KOMORBİD HASTALIKLARIN YOĞUN BAKIM YATIŞI ÜZERİNE ETKİSİ

Öz

Giriş: Çalışmamızda kalça cerrahisi sonrası yoğun bakımda ve ortopedi kliniği'nde takip edilen 75 yaş ve üzeri hastaların; yaş, preoperatif komorbidite, anestezi yöntemleri, hastanede yatış süreleri ve mortalite açısından karşılaştırılması amaçlanmıştır.

Gereç ve Yöntem: Hastanemizde 2011-2016 tarihleri arasında 75 yaş üzeri, intertrokanterik femur fraktürü nedeniyle parsiyel kalça protezi uygulanan hastaların kayıtları incelendi. Yetmiş beş yaş altı, ileri derecede organ yetmezliği ve kanama diyatezi olan hastalar çalışma dışı bırakıldı. Toplam 130 hastanın yaş, cinsiyet, komorbidite varlığı, anestezi yöntemi, ameliyat öncesi yatış, yoğun bakımda ve hastanede yatış süreleri ve mortaliteleri istatistiksel açıdan değerlendirildi. p<0.05 anlamlı kabul edildi.

Bulgular: Postoperatif yoğun bakım ünitesinde takip edilen hastaların, yaş ortalaması, hipertansiyon, diyabetes mellitus, konjestif kalp yetmezliği, kronik obstrüktif akciğer hastalığı varlığı postoperatif ortopedi kliniğinde takip edilenlerden istatistiksel olarak anlamlı derecede yüksek bulundu. Anestezi yöntemi açısından iki grup arasında fark gözlenmedi. Yoğun bakım ünitesinde yatan hastaların hastanede yatış süreleri diğer gruba göre anlamlı olarak uzun idi. Logistik regresyon analizinde; İleri yaş, kronik obstrüktif akciğer hastalığı varlığı, yoğun bakım ünitesinde yatışı etkileyen faktörler olarak anlamlı kabul edildi.

Sonuç: Sonuç olarak 84 yaş üstünde, komorbidite olarak diyabetes mellitus, hipertansiyon, konjestif kalp yetmezliği, kronik obstrüktif akciğer hastalığı, bulunan geriatrik kalça kırığı hastalarının postoperatif yoğun bakım ünitesinde takibi gerektiğini düşünmekteyiz.

Anahtar sözcükler: Ortopedi; Kalça kırıkları; Kritik bakım; Komorbidite

INTRODUCTION

Hip fractures are one of the most hazardous types of fractures in terms of prognosis, as they may result in chronic pain, poor quality of life, and immobility, especially in the elderly population. Recently, as life expectancy has increased, the geriatric population is also rapi dly increasing. According to data from the Turkish Statistical Institute, while the ratio of elderly population in 2012 was 7.5%, it is expected to increase up to 10.2% by 2023. With the population increase, the incidence of hip fracture is expected to increase in our country. Age is a distinctive risk factor in terms of complications and mortality (1,2). However, it is possible to operate on patients suffering from hip fractures regardless of age (3,4). As the large part of these patients are ASA III group patients experiencing comorbidities, hip replacement surgeries may result in high mortality rates due to the characteristics of patients and surgery. To reduce mortality rates, it is advised that preoperative evaluations of patients should be carefully conducted, provisions should be made for the safety of the operation by applying current multidisciplinary treatments when necessary, and patients should be closely monitored by admitting them to postoperative intensive care units when necessary. The present study aimed to compare patients in postoperative intensive care units with those in orthopedic clinics with respect to age, preoperative comorbidity, anesthesia types, length of hospital stay, and mortality following surgery for intertrochanteric femoral fracture.

MATERIALS AND METHOD

We obtained ethics approval from the hospital Ethics Committee, following which our study was conducted on 130 patients aged ≥75 who were followed up in the Orthopedics and Traumatology Clinic and intensive care units at the University of Health Sciences, Kartal Training and Research Hospital, due to intertrochanteric femoral fracture. Patients were divided into two groups: those who were in postoperative intensive care unit (ICU) [the ICU (+) group] (n=70) and those who were followed up in orthopedics clinic [the ICU (−) group] (n=60). Patient data from their admission files and electronic records were retrospectively evaluated. They were evaluated with respect to age; sex; presence of comorbidities; such as chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), hypertension (HT), diabetes mellitus (DM), chronic kidney failure (CKF), and dementia; operation site; anesthesia types (general/spinal); preoperative–postoperative service; postoperative intensive care; and total length of hospital stay along with mortality rates.

In our study, Number Cruncher Statistical System 2007 Statistical Software (Utah, USA) package program was used for statistical analysis. In addition to the complementary statistical methods (mean, standard deviation), independent t-test was used in the comparison of the two groups, and chi-square test was used in the comparison of quantitative data. Factors affecting admission to ICU were determined via logistic regression (LGR) analysis. To determine point estimation of factors affecting ICU admission, sensitivity, specificity, positive predictive value, negative predictive value, which includes the area under the receiver operating characteristic curve were calculated. Results were evaluated according to a p-value of <0.05 and confidence interval of 95%.

RESULTS

The mean age of the ICU (+) group significantly higher than that of the ICU (−) group (p=0.006). No statistically significant difference was observed between the distribution of sex and region of operation in both groups (Table 1).

The prevalence of comorbidities such as HT (p=0.007), DM (p=0.007), CHF (p=0.002), COPD (p=0.01) in the ICU (+) group was significantly higher than that in the ICU (−) group. There was no statistically significant difference between the distribution of CKF (p=0.526) and dementia (p=0.909) in ICU (−) and ICU (+) groups (Table 2).

There was no statistically significant difference between the total length of hospital stay in the ICU (−) and ICU (+) groups (p=0.001) (Table 3).

The mortality rate of the ICU (+) group was significantly higher than that of the ICU (−) group (p=0.017). No statistically significant difference was observed between the distribution of anesthesia types administered in the ICU (+) and ICU (−) groups (p=0.115) (Table 4).

In the univariate analysis, older age [odds ratio (OR)=1.09 (1.0–1.17)], prevalence of HT [OR=0.38 (0.19–0.78)], DM [OR=3.18 (1.34–7.45)], CHF [OR=13.45 (1.7–16.24)], and COPD [OR=0.10 (0.01–0.93)] were determined as factors affecting ICU admission (OR value should be clarified in detail).

In the LGR analysis by which we evaluated age, HT, DM, CHF, and COPD, the prevalence of HT (p=0.235), DM (p=0.540), and CHF (p=0.203) were found to be statistically significant (p>0.05). Older age (p=0.027) and the prevalence of COPD (p=0.043) were found to be statistically significant (p<0.05) (Table 5).

Table 1. Demographic comparison of patients.

		ICU (−) n=60		ICU (+) n=70		p
Age		**81.33±5.16**		**84.26±6.46**		**0.006**
Sex	Male	22	36.67%	19	27.14%	0.244
	Female	38	63.33%	51	72.86%	
Region of operation	Right	30	50.00%	30	42.86%	0.415
	Left	30	50.00%	40	42.86%	

p < 0.05: significant

Table 2. Comparison of comorbid diseases.

Disease		ICU (−) n=60		ICU (+) n=70		p
Hypertension	No	39	65.00%	29	41.43%	0.007
	Yes	21	35.00%	41	58.57%	
DM	No	51	85.00%	45	64.29%	0.007
	Yes	9	15.00%	25	35.71%	
CHF	No	59	98.33%	57	81.43%	0.002
	Yes	1	1.67%	13	18.57%	
COPD	No	59	98.33%	60	85.71%	0.01
	Yes	1	1.67%	10	14.29%	
CKF	No	57	95.00%	68	97.14%	0.526
	Yes	3	5.00%	2	2.86%	
Dementia	No	51	85.00%	60	85.71%	0.909
	Yes	9	15.00%	10	14.29%	

DM, diabetes mellitus; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; CKF, chronic kidney failure p<0.05: significant

Table 3. Length of hospital stay (days).

	ICU (−) n=60	ICU (+) n=70	p
Length of service hospitalization	4.56±1.91	4.62±3.03	0.902
Total length of hospital stay	9.83±3.24	14.04±9.01	0.001

p<0.05: significant

Table 4. Comparison of mortality rates and anesthesia types.

		ICU (−) n=60		ICU (+) n=70		p
Prognosis	Alive	59	98.33%	61	87.14%	0.017
	Ex	1	1.67%	9	12.86%	
Anesthesia type	Spinal	54	90.00%	56	80.00%	0.115
	General	6	10.00%	14	20.00%	

p<0.05: significant

Table 5. Evaluation of comorbid diseases with respect to logistic regression.

	Univariate OR		Multivariate OR	
	p	OR 95% CI	p	OR 95% CI
Age	0.022	1.09 (1.02-1.16)	0.027	1.09 (1.00-1.17)
HT	0.007	0.38 (0.19-0.78)	0.235	0.58 (0.23-1.40)
DM	0.007	3.18 (1.34-7.45)	0.540	0.67 (0.19-2.41)
CHF	0.002	13.45 (1.7-16.24)	0.203	0.24 (0.03-2.14)
COPD	0.01	0.10 (0.01-0.82)	0.043	0.10 (0.01-0.93)

DISCUSSION

Hip fracture is one of the most frequent traumatic diseases with serious mortality and morbidity rates that result in hospitalization in elderly patients (5). Elderly patients with hip fractures are very sensitive to cardiac and respiratory problems, which may develop as a result of fractures as well as surgical stress. It is reported that the 1-year mortality in patients with hip fractures is 24%–29% (6). High mortality rate is related to the general status of

the patients before surgery rather than the surgical intervention itself (7). In a study by de Luice et al. in Denmark, it was demonstrated that hip fractures resulted in an increase in mortality rates in their own right (8).

In elderly patients, it is mandatory to plan a multidisciplinary preoperative evaluation and treatment in surgical decision-making to minimize preoperative and postoperative risks. It is important

that the surgical decision is made as soon as possible. Moran et al. reported that mortality is higher in patients who waited to undergo surgery for ≥5 days (9). In the present study, the waiting period before surgery was <5 days; it was observed that this period did not have any effect on the decision of admission to ICU.

Some studies have shown that due to their age, presence of comorbidities, and increase in the number of comorbidities in geriatric patients with hip fractures result in an increase in the requirement of intensive care and the incidence of mortality (10, 11). In our study, all patients were examined with respect to DM, HT, CHF, COPD, CKF, and dementia. As a result of these examinations, we detected that DM, HT, CHF, and COPD were significantly factors that contributed to admission of patients to ICU (p<0.05).

In a study conducted on 554,733 cases that were operated due to femoral fracture, Smith et al. specified abnormal ECG, cognitive disorder, old age >85, limited pre-fracture mobility, male sex, appropriate geriatric care units, high ASA, and high Charlson comorbidity scores as parameters for evaluating mortality (12). In a study that included 751,232 patients with hip fractures, Erickson et al. reported that the probability of postoperative mortality of patients aged >84 was higher (13). The fact that these studies included patients aged ≥85 was compatible with our study.

Hu et al. examined 12 parameters for 1 year in 75 patients who underwent hip replacement. Old age, high ASA, diabetes and cardiac disease parameters were found to be preoperative mortality indicators (14); these are consistent with the present study. However, in the present study, we found that dementia, which they found to be a preoperative mortality indicator, was not a statistically significant parameter for admission to ICU.

Cree et al. also stated that dementia increased mortality rates following hip fractures (2). However, in our study, we observed that dementia and CKF factors were responsible for admission of patients

to ICUs. This difference may be due to the fact that the present study only evaluated factors affecting the admission to ICU rather than factors affecting mortality.

We found that the anesthesia type (general/spinal) did not have a significant effect on the hemodynamic and cardiovascular parameters of preoperative and postoperative patients and was not significant in patients' transfer to ICUs.

Peled et al. stated that regional anesthesia had positive effects on 109 elderly patients with COPD (11). They reported that 10 of these patients died and that the probability of complications increased in those who underwent general anesthesia.

Memtsoudis et al. observed that there were fewer complications in hip and femur operations that are performed via neuraxial blockade than with general anesthesia (15).

In another study, anesthesia type did not increase the incidence of complications in hip fractures (16). We also detected that anesthesia type did not increase the incidence of complications in our patients.

It is necessary to specify elderly patients as a separate group with specific medical and surgical characteristics with respect to healing and future care (11). Although orthogeriatric units have initiated improvements with respect to care of geriatric patients who are admitted to hospitals due to hip fractures since the 1950s, hip fractures are still a serious socio-economic problem in western countries (17).

Some authors have reported that multidisciplinary geriatric care reduces hospital mortality and complications (17-19). We also believe that ICU monitoring of complicated cases reduces mortality.

In conclusion, we believe that detailed preoperative evaluation is crucial in improving postoperative prognosis in geriatric patients aged ≥84 with hip fractures and comorbidities, such as DM, HT, CHF, and COPD. Optimization of patient

condition via utilization of current treatments and postoperative ICU monitoring are required as well as more frequent vital signs monitoring for a rapid intervention.

Ethical considerations

The local ethic committee approval was obtained (2017/514/118/3).

The written informed consent forms were taken from the patients.

Conflict of interest

The authors have no conflict of interest to declare.

REFERENCES

1. Bhandari M, Koo H, Saunders L et al. Predictors of In-Hospital Mortality Following Operative Management of Hip Fractures. International Journal of Surgical Investigation 1999;1(4):319-26. (PMID:12774456).

2. Cree M, Soskolne CL, Belseck E, et al. Mortality and institutionalization following hip fracture. Journal of the American Geriatrics Society 2000;48(3):283-8. (PMID:10733054).

3. Bergeron E, Moore L, Fournier K, et al. Patients with isolated hip fracture must be considered for surgery irrespectively of their age, comorbidity status and provenance: a statement applicable even to nonagerians. Arch Orthop Trauma Surg 2009;129(11):1549-55. (PMID:19440727).

4. Pelavski A.D, Colomina M.J, De Miguel M, et al. Demographics of nonagenarians and centenarians with a hip fracture. Anesth Analg 2006;103(6):1597-9. (PMID:17122263).

5. de Leur K, Vroemen JP, Vos DI, et al. Outcome after osteosynthesis of hip fractures in nonagenarians. Clin Interv Aging 2014;9:41-9. (PMID:24379658).

6. Petersen MB, Jorgensen HL, Hansen K, et al . Factors affecting postoperative mortality of patients with displaced femoral neck fracture. Injury 2006;37: 705-11.(PMID: 16765352).

7. Roche JJ, Wenn RT, Sahota O, et al. Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study. BMJ 2005;331:1374. (PMID:16299013).

8. de Luise C, Brimacombe M, Pedersen L, et al. Chronic Obstructive Pulmonary Disease and mortality following hip fracture; a population-based cohort study. European Journal of Epidemiology 2008;23(2):115-22. (PMID:18038248).

9. Moran CG, Wenn RT, Sikand M, et al. Early mortality after hip fracture: is delay before surgery important?. J. Bone Joint Surg Am 2005;87(3):483-9. (PMID:15741611).

10. Haentjens P, Autier P, Barette M, et al. Survival and functional outcome according to hip fracture type: a one-year prospective cohort study in elderly women with an intertrochanteric or femoral neck fracture. Bone 2007;41(6):958-64. (PMID:17913614).

11. Peled E, Barak M, Keren Y, et al. Predictors for Adverse Outcome in Patients Aged 80 Years and Older Undergoing Emergent Hip Surgery;Gerontology 2009;55(5):517-22. (PMID:19684382).

12. Smith T, Pelpola K, Ball M, et al. Pre-operative indicators for mortality following hip fracture surgery: a systematic review and meta-analysis. Age Ageing 2014;43(4):464-71. (PMID:24895018).

13. Erickson B.J, Nwachukwu B.U, Kiriakopoulos E, et al. In-hospital mortality risk for femoral neck fractures among patients receiving medicare. Orthopedics 2015;(8):593-6. (PMID:26186321).

14. Hu F, Jiang C, Shen J, et al. Preoperative predictors for mortality following hip fracture surgery: a systematic review and meta-analysis. Injury 2012;43(6):676-85. (PMID:21683355).

15. Memtsoudis S.G, Sun X, Chiu YL, et al. Perioperative Comparative Effectiveness of Anesthetic Technique in Orthopedic Patients .Anesthesiology. 2013;118(5):1046-58. (PMID:23612126).

16. O'Hara DA, Duff A, Berlin JA, et al. The effect of anesthetic technique on postoperative outcomes in hip fracture repair. Anesthesiology 2000;92(4):947-57. (PMID:10754613).

17. Tarazona-Santabalbina FJ, Belenguer-Varea Á, Rovira E, et al. Orthogeriatric care: improving patient outcomes. Clin Interv Aging 2016;11:843-56. (PMID:27445466).

18. Vidan M, Serra JA, Moreno C, et al. Efficacy of a comprehensive geriatric intervention in older patients hospitalized for hip fracture:a randomized, controlled trial. Journal of the American Geriatrics Society 2005;53:1476-82. (PMID:16137275).

19. Wang Y, Tang J, Zhou F, et al. Comprehensive geriatric care reduces acute perioperative delirium in elderly patients with hip fractures: A meta-analysis. Medicine 2017;96(26):e7361. (PMID:28658156).

- Oya ÖZDEMİR[1]
- Pınar BORMAN[1]
- Ayşegül YAMAN[1]

CORRESPONDANCE

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

Phone: 0312 3094142
e-mail: oyaunalozdemir@yahoo.com

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

RESEARCH

UPPER EXTREMITY FUNCTION IN ELDERLY PATIENTS WITH BREAST CANCER-RELATED LYMPHEDEMA: A DESCRIPTIVE STUDY

ABSTRACT

Introduction: Lymphedema is a common complication following breast cancer treatment with physical and pyschosocial consequences. The detrimental effects of lymphedema may become more disabling in conjuction with the aging process. The aim of the study was to evaluate upper extremity function in elderly with breast cancer-related lymphedema and investigate the associations between upper limb function and demographic/clinical characteristics.

Materials and Method: Eight-four women with a mean age of 65.1±5.0 years were enrolled in this study. Demograpic characteristics including age, body mass index, dominant hand, marital status, education level, and occupation were recorded. Cancer and lymphedema-related clinical features were reviewed. The disabilities of arm, shoulder, and hand (DASH) questionnaire was used to assess upper extremity function.

Results: The mean of patients' body mass index was 31.9±6.1 kg/cm². The median duration of lymphedema was 8 months. Approximately 60% of patients had stage 2 lymphedema. The median value of interlimb volume difference was 558.5 ml. DASH score correlated only with body mass index, volume difference, and lymphedema stage. On regression analysis, the best predictors of upper extremity function in patients with lymphedema were found to be as body mass index and volume difference.

Conclusion: The presence of breast cancer-related lymphedema negatively affects upper extremity function in elderly patients. The findings indicate that patients with higher body mass index and interlimb volume difference have more severe disability. Therefore, multimodal therapeutic interventions for reducing volume of the affected arm as well as body mass index could improve upper extremity function in older patients with lymphedema.

Keywords: Breast neoplasms; Lymphedema; Aged; Upper extremity

ARAŞTIRMA

MEME KANSERİ İLE İLİŞKİLİ LENFÖDEMİ OLAN YAŞLI HASTALARDA ÜST EKSTREMİTE FONKSİYONU: TANIMLAYICI BİR ÇALIŞMA

ÖZ

Giriş: Lenfödem, meme kanseri sonrası sık görülen bir komplikasyon olup fiziksel ve psikososyal sonuçlara yol açmaktadır. Lenfödemin zararlı etkileri, yaşlanma süreci ile birlikte daha fazla disabilite gelişmesine neden olabilir. Bu çalışmanın amacı, meme kanseri ile ilişkili lenfödemi olan yaşlılarda üst ekstremite fonksiyonları değerlendirmek ve üst ekstremite fonksiyonu ile demografik/klinik özellikler arasındaki ilişkileri araştırmaktır.

Gereç ve Yöntem: Çalışmaya ortalama yaşları 65.1±5.0 yıl olan 84 kadın katıldı. Yaş, vücut kitle indeksi, dominant el, medeni hal, eğitim düzeyi ve meslekten oluşan demografik özellikler kaydedildi. Kanser ve lenfödem ile ilişkili klinik özellikler gözden geçirildi. Üst ekstremite fonksiyonunu değerlendirmek amacıyla Kol, Omuz ve El Sorunları (DASH) anketi kullanıldı.

Bulgular: Hastaların ortalama vücut kitle indeksi 31.9±6.1 kg/cm² idi. Lenfödem süresinin medyan değeri 8 aydı. Hastaların yaklaşık %60'ı evre 2 lenfödeme sahipti. İki ekstremite arası hacim farkının medyan değeri 558.5 ml idi. DASH skoru ile sadece vücut kitle indeksi, hacim farkı ve lenfödem arasında korelasyon mevcuttu. Regresyon analizi sonucunda, lenfödemi olan hastalarda üst ekstremite fonksiyonunu en iyi tahmin eden değişkenlerin vücut kitle indeksi ve hacim farkı olduğu belirlendi.

Sonuç: Yaşlı hastalarda meme kanseri ile ilişkili lenfödemin varlığı üst ekstremite fonksiyonlarını olumsuz etkilemektedir. Bu çalışmanın bulguları, daha yüksek vücut kitle indeksi ve ekstremiteler arası hacim farkı olan hastaların daha fazla disabiliteye sahip olduğu göstermektedir. Bu nedenle, etkilenen kol hacminin yanı sıra vücut kitle indeksinin de azaltılmasına yönelik multimodal terapötik girişimlerin, lenfödemi olan yaşlı hastalarda üst ekstremite fonksiyonlarının düzeltebileceği düşünülmektedir.

Anahtar sözcükler: Meme kanseri; Lenfödem; Yaşlı; Üst ekstremite

INTRODUCTION

Breast cancer is the most common type of malignancy among women worldwide. In recent years, early diagnosis and advanced treatments have significantly increased survival rates of these patients. Consequently, complications resulting from breast cancer treatment have also become more prevelant. Secondary lymphedema of the upper extremity is one of the most frequent and severe complications in breast cancer survivors, particularly among those undergoing radiotherapy following axillary lymph node dissection (1). Breast cancer-related lymphedema (BCRL) usually develops within the first 2 years after surgery and cases continue to slowly accumulate beyond this period. As reported in the literature, its incidence varies widely due to differences in terminology, study populations, methods of measurement, and timing of assessment. The average incidence of BCRL was found to be 21.4% in a systematic review including data from 30 prospective cohort studies published between 2000 and 2012 (2). As breast cancer typically occurs in women aged >50 years and survivors are now living longer, health care professionals specializing in geriatrics will more commonly encounter this disabling complication.

The initial symptoms of BCRL are tightness and feeling of heaviness in the affected limb. With the gradual increase in the volume of protein-rich fluid in the interstitium due to lymphatic obstruction, swelling becomes obvious and connective tissue fibrosis subsequently develops (1). In later stages, these changes may lead to functional impairment in the affected extremity contributing to limited activities of daily living and deteriorating quality of life (3-6). BCRL and its consequences may be more severe in elderly patients in conjuction with progressive reduction in physiological reserve due to the aging process and coexisting systemic diseases. Lymphedema could lead to functional limitations in elderly individuals, but knowledge regarding upper extremity function and its determinants in this population is lacking. Few studies have examined the relationship between age and upper limb function in patients with BCRL with conflicting results. While Park et al. reported that older patients with BCRL had worse upper limb function, the studies conducted by Pinto et al. and Smoot et al. found that patient age did not significantly affect upper extremity function (4,5,7). Hence, the aim of this cross-sectional study was to evaluate upper limb function in elderly women with BCRL and examine the associations between arm function and demographic and clinical characteristics.

MATERIALS AND METHOD

Our study included a total of 84 women aged ≥60 years with a diagnosis of BCRL who were consecutively admitted to our institution's lymphedema unit in the Department of Physical Medicine and Rehabilitation. Patients with bilateral breast cancer or lymphedema, any preexisting neurological or musculoskeletal disease affecting upper extremity function, or current upper extremity infection such as cellulitis or lymphangitis were excluded from the study. This retrospective study protocol was approved by the local ethics committee in accordance with the Declaration of Helsinki.

Demographic data, including patient age, body mass index (BMI), dominant hand, marital status, education level, and occupation were recorded. Clinical characteristics such as histological type and stage of breast cancer, surgical method, history of adjuvant treatment (chemotherapy, radiotherapy, and/or hormonotherapy), and comorbidities were extracted from the medical records. In addition, duration and side of lymphedema, volume difference between arms, stage of lymphedema according to International Society of Lymphedema Society (ISL) classification, pain severity (upper extremity, axilla, and breast) measured by 10-cm visual analog scale (VAS), and limitations in shoulder joint motion were reviewed. Interlimb volume difference had been calculated by measuring the circumference of each upper extremity with a flexible tape measure, starting from wrist to axilla with 4 cm intervals

and using the truncated cone formula, which was expressed both in milliliters (ml) and percentages (%). Further, disabilities of arm, shoulder, and hand (DASH) questionnaire score, which assessed upper extremity physical function, was recorded. The self-administered DASH questionnaire consists of 30 core items with responses ranging from 0 to 5. The scores are converted to 0 to 100 with higher scores indicating greater disability. The Turkish version of the DASH questionnaire has demonstrated excellent test-retest reliability and validity (8).

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 22.0. Numerical variables were expressed as the mean±standard deviation or median and categorical variables as frequencies and percentages. Normality of continuous variables was evaluated by the Kolmogorov–Smirnov test, and homogeneity of variances was tested by the Levene test. Differences between groups according to DASH score were determined by independent samples t test or one-way ANOVA, and the relationship between DASH score and other continuous variables was determined using the Pearson or Spearman correlation coefficient. Those variables with $p<0.25$ on univariate analysis were selected for the multivariate analysis. Factors affecting DASH score were determined by stepwise multiple linear regression analysis. A p-value of <0.05 was considered significant.

RESULTS

The mean age of the participants was 65.1±5.0 years (range, 60–87). Of the 84 patients, 52 (61.9%) were classified as obese (BMI≥30 kg/cm^2), and the mean BMI was 31.9±6.1 kg/cm^2. Demographic charateristics of the patients are presented in Table 1. All patients underwent mastectomy for the treatment of breast cancer, with chemotherapy given to 70 patients, radiotherapy to 66 patients, and hormonoterapy to 60 patients. The most common histological type was invasive ductal carcinoma (85.7%), and nearly two-third of participants

had comorbidities, including hypertension, hyperlipidemia, diabetes mellitus, hypothyroidism, bronchial asthma, and congestive heart failure.

Overall, 80 patients were right-handed; the right side was affected in 48.8% of the patients, and lymphedema developed in the dominant extremity in 43 patients (51.2%). While the duration of lymphedema varied widely from 1 month to 22 years, with a median value of 8 months, 60.7% of patients had lymphedema for ≤1 year. The mean volume difference was 26.2%±16.9% and ranged between 20% and 40% in most patients (52.4%). The median volume difference in terms of ml was 558.5. Approximately 60% of patients had ISL stage 2 lymphedema. Fourteen patients (16.7%) had pain in their arm and/or surgery scar (breast, axilla) with a mean VAS score of 4.1±1.8 (range, 1–7). Furthermore, 12 patients (14.3%) had limited shoulder motion. The mean DASH score was 41.0±23.8. The clinical features of the participants are shown in Table 2.

Table 1. Demographic characteristics of the participants.

Age (years) (mean±sd)	65.1±5.0
Body mass index (mean±sd)	31.9±6.1
Dominant hand	
Right	80 (95.2%)
Left	4 (4.8%)
Marital status	
Married	66 (78.6%)
Single	6 (7.1%)
Widow	12 (14.3%)
Educational level	
Unlettered	8 (9.5%)
Primary	30 (35.7%)
Secondary	3 (3.6%)
High	20 (23.8%)
University	23 (27.4%)
Occupation	
Retired	30 (35.7%)
Housewife	47 (56.0%)
Officer	7 (8.3%)

Table 2. Clinical features of patients with BCRL.

Characteristics	n (%)
Histologic type	
Invasive ductal	72 (85.7%)
Invasive lobular	10 (11.9%)
Invasive papillary	1 (1.2%)
Mixed (ductal+lobular)	1 (1.2%)
Stage of breast cancer	
1	6 (7.1%)
2	51 (60.7%)
3	24 (28.6%)
Unknown	3 (3.6%)
Surgery type	
Simple mastectomy	14 (16.7%)
Modified radical mastectomy	67 (79.8%)
Radical mastectomy	3 (3.6%)
Chemotherapy	
Yes	70 (83.3%)
No	14 (16.7%)
Radiotherapy	
Yes	66 (78.6%)
No	18 (21.4%)
Hormonotherapy	
Yes	62 (74.8%)
No	20 (23.8%)
Unknown	2 (2.4%)
Duration of lymphedema	
≤1 year	51 (60.7%)
1–5 years	24 (28.6%)
>5 years	9 (10.7%)
Side of lymphedema	
Right	41 (48.8%)
Left	43 (51.2%)
Involvement of dominant side	
Yes	43 (51.2%)
No	41 (48.8%)
Volume difference	
<20%	29 (34.5%)
20%–40%	44 (52.4%)
>40%	11 (13.1%)
Stage of lymphedema	
1	32 (38.1%)
2	50 (59.5%)
3	2 (2.4%)
Pain	
Yes	14 (16.7%)
No	70 (83.3%)
Limitation in shoulder	
Yes	12 (14.3%)
No	72 (85.7%)
Comorbidities	
Yes	54 (64.3%)
No	30 (35.7%)

Table 3. Correlations between DASH score and demographic/clinical characteristics.

	r	p
Age	0.143	0.195
Body mass index	0.365	0.001
Duration of lymphedema	0.092	0.407
Volume difference (ml)	0.277	0.012
Volume difference (%)	0.138	0.212
	Mean±sd	**p**
Method of surgery		
Radical mastectomy and MRM	41.9±24.3	0.417
Simple mastectomy	36.2±21.7	
History of chemotherapy		
Yes	41.1±24.4	0.883
No	40.1±21.6	
History of radiotherapy		
Yes	41.5±24.8	0.718
No	39.1±20.6	
Side of lymphedema		
Right	41.5±23.4	0.852
Left	40.5±24.5	
Involvement of dominant side		
Yes	41.4±23.0	0.869
No	40.5±24.9	
Stage of lymphedema (ISL)		
1	34.5±24.8	0.051
2 and 3	44.9±22.6	
Pain		
Yes	48.9±25.6	0.175
No	39.4±23.4	
Limited shoulder motion		
Yes	48.9±28.6	0.217
No	39.6±22.9	
Comorbidities		
Yes	43.0±22.5	0.304
No	37.4±26.0	

MRM, modified radical mastectomy

Table 4. Multivariate stepwise linear regression analysis results between DASH scores and correlation factors.

Correlation factors	B	sd	Beta	p
Body mass index	1.004	0.404	0.261	0.015
Volume difference (ml)	0.015	0.005	0.325	0.003

There were no statistically significant relationships between DASH score and patient age, surgical method, history of chemotherapy or radiotherapy, presence of comorbidities, duration of lymphedema, side of lymphedema, and whether dominant side was affected. Moreover, no significant differences in DASH scores were found between those with and without pain or limited shoulder motion. On the other hand, DASH score correlated with BMI, volume difference, and stage of lymphedema (Table 3). Accordingly, a stepwise multiple regression model was constructed using DASH score as a dependent variable and BMI, volume difference (ml), stage of lymphedema, presence of pain, and limited shoulder motion as independent variables. Only BMI (p=0.015) and interlimb volume difference (p=0.003) significantly contributed to the variance in DASH score (Table 4). The combination of these two variables resulted in R^2 of 0.228.

DISCUSSION

Breast cancer-related lymphedema has many physical and psychosocial ramifications, including physical discomfort, pain, limited arm movement, increased risk of infection, cosmetic disfigurement, anxiety, and depression (9). Following breast cancer treatment, survivors may have upper extremity impairments due to complications including pain and/or numbness in the shoulder, axilla, or lateral chest wall, limited shoulder motion, reduction in muscle strength, and lymphedema (10). Women with BCRL are reported to have a greater degree of upper limb disability than are those without lymphedema (3,5,7,11). Reduced function of the lymphedematous arm corresponds with lower quality of life (6). The effects of lymphedema on physical function may be more profound in older versus younger patients, which in turn could decrease their ability to live independently (12). There are inconsistent findings in the literature

regarding the relationship between patient age and upper extremity function. A study conducted by Park et al. divided 59 women with BCRL into three groups according to age (40–49, 50–59, and ≥60 years) and found that the older the patient, the lower their upper extremity function (4). In contrast, Pinto et al. and Smoot et al. found no significant correlation between patient age and DASH scores (5,7). To the best of our knowledge, few data exist regarding the effects of BCRL on physical function in elderly patients (9,12). For 7 years, Clough-Gorr et al. followed 400 women aged ≥65 years who were diagnosed with primary stage I–IIIA breast cancer and found an overall prevalence of persistent lymphedema symptoms of 36%, and presence of lymphedema had a noticeable negative impact on physical function measured by the Physical Function Index 10 (9). Another recent study with a 24-month follow-up evaluated 321 women aged ≥65 years to determine the incidence of lymphedema and self-reported musculoskeletal events caused by breast cancer treatment and their effects on physical function. In total, 7.5% of patients developed post-surgical lymphedema over 2 years. Participants were asked about their ability to lift a shopping bag or suitcase in order to assess arm function; however, no relationship was detected between arm/hand swelling and upper limb function in older adults (12). Consistent with the previous studies including mixed-aged populations of breast cancer survivors, we used the DASH questionnaire to assess arm function (3-7,10,11,13). It has been suggested that DASH score increases an average of 0.3 points yearly in healthy patients, and an expected normative DASH score can be calculated using the following formula: [(0.29×age of subject)−4.46] in women (14). Thus, DASH scores between 12.9 and 21.6 are considered to be in normal ranges for healthy women aged 60–90 years. In addition, the mean score for subjects who are able to do all that they want was 23.6 (15). Similarly, investigators of a previous study classified the severity of upper

extremity disability in BRCL patients by a cutoff value of 23.7 (5). In the current study, a mean DASH score of 41.0±23.8 indicated upper extremity disability in older patients with BCRL, and no significant correlation was determined between DASH score and age in these elderly patients.

The method of surgery and history of chemotherapy or radiotherapy are well-known risk factors for lymphedema development (2). None of the patients in the current study underwent breast-conserving surgery for the treatment of their cancer; they all had mastectomy and most of them received chemotherapy and/or radiotherapy. No significant differences in DASH scores were observed when we divided patients into groups according to the surgery method and history of chemotherapy and/or radiotherapy. Likewise, Park et al. found no significant relationship between upper extremity function and history of chemotherapy or radiotherapy (4). A previous study reported that the number of comorbidities contributed to the variance in DASH scores (7); however, the presence of comorbidities did not affect upper extremity function in our study population.

Consistent with the results of Park et al. (4), we found that DASH score was not correlated with duration of lymphedema or side of lymphedema. In addition, it could be assumed that surgery performed ipsilateral to the dominant hand would cause worse disability; however, we found no significant relationship between DASH score and whether the dominant side was affected. Velloso et al. also determined no association between upper limb performance in activities of daily living and handedness in patients who underwent sentinel lymph node biopsy for breast cancer (10).

The development of chronic pain is one of the most frequent adverse events in cancer survivors (16). Forsythe et al. reported that 32.3% of breast cancer survivors had above-average pain at 10 years following completion of treatment (17). Velloso et al. observed higher proportions of pain/discomfort after nearly 2 years following surgery with 52.9% of patients having shoulder pain and 47.1% having breast scar discomfort, but the intensity of their pain/discomfort was low (10). In another prospective study, 63% of elderly women who had undergone surgery and received adjuvant chemotherapy for breast cancer experienced arm and shoulder pain at baseline (within 84 days postoperatively), 49% at 12 months, and 43% at 24 months (12). A recent meta-analysis aiming to identify risk factors for the development of pain in breast cancer survivors demonstrated that BMI >30, education duration <12–13 years, lymphedema, not smoking, and history of axillary lymph node dissection, chemotherapy, hormonotherapy, and radiotherapy were significantly associated with higher odds of developing chronic pain, with lymphedema being the greatest risk factor. Conversely, the overall odds ratio for the development of chronic pain in breast cancer survivors aged >50–55 years was lower than in younger subjects (18). In another meta-analysis, high-quality evidence showed that development of persistent pain following surgery was associated with younger age, radiotherapy, axillary lymph node dissection, greater acute postoperative pain, and preoperative pain (19). Moreover, Smoot et al. stated that breast cancer survivors frequently have less shoulder range of motion on the affected side. The interlimb difference was greater in women with lymphedema, particularly in shoulder abduction (7). It has been noted that breast/arm pain and/or reduction of shoulder range of motion significantly interfered with arm function (7,12). In our study, the percentages of patients with pain in their arm and/or surgery scar and limited shoulder motion were 16.7% and 14.3%, respectively. Suprisingly, we found no significant difference in DASH scores between those with and without pain or limited shoulder motion. Moreover, in agreement with our data, Park et al. also found no relationship between arm function and shoulder pain (4).

Lee et al. recently examined the potential impact of lymphedema severity on upper extremity function in 54 patients. Bioimpedence spectroscopy was performed for the diagnosis of lymphedema, and lymphedema severity was classified by ISL staging. They showed that for every 1-point increase in L-Dex score, there was a 30% increase in DASH score. But they did not determine a significant relationship between DASH and ISL staging, suggesting that ISL categories are possibly not sensitive enough to detect changes in physical function (6). In contrast, other studies indicated that neither arm volume calculated using circumferential measurements nor bioimpedance ratios contributed to the variance in DASH scores (3,7). Although we found that DASH score significantly correlated with both lymphedema staging and interlimb volume difference, only volume difference was left in the regression model built to explain the variation of DASH score in older BCRL patients. Our findings are in line with those of Lee et al., who demonstrated that bioimpedance is superior to ISL classification in establishing a correlation between worse upper extremity function and increased lymphedema severity (6).

Being overweight or obese is strongly associated with increased risk of lymphedema (2,7,9). However, findings regarding the effect of obesity on arm function in patients with BCRL are inconsistent. While Smoot et al. did not find a correlation between DASH score and BMI, Pinto et al. reported that obesity significantly affected DASH scores in lymphedema subjects (5,7). In the current study, almost two-thirds of participants were obese, and BMI strongly correlated with DASH score, indicating that obese patients have more severe upper extremity disability. On stepwise regression analysis, BMI was found to be an independent variable significantly contributing to the variance of DASH score.

Our study has some limitations. Because it was a descriptive study, information about the cause-effect relationships or temporal sequences is limited. Moreover, performance of functional tasks is influenced by many physical, psychosocial, and environmental factors. Unfortunately, not all of these factors could be addressed in this study due to its retrospective design. Interlimb volume difference and BMI only explained 22.8% of the variance in DASH score, indicating that other factors aside from those variables examined in the present study also have a detrimental effect on upper extremity function in BCRL patients.

In conclusion, we found that elderly women with BRCL have upper extremity impairment, which may subsequently threaten their ability to live independently. Understanding the risk factors of upper limb disability, especially in older patients with BCRL, is important for delineating preventative and therapeutic interventions to help maintain their physical function over the long term. Interlimb volume difference and BMI, both of which are modifiable factors, are significantly associated with arm function in elderly patients with BCRL. Based on our results, we suggest that treatment approaches focusing on reducing not only volume of the affected limb but also BMI may be more effective for improving upper extremity function in BCRL patients. Growing evidence suggests that resistance exercises have a positive effect on arm function without increasing arm volume during or shortly after complex decongestive therapy (20-22). However, the effect of weight management interventions on arm function via diet and exercise has not been established. Further research is necessary for identifying additional risk factors and evaluating the efficacy of multimodal therapy on arm function in older breast cancer survivors in particular.

Acknowledgments

REFERENCES

1. Cormier JN, Cromwell KD. Lymphedema, In: Zuther JE, Norton S (Eds). Lymphedema management. The comprehensive guide for practitioners. 3rd edition, Georg Thieme Verlag KG, Stuttgart, Germany 2013, pp 46-7.

2. DiSipio T, Rye S, Newman B, Hayes S. Incidence of unilateral arm lymphoedema after breast cancer: a systematic review and meta-analysis. Lancet Oncol 2013;14(6):500-15. (PMID:23540561).

3. Dawes DJ, Meterissian S, Goldberg M, Mayo NE. Impact of lymphoedema on arm function and health-related quality of life in women following breast cancer surgery. J Rehabil Med 2008;40(8):651-8. (PMID:19020699).

4. Park JE, Jang HJ, Seo KS. Quality of life upper extremity function and the effect of lymphedema treatment in breast cancer related lymphedema patients. Ann Rehabil Med 2012;36(2):240-7. (PMID:22639749).

5. Pinto M, Gimigliano F, Tatangelo F, et al. Upper limb function and quality of life in breast cancer related lymphedema: a cross-sectional study. Eur J Phys Rehabil Med 2013;49(5):665-73. (PMID:23698473).

6. Lee TS, Morris CM, Czerniec SA, Mangion AJ. Does lymphedema severity affect quality of life? Simple question. Challenging answers. Lymphat Res Biol 2018;16(1):85-91. (PMID:28453410).

7. Smoot B, Wong J, Cooper B, et al. Upper extremity impairments in women with or without lymphedema following breast cancer treatment. J Cancer Surviv 2010;4(2):167-78. (PMID:20373044).

8. Duger T, Yakut E, Oksuz C, et al. Reliability and validity of the Turkish version of the disabilities of the arm, shoulder and hand (DASH) questionnaire. Fizyoter Rehabil 2006;17(3):99-107. [Internet] Available from: http://dergipark.gov.tr/download/article-file/138179. Accessed: 21.3.2018.

9. Clough-Gorr KM, Ganz PA, Silliman RA. Older breast cancer survivors: factors associated with self-reported symptoms of persistent lymphedema over 7 years of follow-up. Breast J 2010;16(2):147-55. (PMID:19968661).

10. Velloso FS, Barra AA, Dias RC. Functional performance of upper limb and quality of life after sentinel lymph node biopsy of breast cancer. Rev Bras Fisioter 2011;15(2):146-53. (PMID:21789365).

11. Hayes SC, Janda M, Cornish B, Battistutta D, Newman B. Lymphedema after breast cancer: incidence, risk factors, and effect on upper body function. J Clin Oncol 2008;26(21):3536-42. (PMID:18640935).

12. Hopkins JO, Allred J, Hurria A, et al. Lymphedema, musculoskeletal events and arm function in older patients receiving adjuvant chemotherapy for breast cancer (Alliance A171302). Breast Cancer Res Treat 2017;166(3):793-808. (PMID:28825227).

13. Lee D, Hwang JH, Chu I, Chang HJ, Shim YH, Kim JH. Analysis of factors related to arm weakness in patients with breast cancer-related lymphedema. Support Care Cancer 2015;23(8):2297-304. (PMID:25576430).

14. Klum M, Wolf MB, Hahn P, Leclère FM, Bruckner T, Unglaub F. Normative data on wrist function. J Hand Surg Am 2012;37(10):2050-60. (PMID:22960029).

15. Roy JS, MacDermid JC, Woodhouse LJ. Measuring shoulder function: a systematic review of four questionnaires. Arthritis Rheum 2009;61(5):623-32. (PMID:19405008).

16. Glare PA, Davies PS, Finlay E, et al. Pain in cancer survivors. J Clin Oncol 2014;32(16)1739-47. (PMID:2479947).

17. Forsythe LP, Alfano CM, George SM, et al. Pain in long-term breast cancer survivors: the role of body mass index, physical activity, and sedentary behavior. Breast Cancer Res Treat 2013;137(2):617-30. (PMID:23242613).

18. Leysen L, Beckwée D, Nijs J, et al. Risk factors of pain in breast cancer survivors: a systematic review and meta-analysis. Support Care Cancer 2017;25(12):3607-43. (PMID:28799015).

19. Wang L, Guyatt GH, Kennedy SA, et al. Predictors of persistent pain after breast cancer surgery: a systematic review and meta-analysis of observational studies. CMAJ 2016;188(14):E352-E361. (PMID:27402075).

20. Kilbreath SL, Refshauge KM, Beith JM, et al. Upper limb progressive resistance training and stretching exercises following surgery for early breast cancer: a randomized controlled trial. Breast Cancer Res Treat 2012;133(2):667-76. (PMID:22286332).

21. Do JH, Kim W, Cho YK, et al. Effects of resistance exercises and complex decongestive therapy on arm function and muscular strength in breast cancer related lymphedema. Lymphology 2015;48(4):184-96. (PMID:27164764).

22. Dos Santos WDN, Gentil P, de Moraes RF, et al. Chronic effects of resistance training in breast cancer survivors. Biomed Res Int 2017;2017:8367803. (PMID:28835898).

- Fatih Doğu GEYİK[1]
- Yücel YÜCE[1]
- Kutlu Hakan ERKAL[1]
- Banu ÇEVİK[1]
- Necati ÇITAK[2]

CORRESPONDANCE

Fatih Doğu GEYİK
University of Health Sciences, Kartal Dr. Lütfi
Kırdar Education and Research Hospital,
Anesthesiology and Reanimation Clinic, İstanbul,
Turkey

Phone: 02164413900
e-mail: dogugeyik@hotmail.com

[1] University of Health Sciences, Kartal Dr. Lütfi
    Kırdar Education and Research Hospital,
    Anesthesiology and Reanimation Clinic,
    İstanbul, Turkey
[2] University of Health Sciences, Bakırköy Sadi
    Konuk Education and Research Hospital,
    Thoracic Surgery Clinic, İstanbul, Turkey

RESEARCH

THE USE OF QUICK SOFA (QSOFA) IN ELDERLY PATIENTS WITH SEPSIS IN THE INTENSIVE CARE UNIT

Abstract

Introduction: In elderly patients with clinically diagnosed sepsis, we investigated the performance of quick sepsis-associated organ failure assessment in admission to the mortality and intensive care unit and compared its performance with acute physiology and chronic health assessment, assessing systemic inflammatory response syndrome, sepsis-related organ failure.

Materials and Method: From February 2016 to February 2017, we retrospectively reviewed 92 elderly patients (≥65 years of age) who were clinically diagnosed with sepsis in the intensive care unit. We compared the performance of organ failure assessment associated with sepsis, acute physiology and chronic health assessment II, systemic inflammatory response syndrome, and quick sepsis related with organ failure assessment, foreseeing a 28-day mortality in the intensive care unit.

Results: The scores of organ failure assessment associated with quick sepsis were 1 in 6.5% (n=6), 2 in 30.4% (n=28) and 3 in 63% (n=58) Mean sepsis-related organ failure rating score was 9.2±3.0, mean systemic inflammatory response syndrome score was 2.6±0.6, and acute physiology and chronic health assessment score II was 25.4±7.2. There was a statistically significant difference (p<0.001) between patients with mortality rates of> 7 and <7 and 81% and 31% respectively in patients with organ failure assessment score associated with sepsis.

Conclusion: Quick sepsis related organ failure assessment may be a better alternative in determining mortality risk, since it can be easily applied when compared to sepsis related organ failure assessment in geriatric patients.

Keywords: Organ dysfunction scores; Sepsis; Geriatrics; Critical care

ARAŞTIRMA

YOĞUN BAKIM ÜNİTESİNDE SEPSİS TANILI YAŞLI HASTALARDA HIZLI SOFA (QSOFA) KULLANIMI

Öz

Giriş: Klinik olarak tanısı konmuş sepsis olan yaşlı hastalarda mortalite ve yoğun bakım ünitesine kabul etmede hızlı sepsis ile ilişkili organ yetmezliği değerlendirmesinin performansını araştırdık ve performansını sistemik inflamatuar yanıt sendromu, sepsis ile ilişkili organ yetmezliği değerlendirmesi ve akut fizyoloji ve kronik sağlık değerlendirmesi ile karşılaştırdık.

Gereç ve Yöntem: Şubat 2016'dan Şubat 2017'ye kadar, yoğun bakım ünitesinde klinik olarak sepsis tanısı alan 92 yaşlı (≥65 yaş) hastayı retrospektif olarak inceledik. Yoğun bakım ünitesinde 28 günlük mortaliteyi öngörmede sepsis ile ilişkili organ yetmezliği değerlendirmesi, akut fizyoloji ve kronik sağlık değerlendirmesi II, sistemik inflamatuar yanıt sendromu ve hızlı sepsis ile ilişkili organ yetmezliği değerlendirmesinin performansını karşılaştırdık.

Bulgular: Hızlı sepsis ile ilişkili organ yetmezliği değerlendirmesi skorları %6.5 (n=6) hastada 1, %30.4 (n=28) hastada 2 ve %63 (n=58) hastada 3 idi. Ortalama sepsis ile ilişkili organ yetmezliği değerlendirmesi skoru 9.2±3.0, ortalama sistemik inflamatuar yanıt sendromu skoru 2.6±0.6 ve akut fizyoloji ve kronik sağlık değerlendirmesi II skoru 25.4±7.2 idi. Ölüm oranları >7 and <7 sepsis ile ilişkili organ yetmezliği değerlendirmesi skoru olan hastalarda sırasıyla %81 ve %31 olup, aralarında istatistiksel olarak anlamlı bir fark bulunmuştur (p<0.001).

Sonuç: Geriatrik hastalarda sepsis ile ilişkili organ yetmezliği değerlendirmesiyle karşılaştırıldığında kolay uygulanabilmesi nedeniyle hızlı sepsis ile ilişkili organ yetmezliği değerlendirmesi mortalite riskini belirlemede daha iyi bir alternatif olabilir.

Anahtar Sözcükler: Organ disfonksiyonu skorları; Sepsis; Geriatri; Kritik bakım

INTRODUCTION

According to data from the Turkish Statistical Institute, the proportion of the geriatric population was 7.5% in 2012, which has increased to 8.3% in 2016. Males constitute 43.9% and females constitute 56.1% of the geriatric population (1). In many countries, the average age and life expectancy of the population are also increasing. As a result, a growing number of older patients are admitted to the intensive care unit. In the intensive care unit, geriatric patients and their treatment may be different from that of younger patients. In fact, the duration of intensive care unit stay was found to be longer in patients aged >75 years than in patients aged <65 years (2). Currently, a significant number of patients in the intensive care unit are geriatric patients with numerous, life-threatening, progressive, and irreversible disorders, and the indications of hospitalization in the intensive care unit are similar to those of younger patients. Clearly, being in the geriatric age group is not a contraindication to intensive care unit admission (3).

The definitions of sepsis and septic shock were recently modified in The Third International Consensus Definitions for Sepsis and Septic Shock (4). The quick sepsis-related organ failure assessment (qSOFA) is a new screening tool that has been recommended to evaluate sepsis in accordance with its new definition (5). The qSOFA criteria for sepsis include a Glasgow Coma Scale score of ≤13, systolic blood pressure ≤100 mmHg, and respiratory rate ≥22 cycles/min (1 point each to yield a score value between 0 and 3) (5). According to the recommendations in Sepsis-3, patients outside the intensive care unit with a qSOFA score of ≥2 who are suspected to have an infection should be closely monitored for sepsis and further assessed using the SOFA score. Simplicity in the calculation and close accordance with complex systems used for non- intensive care unit settings are the main advantages of qSOFA. Furthermore, its independence from laboratory test results means that qSOFA can be calculated within a few minutes at the patient's bedside. The Surviving Sepsis Campaign also recommended that further

investigations are required for qSOFA's sensitivity (6). However, no study was conducted using qSOFA in predicting mortality of elderly patients aged over 65 years.

This study aimed to investigate the performance of qSOFA for predicting mortality of geriatric patients with clinically diagnosed infection in the intensive care unit and to compare its performance with those of systemic inflammatory response syndrome, acute physiology and chronic health evaluation II, and sepsis-related organ failure assessment.

MATERIALS AND METHOD

The study was a single-center, retrospective analysis of a prospective observational research database in patients with clinically diagnosed sepsis at the ICU from February 2016 to February 2017. This study was approved by the ethics committee of our institution.

Elderly patients (≥65years old) with sepsis, and admitted in the ICU were included in the study. The exclusion criteria were as follows: age <65 years, terminal disease, human immunodeficiency virus positivity, and use of immunosuppressant.

Data on demographic characteristics, comorbidities, infection sites, vital signs, imaging, and results of the laboratory test of enrolled patients were recorded upon ICU admission. qSOFA, SOFA, APACHE II, and SIRS scores were calculated using the data obtained during enrollment. Patient mortality rate was followed up for 28 days.

Data analysis was done using SPSS version 18 (SPSS Inc., Chicago, IL, USA). The individual relationship of each score qSOFA, simplified acute physiology score (SAPS), and APACHE) and length of admission with the risk of death and the comparison of the score was done using-test and ANOVA. P-value of <0.05 was considered statistically significant. The means of continuous variables were compared using Student's *t*-test. Predicted mortality was calculated using the

original regression formulas. Categorical variables were compared using either chi-square test or Fisher's exact test. Discrimination was tested using the receiver operating characteristic (ROC) curves and by comparing areas under the curve (AUC). AUCs >0.8 were considered excellent and 0.6–0.8 were acceptable.

RESULTS

Of the 312 admissions during the study period, 92 (29.4%) patients who met the inclusion criteria were included in the final analysis. The average age of patients was 78.5±9.2 years. Of the subjects, 55 (59%) were women and 37 (41%) were men. Furthermore, 93.5% (n=86) of patients had at least and 6.5% (n=6) without comorbidity. Forty-nine had ≤2 comorbidities; by contrast, 37 patients had ≥3 comorbidities. The determined comorbidities were congestive heart failure (29.3%), chronic obstructive lung disease (31.5%), renal failure (12%), cerebrovascular disease (27.2%), type II diabetes mellitus (25%), malignancy (18.5%), hypertension (58.7%), and others (25%). The source of infection was pulmonary (63%; n=58) and other sources (37%; n=34) (Table 1).

Table 1. Comparison between the baseline characteristics of patients.

Parameter of interest	Overall	Survivors (n=32)	Non-survivors (n=60)	p
Age (years)	78.5±9.2	76.2±8.8	79.7±9.3	0.08
Sex				
Males	37	19	36	0.954
Females	55	13	24	
ICU stay(days)	10.2±8.5	11.7±10.1	9.5±7.5	0.245

* p<0.05 was considered significant. ICU: intensive care unit, MV: mechanical ventilation, RRT: renal replacement therapy.

The 28-day mortality rate was 65.3% (n=60). The length of ICU stay was 10.2±8.5 days. Moreover, 27.2% (n=25) of patients were discharged and 7.6% (n=7) stayed in the ICU after 28 days.

qSOFA scores were 1 in 6.5% (n=6), 2 in 30.4% (n=28), and 3 in 63% (n=58) of patients. The mean SOFA score was 9.2±3.0, the mean SIRS score was 2.6±0.6, and the mean APACHE II score was 25.4±7.2.

No statistically significant difference was found between gender (p=0.954), age (p=0.323), comorbidity (p=0.493), congestive heart failure (p=0.439), chronic obstructive lung disease (p=0.493), renal failure (p=0.218), cerebrovascular disease (p=0.732), diabetes mellitus (p=0.312), malignancy (p=0.961), hypertension (p=0.153), and pulmonary infection (p=0.324).

The mortality rate was 33.3%, 53.6%, and 74.1% in patients with qSOFA score of 1, 2 and 3, respectively. This difference was statistically significant (p=0.01).

Mortality was higher in patients with qSOFA of >2 than those with qSOFA≤2, which was statistically significant (p=0.01).

The mortality rate was 51.2% in patients with a SIRS score of ≤2 and 75.4% in those with SIRS score of≥3 and this difference was statistically significant (p=0.01).

SOFA and APACHE II scores were higher in patients who subsequently died. The SOFA score of patients who subsequently died was 10.4±2.6 and that of who is still alive was 7.1±2.5 (p<0.0001). The APACHE II score of patients who died was 27.5±6.8 and those who are still alive was 21.5±6.6 (p<0.0001).

APACHE II predicted higher mortality rate in patients who subsequently died (p=0.001).

The AUCs of the 28-day mortality of qSOFA, SOFA, SIRS, and APACHE II were 0.633, 0.804, 0.654, and 0.730, respectively. The AUCs of qSOFA and SOFA were significantly different (p=0.002).

No differences were found between qSOFA and SIRS, qSOFA and APACHE II scores (p=0.704 vs. p=0.109). A statistically significant difference was observed between SOFA and SIRS (p=0.009), but no difference was found between SOFA and APACHE II (p=0.220). There was no difference between SIRS and APACHE II (p=0.229) (Table 2).

Given that the best sensitive and specific area is accepted as a cutoff value in the ROC curves, we calculated the cutoff values of qSOFA at>2, SOFA at >7, SIRS at >2, and APACHE II at >18.The mortality rate was 81% and 31% in patients with SOFA scores of>7 and <7, respectively, in which a statistically significant difference was observed (p<0.001) (Figure 1).

Table 2. Characteristics of scoring systems.

Variables	Whole cohort	Non-survivors	Survivors	p
Illness severity				
qSOFA	2.56±0.6	2.34±0.7	2.68±0.5	0.01
APACHE II	25.4±7.2	21.5±6.6	27.5±6.8	<0.0001
SOFA	9.29±3.0	7.1±2.5	10.4±2.6	<0.0001
SIRS	2.66±0.6	2.40±0.4	2.80±0.8	0.009
28-day mortality	65.2%	65.2%	0%	

qSOFA: quick sepsis-related organ failure assessment, APACHE II: acute physiology and chronic health evaluation II, SOFA: sepsis-related organ failure assessment, SIRS: systemic inflammatory response syndrome
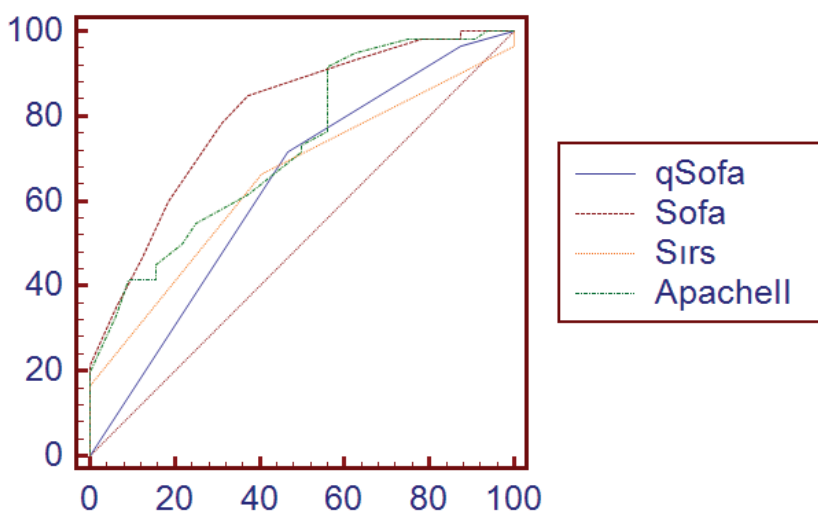
Figure 1. ROC curves of 28-day mortality and ICU admission of patients.

DISCUSSION

Sepsis has a heterogenous disease process and this makes the definition and diagnosis of sepsis crucial. In 2016, the third international consensus on sepsis definitions was published and the definition of Sepsis-3 was declared as "dysregulated host response to an external pathogen" (4). In this conference, qSOFA was defined as a new index to evaluate the patients with suspected infection who are likely to develop sepsis. The qSOFA score was the sum of 1 point for a Glasgow Coma Scale (GCS) of 14 or less, 1 point for a systolic blood pressure of 100 mmHg or less, and 1 point for a respiration rate of 22/min or more.

In a recent study, sepsis was reported as one of the major cause of death in elder patients although new antibiotics and other modern therapies for resuscitation were used (7).

The aging of the population will lead to an increasing demand for critical care resources. Current data suggests that planned surgery for patients ≥80 years of age may benefit from ICU care. A study reported that 27% of patients aged >65 years may need ICU management (8). Scoring systems are used in the ICU to provide clinical information about disease severity and estimated hospital mortality rate. Scoring systems involve the collection of patients' medical and clinical data, and each data variable is assigned with points. These scoring systems can help physicians, patients, and their attendants to select treatment options and allocate the limited ICU resources. They may also help in evaluating the effect of newer treatment modalities and organizational changes.

The scoring system has two parts: a severity score, indicated by a number (the higher the score, the higher the severity), and a calculated probability of mortality (9). The SAPS II is certainly among the most commonly used and validated tools for predicting outcome in the ICUs (10). However, these scoring systems were developed in the 1980s and therefore may be out of date because of the major advances in critical care management of patients in the recent years.

Although newer generations of scoring systems have been developed, these have neither been widely tested and validated nor compared with previous generations of scoring systems.

An ideal scoring system should be able to predict mortality rate correctly, i.e., predicted mortality should be close to the actual mortality rate should be well calibrated, i.e., it should be able to provide risk estimate corresponding to the observed mortality; should have high levels of discrimination, i.e., it should be able to identify patients who are at higher risk of dying; and it should be easy to compute and based on easily available patient parameters.

The accuracy of these scoring systems may not only differ over time but may also vary in different countries because of differences in ethnicity, patient population, health care systems, and ICU structure and organization (11).

Indications of admissions to intensive care were mostly preoperative hemodynamic instability, massive blood transfusion, and respiratory and surgical complications of geriatric patients.

In a retrospective study on the 28-day and 1-year mortality rates of 7,265 geriatric patients, the incidence of heart failure, severe cardiac arrhythmia, and valvular disorders as reasons for ICU admission was found to increase by age. The highest mortality rate was 56% in the >85-year age group and the lowest was 36% in the 65–74-year age group. The SOFA score increased with increasing age and was found to increase with mortality. This study claimed that in patients aged>75 years, mortality might be higher than expected; the need for special care for these patients was emphasized (12).

In our study, the 28-day mortality rate was 65.3%, which was higher than that reported in the original qSOFA study (13). The possible reason for the higher mortality in the present study may be that older patients have more comorbidities and greater illness severity.

Wang et al. have shown that the AUC for qSOFA in predicting mortality was lower than those for APACHE II, SOFA, and MEDS scores, but only the difference between qSOFA and MEDS was statistically significant (14). In the present study, the AUCs of qSOFA and SOFA were significantly different; on the contrary, no difference was found between APACHE II and SIRS.

Askim et al. showed that a SIRS score of≥2 had higher sensitivity than qSOFA in predicting both 7-day and 30-day mortality (15). In addition, our findings supported (75.4%) this argument. Identification and treatment of sepsis in a heterogeneous group are challenging because of

age, comorbidities, and type of infection (16-18). In our study, comorbidities and mean age are higher than those in other studies, which are attributed to high mortality rate.

The major drawback of this study was the small sample size. Of the 312 elderly patients, only 92 were included as it was a time-limited study. Further studies involving a large population investigated on a daily basis until the patient was discharged or shifted can be conducted to predict the outcome of ICU stay using daily scores of qSOFA, SAPS, and APACHE. Another limitation of our study was that it was a single-center retrospective study; hence, the results may lack wider applicability.

In conclusion, qSOFA was found as successful as SOFA in determining the mortality rate of geriatric patients in the ICUs. qSOFA can be a better alternative in detecting mortality risk in geriatric patients because of its easy application as compared with that of SOFA.

REFERENCES

1. Albayrak T, Kahveci R, Ozkara A, Kasım I. The future of elderly care in Turkey. Br J Gen Pract 2014;64(618):14-5. (PMID:2456755).

2. Behrendt CE. Acute respiratory failure in the United States; incidence and 31-day survival. Chest 2000;118(4):1100-5. (PMID:11035684).

3. Yu W, ASh AS, Levinsky NG, Moskowitz MA. Intensive care unit and mortality in the elderly. J Gen Intern Med 2000;15(2):97-102. (PMID 10672112).

4. Singer M, Deutschman CS, Seymour CW, et al. The third international consensus definitions for sepsis and septic shock (Sepsis-3). JAMA 2016;315(8):801-10. (PMID:26903338).

5. Seymour CW, Liu VX, Iwashyna TJ, et al. Assessment of clinical criteria for sepsis: for the third international consensus definitions for sepsis and septic shock (Sepsis-3). JAMA 2016;315(8):762-74. (PMID:26903335).

6. Levy MM, Artigas A, Phillips GS, et al. Outcomes of the surviving sepsis campaign in intensive care units in the USA and Europe: a prospective cohort study. Lancet Infect Dis 2012;12(12):919-24. (PMID:23103175).

7. Kumar G, Kumar N, Taneja A, Kaleekal T, Tarima S, McGinley, et al. Nationwide trends of severe sepsis in the 21st century (2000–2007) Chest 2011;140:1223–31. (PMID: 21852297).

8. Nuckton TJ, List ND. Age as a factor in critical care unit admissions. Arch Intern Med 1995;155(10):1087-92. (PMID:7748053).

9. Juneja D, Singh O, Nasa P, Dang R. Comparison of newer scoring systems with the conventional scoring systems in general intensive care population. Minerva Anestesiol 2012;78(2):194-200. (PMID:22095102).

10. Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Crit Care Med 1985;13(10):818-29. (PMID:3928249).

11. Le Gall J-R, Lemeshow S, Saulnier F. A new Simplified Acute Physiology Score (SAPS II) based on a European/ North American multicenter study. J Am Med Assoc 1993;270(24):2957-62. (PMID:8254858).

12. Fuchs L, Chronaki CE, Park S, et al. ICU admission characteristics and mortality rates among elderly and very elderly patients. Intensive Care Med 2012;38(10):1654-61. (PMID:22797350).

13. Shankar-Hari M, Phillips GS, Levy ML, et al; Sepsis Definitions Task Force. Developing a New Definition and Assessing New Clinical Criteria for Septic Shock: For the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA 2016;315(8):775-87. (PMID:26903336).

14. Wang JY, Chen YX, Guo SB, Mei X, Yang P. Predictive performance of quick Sepsis-related Organ Failure Assessment for mortality and ICU admission in patients with infection at the ED. Am J Emerg Med 2016;34(9):1788-93. (PMID:27321936).

15. Askim A, Moser F, Gustad LT, et al. Poor performance of quick-SOFA (qSOFA) score in predicting severe sepsis and mortality-a prospective study of patients admitted with infection to the emergency department. Scand J Trauma Resusc Emerg Med 2017;9;25(1):56. (PMID:28599661).

16. Peterson LN, Chase K. Pitfalls in the treatment of sepsis. Emerg Med Clin North Am 2017;35(1):185-98. (PMID:27908333).

17. Kaukonen KM, Bailey M, Pilcher D, et al. Systemic inflammatory response syndrome criteria in defining severe sepsis. N Engl J Med 2015;372:1629-38. (PMID:26308693).

18. Vincent JL, Martin GS, Levy MM. qSOFA does not replace SIRS in the definition of sepsis. Crit Care 2016;20(1):210. (PMID:27423462).

HEADACHE CHARACTERISTICS IN GERIATRIC AGE GROUP ACCORDING TO ICHD-3 BETA VERSION

■ İrem YILDIRIM[1]
■ Eda DERLE ÇİFTÇİ[2]
■ Münire KILINÇ TOPRAK[3]

Abstract

Introduction: The aim of this study was to screen patients aged ≥65 years admitted to the Başkent University Hospital Neurology Polyclinic between 2011 and 2013 and classify them according to the International Classification of Headache Disorders, 3rd edition.

Materials and Method: In total, 175 patients (126 females and 49 males) were screened. First, they were separated into primary and secondary headache groups, and the subgroup headache types were then defined within these groups according to the International Classification of Headache Disorders, 3rd edition; then, the concurrence of accompanying chronic diseases were examined.

Results: In the primary headache group, 21.1% of the patients had migraine, 39.4% had tension-type headache, and 51% had trigeminal neuralgia; in the secondary headache group, 24.2% of the patients had headache attributed to hypertension, 18.2% had headache attributed to temporal arteritis, 18.2% had headache attributed to cervical pathology, and 12.1% had headache attributed to intracranial mass.

Conclusion: This study was conducted to detect the most commonly seen headache types in geriatric population, and the results of this study are important in terms of increasing awareness of the evaluation of both primary and secondary headaches in geriatric patients. Because the study was conducted with a less patient population, it is important in terms of more accurately demonstrating the factors constituting the etiology of headache in this patient group.

Keywords: Headache; Migraine; Tension-type headache; Trigeminal neuralgia

1 Kafkas University, Faculty of Medicine, Neurology Clinic, Kars, Turkey
2 Başkent University, Faculty of Medicine, Neurology Clinic, Ankara, Turkey
3 Başkent University, Faculty of Medicine, Neurology Clinic, Ankara, Turkey

GERİATRİK YAŞ GRUBU HASTALARDAKİ BAŞ AĞRISI ÖZELLİKLERİNİN ICHD-3 BETA SINIFLANDIRMA ÖLÇEĞİNE GÖRE DEĞERLENDİRİLMESİ

Öz

Giriş: 2011-2013 yılları arasında Başkent Üniversitesi Hastanesi Nöroloji polikliniğine başvuran 65 yaş üstü hasta grubunun taranarak 3. Uluslarası Baş ağrısı Sınıflandırma ölçeğine göre sınıflandırılması amaçlanmıştır.

Gereç ve Yöntem: Araştırmada 126'sı kadın, 49'u erkek toplam 175 hasta tarandı. Önce primer ve sekonder baş ağrısı gruplarına ayrılarak, 3. Uluslararası Baş ağrısı sınıflandırma Ölçeği'ne göre kendi içlerinde alt grup baş ağrısı çeşitleri tanımlandı ve eşlik eden kronik hastalıkların birlikteliği incelendi.

Bulgular: Primer baş ağrısı grubunda hastaların %21.1'i migren, %39.4'ü gerilim tipi baş ağrısı, %51'i trigeminal nevralji olarak tanımlanırken, sekonder baş ağrısı grubunda %24.2'si hipertansiyon ilişkili, %18.2'si temporal arterite bağlı, %18.2 servikal patolojiye bağlı, %12.1 intrakraniyal kitleye bağlı başağrısı olarak tanımlanmıştır.

Sonuç: Bu çalışma geriatrik popülasyonda en sık görülen başağrısı tiplerinin saptanması için yapılmış olup, çalışmanın sonuçları, yaşlılarda hem primer hem sekonder baş ağrılarını değerlendirmede farkındalığı artırmak açısından önem taşımaktadır. Çalışmanın daha geniş hasta popülasyonu ile yapılması; bu grupta baş ağrısı etyolojisini oluşturan etkenlerin daha doğru bir oranda ortaya konulması açısından önemlidir.

Anahtar sözcükler: Baş ağrısı; Migren; Gerilim baş ağrısı; Geriatri

INTRODUCTION

Headache is one of the most frequent neurological complaints both in the general and geriatric populations. The prevalence of headache in the adult population is 46%. Tension-type headache (43%) and migraine (11%) are types of headaches that most frequently affect adults (1).

The prevalence of headache according to age groups in men and women in the order of increasing ages is as follows: 94%–74% for 21–34 years, 66%–53% for 55–74 years, and 55%–22% for ≥75 years (2). Headaches are one of the most common neurological complaints in geriatric patients, and 52% of patients who are admitted with complaints of headache are in the age group of ≥65 years (3). Although it can be predicted that there would be an increase in the frequency of secondary headaches with increasing age, primary headaches are seen more frequently than secondary headaches in the geriatric population (4).

Hypnic headache and headache attributed to temporal arteritis and Parkinson's disease are the more commonly seen headaches in the geriatric population (5).

When epidemiological headache studies are considered, while many studies have been performed on young and middle-aged populations, the lack of studies on the geriatric population draws attention (6,7). The aim of this study was to classify the variety, frequency, and accompanying clinical characteristics of headaches seen in people aged ≥65 years in Turkey according to the International Classification of Headache Disorders, 3rd edition (beta version) (ICHD-3), and compare these with studies from other countries in the literature.

MATERIALS AND METHOD

In this retrospective study, medical records of 175 patients aged ≥65 years who were admitted to the Başkent University Faculty of Medicine Neurology Polyclinic with complaints of headache between 2011 and 2013 were examined. The patients were diagnosed according to their complaints of headache using ICHD-3. Headache was classified using anamnesis information, examination results, and diagnosis criteria of headache types in the ICHD-3. Initially, the headache types in the patient group were divided into primary and secondary headaches. Both groups were compared according to age and gender characteristics. Other existing diseases (diabetes mellitus, hypertension, hypothyroidism, coronary artery disease, depression, history of head trauma history, presence of mass or aneurysm in the brain, etc.) in both groups were compared. Subgroups within both groups were formed according to the headache types, and were stated with their percentage ratios.

Statistical analyses were performed with IBM SPSS Statistics for Windows Version 21.0 package software (United States). Numerical variables were presented as mean±standard deviation and (minimum–maximum) definitions, whereas categorical variables were presented as number and percentage. Existence of a difference between the two groups in terms of numerical variables was examined using the independent samples t-test. Existence of a difference between the two groups in terms of categorical variables was examined using the chi-square test. Statistical significance was accepted as $p < 0.05$.

Financial disclosure

RESULTS

In total, 175 patients aged ≥65 years were evaluated in this study. The average age of the

patients was 73.5±6.9 years, and 49 were males and 126 were females. The headache types in the patient group were divided into primary and secondary headaches. There were 142 (81.1%) patients in the primary headache group and 33 (18.9%) in the secondary headache group. Male/female ratio in both groups was determined (Table 1). The risk factors of primary and secondary headaches are shown in Table 2. No statistically significant difference was found in the comparison of risk factors between the two headache groups (Table 2).

In the evaluation of the primary headache group, tension-type headache was determined in 56 (39.4%) patients, trigeminal neuralgia in 44 (51.0%), migraine without aura in 19 (13.4%), migraine with aura in 11 (7.7%), primary cough headache in 3 (2.1%), probable new daily persistent headache in 3 (2.1%), short-lasting unilateral neuralgiform headache attacks with conjunctival injection and tearing in 2 (1.4%), and occipital neuralgia in 2 (1.4%).

Headache attributed to hypertension (24.2%) was the most common in the secondary headache subgroup, followed by headache attributed to temporal arteritis (18.2%). Other secondary headache subgroups are shown in Table 3.

Table 1 . Comparison of headache groups according to age and gender characteristics.

	Primary (n=142)	Secondary (n=33)	Total (n=175)	p
Age	73.4±7.1	73.9±6.4	73.5±6.9	0.710
	(64–89)	(65–86)	(64–89)	
Gender (M/W)	39/103	10/23	49/126	0.911
	(27.5%/72.5%)	(30.3%/69.7%)	(28%/72%)	

Table 2. Risk factors of primary and secondary headache groups.

Risk Factors	Primary (n=142)		Secondary (n=33)		P
Diabetes mellitus	27	(19.0%)	7	(21.2%)	0.965
Hypertension	99	(69.7%)	22	(66.7%)	0.894
Hypothyroidism	15	(10.6%)	3	(9.1%)	1.000
Coronary artery disease	16	(11.3%)	5	(15.2%)	0.748
History of head trauma	8	(5.6%)	1	(3.0%)	0.863
Depression	17	(12.0%)	2	(6.1%)	0.501
Aneurism or mass in brain		-	4	(12.1%)	0.001

Table 3. Subgroups of secondary headache (n=33).

	n	%
Hypertension related headache	8	24.2
Drug related headache	1	3.0
Headache related to temporal arteritis	6	18.2
Headache secondary to carotid-vertebral disease	1	3.0
Headache related to non-inflammatory disease	1	3.0
Headache secondary to cervical dystonia	1	3.0
Headache related to ischemic stroke disease	1	3.0
Headache secondary to cervical pathology	6	18.2
Headache related to intracranial mass lesion	4	12.1
Glaucoma related headache	1	3.0
Headache secondary to unruptured intracranial saccular aneurism	1	3.0
Headache related to metabolic disorder	1	3.0
Painful trigeminal neuropathy related to intracranial space occupying lesion	1	3.0

DISCUSSION

Headache is a disorder that should be considered in detail because it does not only disturb the quality of life but can also be a symptom of intracranial and/or systemic diseases. Although there are many studies on young and middle-aged populations regarding the epidemiology of headache, there are very few studies focusing on the geriatric population. When we reviewed the literature, we found that this is the first study categorizing headache in the geriatric population in Turkey according to the ICHD-3.

The principal limitations of this study are that this is a single-center retrospective study conducted with a relatively small patient population. Thus, other primary and secondary headache types that may arise in this age group might not be defined in detail. This has caused the specific diagnoses to be defined less in the headache classification.

In a study in which the frequency of headache was examined according to age groups, the prevalence was determined to be 92% in women and 74% in men aged 21–34 years, 53% in women and 66% in men aged 55–74 years, and 55% in women and 22% in men aged ≥75 years (8). According to this, headache prevalence shows a decrease with increasing age. However, because the prevalence of secondary headache was found to be higher in patients aged ≥65 years compared with young patients and both symptomatic and prophylactic treatments have different characteristics in these ages, headaches should be carefully examined in the geriatric population.

In an epidemiologic study by Mei-Ling et al., the prevalence of primary and secondary headaches in patients aged ≥65 years was 81.6% and 14.9%, respectively (9). In a study by Pascual et

al. focusing on a similar age group, the proportion of male and female patients was 37% and 63%, respectively (10). In our study, the prevalence of primary and secondary headaches in the geriatric population was 81.1% and 18.9%, respectively; the proportion of male and female patients was 28% and 72%, respectively. According to our results, among the primary headaches in geriatric age group, the prevalence of tension-type headache was 56%, that of migraine without aura was 13.4%, that of migraine with aura was 7.7%, and that of trigeminal neuralgia was 31.0%. Although these ratios are similar to those reported by Lisotto et al. (11), the prevalence of trigeminal neuralgia was 7.7% in that study, which was lower than that found in our study. In another study, primary stabbing headache was the second most prevalent headache besides migraine and tension-type headache in patients aged ≥65 years (3). In our study, trigeminal neuralgia was also the second most common among primary headaches. The criteria of pain being observed on the first branch of the trigeminal nerve stated in the primary stabbing headache criteria was removed in the ICHD-3 beta version. Because patient histories were not very detailed, primary stabbing headache may not have been separated from the trigeminal neuralgia group, and this may have caused a higher detection rate of trigeminal neuralgia (3). This type of headaches being frequently seen in this age group may be related to cervicogenic headaches, nerve inflammations, and vascular tortuosity being more frequent in geriatric patients (12,13).

In a study examining 193 patients aged ≥65 years, the prevalence of tension-type headaches was 43.0% (10), and this prevalence is similar to that detected in our study (39.4%). In another study, the prevalence of tension-type headache was 27% and that of migraine was 15% (14). Chronic diseases make the episodes of primary headaches more severe and may accelerate the transformation of headaches from episodic form to chronic daily headaches (6).

In most of the studies evaluating geriatric populations, it was found that the prevalence of tension-type headaches is higher compared with young population. It was suggested that this may be because of the increasing prevalence of cervical osteoarthritis, depression and/or diseases related to depression, and sleep disorders in geriatric patients (14).

In a study conducted in 2004, the ratio of migraine without aura in geriatric patients was 15%, whereas the ratio of migraine with aura was 1.7% (15). In our study, the ratio of migraine without aura detected as 13.4% shows a similarity to that study. It is stated that the frequency of migraine transforming into chronic headache in geriatric patients is high (12). It should be kept in mind that pain characteristics may change and this may make diagnosis more difficult in geriatric patients. Compared to the young population, the throbbing characteristic, photophobia and phonophobia relationship, worsening with exercise, and severe headache attack characteristics of headaches diminish over time. On the other hand, autonomic symptoms and bilateral pain are seen more frequently in geriatric patients. The importance of migraine with aura in geriatric patients is still a topic of debate (16). Migraine is closely related to ischemic and hemorrhagic stroke risk, hearth diseases, retinal vasculopathies, and high mortality (17).

In the study by Pascual et al., the ratio of headache attributed to ischemic stroke, temporal arteritis, and intracranial mass in 193 patients aged ≥65 years was found to be significantly higher (15%) compared with patients aged <65 years. (18) In our study, it was found that the total ratio of headaches attributed to these diseases was quite high at 33.3%.

In the study of Pascual et al., the ratio of "benign" cough headache was 1.5% and occipital neuralgia ratio was 1%. In our study, these ratios were found as 2.1% and 1.4%, respectively. The importance of cough headache is due to the existence of severe

secondary factors, especially geriatric patients, such as posterior fossa tumors particularly and non-ruptured intracranial aneurisms, dissection, carotid/vertebrobasilar stenosis, acute sphenoid sinusitis, low cerebrospinal fluid volume, and subdural hematoma. However, most cases are of primary nature and secondary factors are more commonly seen in the younger population (18).

The fact that we did not observe hypnic headache, which is usually seen in patients aged >60 years, in the patient group we examined may be due to the low number of participants or due to this headache being rarely seen.

Cluster headache was detected in 2 out of 5 patients in a study screening patients over the age of 65 years (6). In our study, cluster headache was not detected in any patients. Because the first attacks start around the age of 30 years in these types of headaches and become less frequent over time and because the probability of first attacks being observed at later ages is very low, this was seen as an expected outcome (19).

Among secondary headaches, headaches attributed to hypertension were the most frequent (24.2%), similar to the study by Serratrice et al. (25.9%) (7).

In the study by Lisotto et al., headache attributed to cervical pathology was reported at a ratio of 26.2%, headache attributed to temporal arteritis was reported at 7.1%, and headache attributed to intracranial mass was reported at 2.4%. In another study, headache attributed to cervical pathology was determined at a ratio of 18.2%, headache attributed to intracranial mass was determined at 12.1%, and headache attributed to intracranial mass was determined at 12.1% (11). Temporal arteritis in geriatric patients admitted with headaches is also reported in similar ratios in two other studies (10, 20). In our study, headache attributed to temporal arteritis was found at similar ratios with other studies in this age group. This emphasizes the importance of quick differential

diagnosis of temporal arteritis, which requires urgent start of treatment, from other headaches. Moreover, the fact that temporal arteritis was the third most prevalent headache cause in the secondary headache group in our study shows its importance in terms of diagnosis and treatment especially in geriatric patients.

Headache attributed to glaucoma was detected only in 1 patient. This was evaluated as the inability of detecting statistically adequate data due to the low number of patients. It was also considered that because elderly patients cannot describe specific eye symptoms, wrong diagnosis or delays in diagnosis may have occurred. When in suspicion, urgent eye consultation and appropriate treatment should be carried out (21).

Headaches are the common side effect of prostaglandin synthetase inhibitors (such as indomethacin), beta blockers (atenolol, metoprolol), sulfonamides (trimethoprim-sulfamethoxazole), nitrates (isosorbide dinitrate), ACE inhibitors (captopril), dipyridamole, and alpha 2 stimulants (methyldopa). On the other hand, chronic use and over use of analgesics including NSAIDs can trigger headaches (17). The prevalence in geriatric population is between 1%–1.7% (6). In our study, headache attributed to isosorbide mononitrate was detected in one patient. This can be explained by the number of patients.

The results of the study are important in terms of increasing awareness in evaluation of both primary and secondary headaches in geriatric patients. The study being carried out with a larger patient population is important in terms of demonstrating the factors constituting the headache etiology in this group at a more accurate rate. We believe that prospective and randomized studies investigating geriatric headaches will result in regulations and arrangements in the headache classification scale that can provide benefits in diagnosis and treatment in this special patient group.

REFERENCES

1. Wang Y, Zhou J, Fan X, et al. Classification and clinical features of headache patients: an outpatient clinic study from China. J Headache Pain 2011;12:562-7. (PMID:21744226).

2. Silberstein SD. Geriatric headache, In: Silberstein SD, Lipton RB, Goadsby PJ. Headache in clinical practice. 2nd edition, Martin Dunitz, Taylor & Francis Group, London 2002, pp 269–83.

3. Song TJ , Kim YJ, Kim BK, et al. Characteristics of elderly-onset (≥65 years) headache. J Clin Neurol Oct 2016;12(4):419-25. (PMID:27819415).

4. Prencipe M, Casini AR, Ferretti C, et al. Prevelance of headache in an elderly population: Attack frequency, disability, and use of medication. J Neurolog Neurosurg Psychiatry 2001;70:377-81. (PMID:11181862).

5. Lipton RB, Bigal ME. Identification or exclusion of secondary headaches. In: Migraine and other headaches. CRC Press, 2006, pp 138-9.

6. Tonini MC, Bussone G. Headache in the elderly: primary forms. Neurological Sciences 2010;31:67-71. (PMID:20464587).

7. Serratrice G, Serbanesco F, Sambuc R. Epidemiology of headache in elderly correlations with life conditions and socio-professional environment. Headache Mar 1985;25(2):85-9. (PMID:3988504).

8. Waters WE. The pontypridd headache survey. Headache Jul 1974;14(2):81-90. (PMID:4854994).

9. Tai ML, Jivanadham JS, Tan CT, et al. Primary headache in the elderly in South-East Asia. J Headache Pain 2012;13:147-57. (PMID:22422347).

10. Pascual J, Berciano J. Experience in the diagnosis of headaches that start in elderly people. J Neurol Neurosurg Psychiat 1994;57:1255–57. (PMID:7931391).

11. Lisotto C, Mainardi F, Maggioni F et al. Headache in the elderly: a clinical study. J Headache Pain 2004;5:36-41.

12. Edmeads J. The cervical spine and headache. Neurology 1988; 38:1874-78. (PMID:3194065).

13. Love S, Coakham HB. Trigeminal neuralgia: pathology and pathogenesis. Brain Dec 2001;124 (Pt 12):2347-60. (PMID:11701590).

14. Solomon GD, Kunkel RS, Frame J. Demographics of headache in elderly patients. Headache 1990;30: 273-6. (PMID:2354949).

15. Wang X, Li WW, Duan JX, et al. Clinical characteristics and diagnosis and treatment status of headaches in the department of gerontology of a university hospital in China. Neurol Res Oct 2014;36(10):921-4. (PMID:24712392).

17. Ruiz MPM, de la Cruz C, Barón J, et al. Cefaleas en la persona mayor: características de una serie de 262 pacientes. Neurologia 2014;29(6):321-6.(6):321-6. (in Spanish).

20. Van Oosterhout W, Cheung C, Haan J. Primary headache syndromes in the elderly: Epidemiology, diagnosis and treatment. J Clin Transl Res 2016;2(2):45-51.

21. Chen PK, Fuh JL, Wang SJ. Cough headache: a study of 83 consecutive patients. Cephalalgia 2009;29:1079–85. (PMID:19438909).

22. Goadsby PJ, Lipton RB. A review of paroxysmal hemicranias, SUNCT syndrome and other short-lasting headaches with autonomic feature, including new cases. Brain Jan 1997;120 (Pt 1):193-209. (PMID:9055807).

23. Serratrice G, Serbanesco F, Sambuc R. Epidemiology of headache in elderly correlations with life conditions and socio-professional environment. Headache Mar 1985;25(2):85-9. (PMID:3988504).

24. Dwolatzky T. New-onset headaches in the elderly: An indicator of underlying disease. Aging Health 2012;8(1):79-88.

- Berna ŞENEL ERASLAN[1]
- İbrahim ERAY ÇAKI[1]
- Beytullah KARADAYI[1]
- Abdi ÖZASLAN[1]

CORRESPONDANCE

Berna ŞENEL ERASLAN
İstanbul University, Cerrahpaşa Medical Faculty, Department of Forensic Medicine, İstanbul, Turkey

Phone: 2124143029
Fax: 2124143028
e-mail: drbsenel@gmail.com

[1] İstanbul University, Cerrahpaşa Medical Faculty, Department of Forensic Medicine, İstanbul, Turkey

RESEARCH

A STUDY ON PHYSICIANS' PERSPECTIVES ON ELDER ABUSE AND NEGLECT

Abstract

Introduction: Rapid developments in science and technology, increased quality of life, and developments in in methods for diagnosing and treating diseases have led to an increased geriatric population worldwide. This is associated with an increased risk of elder abuse and neglect. In the present study, we aimed to evaluate physicians' perspectives on elder abuse and neglect, to understand their knowledge and approaches, to raise awareness on the subject, and to identify the abuse and offer suggestions to resolve it.

Materials and Method: This study was conducted on 524 volunteer physicians working at public institutions and hospitals or private hospitals and private clinics. They completed a questionnaire including questions evaluating physicians' demographic characteristics, education regarding elder abuse and neglect, diagnostic approaches, and knowledge about the approach to elder abuse and neglect. Data were analyzed using descriptive statistics and graphical analysis using SPSS 21.0 software.

Findings: Forty five percent of the physicians indicated that they encountered elder abuse and neglect. Neglect was most common, with 37.4% of physicians reporting this. Only 24.3% of the physicians who encountered elder abuse and neglect stated that they had notified the authorities of the same. When the physicians were asked for their reasons for not reporting elder abuse and neglect cases, the most common response (62.3%) was concern that the older person could be harmed further.

Conclusion: Based on our findings, necessary legal arrangements should be made to provide home care for the older persons, families should be financially supported, research into this topic should be conducted, and propose solutions should be developed.

Keywords: Elder Abuse; Physician; Jurisprudence

ARAŞTIRMA

HEKİMLERİN YAŞLI İSTİSMARINA VE İHMALİNE BAKIŞ AÇISINI DEĞERLENDİREN BİR ÇALIŞMA

Öz

Giriş: Bilim ve teknolojideki hızlı ilerleyiş, yaşam kalitesindeki artış, hastalıkların tanı ve tedavi yöntemlerinin gelişmesi dünyadaki yaşlı nüfusun artmasına yol açmıştır. Bu durum yaşlının istismar ve ihmal edilme riskini artırmaktadır. Bu çalışmada; hekimlerin yaşlı istismar ve ihmaline bakış açılarını değerlendirmek, bilgi ve yaklaşımlarını öğrenmek, konuya farkındalık kazandırmak, istismarın tespit edilmesi ile çözümüne yönelik öneriler sunulması hedeflendi.

Gereç ve Yöntem: Araştırma, Türkiye'de kamu kuruluşu hastanelerinde ya da özel hastane ve muayenehanelerde görev yapan 524 gönüllü doktor üzerinde gerçekleştirildi. Ankette; hekimlere ait demografik özellikler, yaşlı istismarı ve ihmali konusunda aldıkları eğitimler, ihmal deneyimleri, tanıda izledikleri yollar, olguya yaklaşım ve ihmal konusundaki bilgi düzeylerini ölçen soruları içermektedir. Elde edilen veriler SPSS 21.0 istatistik programı kullanılarak tanımlayıcı istatistik ve grafik analizi ile değerlendirildi.

Bulgular: Mesleki uygulamaları sırasında hekimlerin %45.0'ı yaşlı istismarı ve ihmali ile karşılaştığını belirtti. En sık karşılaşılan tür %37.4 sıklık ile ihmal olarak tespit edildi. Yaşlı istismarı ve ihmali ile karşılaştığını belirtenlerin sadece %24.3'ü bu konuda resmi makamlara bildirimde bulunduğunu belirtti. Hekimlere adli olgu bildiriminde bulunmama nedenleri sorgulandığında ise en fazla işaretlenen seçeneğin %62.3 ile yaşlının zarar görebileceği endişesi olduğu görüldü.

Sonuç: Yaşlılara evde bakımın temin edilebilmesi için gerekli yasal düzenlemeler yapılmalı, bu konuda aileler ekonomik açıdan desteklenmeli, konuya yönelik araştırmalar yapılmalı ve bu verilere dayalı olarak çözüm önerileri geliştirilmelidir.

Anahtar sözcükler: Yaşlı İstismarı; Hekim; Yasal yükümlülük

INTRODUCTION

Rapid developments in science and technology, increased quality of life, and developments in the methods of diagnosis and the treatments of diseases have resulted in an increased mean human lifespan. As a result, the geriatric population increases every year (1). While the size of the population was 542 million in 1995, it has been estimated to rise to approximately 1.2 billion by 2025 (2). This situation is similar in Turkey. Data from the Turkish Statistical Institute for 2016 revealed that while the size of the geriatric population was 5,682,003 in 2012, it increased by 17.1% in the last five years and was reported to be 6,651,503 in 2016 (3).

Aging is associated with various problems including decline in physical and cognitive functions, financial difficulties, health issues and decreased social support. With modernization of traditional society of Turkey, younger generations are paying lesser attention to the care of older relatives (4). Consequently, difficulties experienced during the care of an older person individually at home or in an institution increases the risk of abuse and neglect.

According to the Toronto Declaration by the World Health Organization (WHO), elder abuse is defined as "single or recurrent inappropriate behavior that harms or distresses to an older people in a relationship based on trust expectation" (5). This definition includes physical, emotional, sexual, and economical abuse and neglect.

Physicians also witness elder abuse and neglect while making diagnoses and during treatment. Physicians have an important role in determining the findings of abuse and neglect, reporting suspected cases and discovering barriers and supports in the detection and management of elder abuse cases (6,7,8).

The present study aimed to evaluate the perspective of physicians on elder abuse and neglect, to understand their knowledge and approaches, to raise awareness on the subject, and to offer possible solutions.

MATERIALS AND METHOD

Study design and participants

A total of 524 physicians including practitioners, specialists, and academics with medical background from public hospitals or private hospitals and private clinics in Turkey participated in this descriptive study. In this study, convenience sampling method was used to generate the sample. Questionnaire forms prepared for this study were administered via an online platform exclusively for physicians where around 15000 physicians all across Turkey were members of or as printed materials to voluntary participants. The sample size was calculated as 375 with 95% confidence interval level, 50% frequency and 10% sampling error. Incorrect filling of questionnaire and ratio of replies being under 80% are accepted as exclusion criteria, 450 people were targeted to minimize the sampling error. The number of participants in this study corresponds the minimal sampling size. The participants were informed about the topic and purpose of the study and were assured that the information they provided was only going to be used for the study and was strictly confidential. Physicians were asked to answer questions in relation to their thoughts and knowledge. The questionnaire included 24 questions, of which the first six were prepared as a data collection tool to determine the sociodemographic characteristics (such as age, gender, marital status, specialty, professional experience) of physicians. The latter questions to evaluate physicians' perspectives on elder abuse and neglect, education, types of elder abuse encountered, diagnosis criteria, and approach to cases and were presented as multiple-choice questions.

Statistical analysis

The data obtained from the researchers were transferred to the computer. Data were analyzed with descriptive statistics and graphical analyses using SPSS 21.0 statistical analysis software (SPSS Inc. Chicago, IL, USA). The chi-square test was used

to compare the groups. p<0.05 was considered to be statistically significant. While evaluating the questionnaires, it was noticed that physicians did not answer some questions; therefore, statistical analyses were conducted using appropriate valid data.

Ethical considerations

The study was approved by the Ethical Board at the Faculty of Medicine at Istanbul University on 03.16.2017 (Number: 53239941-604.01.02-104683).

RESULTS

Of the 524 physicians who agreed to participate, 68.7% were female, 31.3% were male, 74.7% were married, 25.3% were single, 79.3% worked in public institutions, and 20.7% worked in the private sector. Furthermore, 42.1% of the participants were practitioners, while 51.1% and 6.7% were specialists and academics with a medical background, respectively. The mean age was 36.2±8.3 years, and the mean duration of professional experience was 12.2±8.5 years.

Sixty percent of the physicians stated that care support was given to the older persons in their homes (mostly grandparents) and that the average care period was 4.4 years.

Totally, 56.9% of the physicians considered patients older than 65 years to be older persons.

A total of 90.6% of the physicians stated that they were obliged to report elder abuse to the authorities.

Almost half (45.0%) of the physicians stated that they encountered elder abuse and neglect during their practice. The types of abuse they encountered were neglect (37.4%), emotional abuse (25.1%), economic abuse (22.2%), physical abuse (15.7%), and sexual abuse (1.1%). Only 24.3% of the physicians who encountered abuse and neglect reported it to the authorities. When the physicians were asked about their reasons for not reporting abuse to the

authorities, the main reason (62.3%) was concern that the older person would suffer (Figure 1).

When the physicians were asked about under which circumstances they suspect about the abuse of older people; the most frequent response was "the presence of numerous physical trauma traces on the body that are in different healing stages". When the same question was repeated for elder neglect, the most common answer was "insufficient hygiene and care of nails, hair, beard, mouth, body, and clothes" (Table 1).

When asked about the physicians' approach in cases that were determined to be elder abuse, 55.1% of the physicians stated that they reported such cases to the police without informing the family. When the same question was repeated for elder neglect, 24.8% of the physicians stated that they reported such cases to social services and 21.3% of them informed law enforcement agencies (Table 2).

Physicians' obligations to report elder abuse and neglect were compared according to whether they had received education. The reporting rate of the educated group to the authorities was higher than that in the group without education, and this difference was statistically significant (p<0.001). Similarly, the educated group reported a higher rate of encountering elder abuse (p=0.04) and suggested that "they feel sufficient about elder abuse," "previous notifications were not useful," and "governments did not provide older victims enough support" at a higher rate than the other group (p=0.01, p=0.04, and p=0.006, respectively; Table 3). The educated group defined "older person" as an "individual older than 65 years" at a higher rate than the group without education on the subject (p=0.026). Similarly, the educated group defined the period of old age as a "period of resting/peaceful life" at a higher rate (p=0.02) than the group without education on the subject but defined it as a "period of dependence/neediness

from others" at a lower rate (p=0.02) than the group without education on the subject.

When the answers of the physicians were compared taking gender into account, it was observed that female physicians encountered elder abuse and neglect at a higher rate than their male counterparts (p=0.006), while there was no difference between the two genders for reporting cases (p=0.35) (Table 3).

When the physicians were compared according to the sectors they worked in, those in the public sector had higher education about the subject (p=0.004) and higher rates of reporting (p=0.005) than those in the private sector (Table 3).
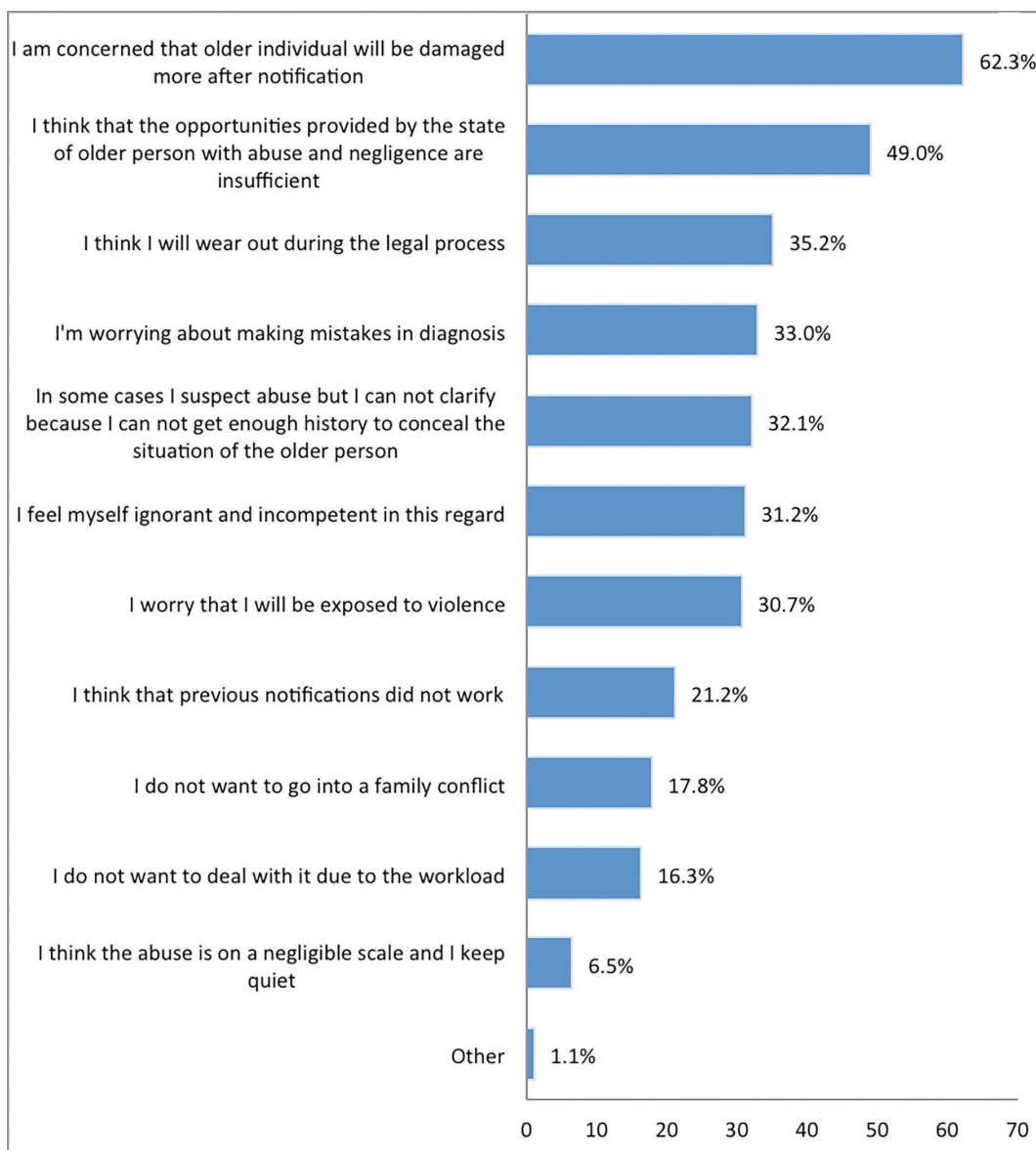
Figure 1. Reasons for physicians not reporting elder abuse.

Table 1. Situations raising doubt of elder abuse and neglect.

	n	%
Situations raising suspicion of abuse*		
Presence of numerous physical trauma traces on the body that are in different healing stages	482	92.9
Although the older person has economic power, the basic needs of the older person have not been met and their financial resources have been used by relatives	462	89.0
Older person in a cowardly, timid manner while in a relationship with family members	434	83.6
Presence of suspicious genital or anal wound(s)	420	80.9
Presence of delayed or untreated disease(s) in the older person	420	80.9
Situations raising suspicion of neglect*		
Inadequate nail, hair, beard, and mouth care; body hygiene; and laundry cleaning	476	91.4
Failing to meet the basic needs of the older person while having enough financial power	469	90.0
Presence of delayed or untreated disease(s) in the older person	440	84.5
Inadequate nutrition of the older person despite adequate financial power in the family	432	82.9
The care of the family (according to economic power) can not meet the social needs of the older person	359	68.9
Hearing, vision, and other support devices not adequately provided	305	58.5
No communication between family members and the older person other than to meet basic care needs	296	56.8

* For both of the questions, the participants were allowed to choose more than one choice.

Table 2. Approach to cases in which physicians are convinced that elder abuse and neglect.

	n	%
Approach to cases determined to be abuse*		
Make a direct police statement without informing the family	284	55.1
I definitely take the advice of the older person about reporting and act in accordance with his/her requirements	119	23.1
I inform the family and tell them that if it is repeated, I will inform the police	90	17.5
I remain silent	1	0.2
Others	21	4.1
Approach to cases determined to be neglect*		
I notify the social services	127	24.8
I report it to the hospital police/law enforcement	109	21.3
I apply a multidisciplinary approach (consultation)	100	19.5
I inform family members	79	15.4
I take the advice of the older person about reporting and act in accordance with his/her requirements	72	14.1
I ask for support from the forensics department	15	2.9
I remain silent	2	0.4
Others	8	1.6

* Some of the participants did not answer these questions.

Table 3. Comparison of physicians' education status in elder abuse and neglect.

			Did you receive education on elder abuse and neglect?				Gender				Sector			
			Yes	No	Value	p	Female	Male	Value	p	Public	Private	Value	p
Do you think that the physician has an obligation to officially report cases of elder abuse and neglect?		Yes	94.9%	89.9%	1.955	0.16	91.6%	88.4%	1.359	0.24	91,7%	86,9%	2,264	0,132
		No	5.1%	10.1%			8.4%	11.6%			8,3%	13,1%		
Have you ever encountered elder abuse and neglect during your professional practice?		Yes	55.8%	43.1%	4.276	0.04	49.0%	36.2%	7.454	0.006	46,7%	38,7%	2,187	0,139
		No	44.2%	56.9%			51.0%	63.8%			53,3%	61,3%		
Did you officially report it when you encountered elder abuse cases?		Yes	41.7%	14.9%	18.647	<0.001	17.8%	22.5%	0.882	0.35	21,7%	10,3%	3,829	0,050
		No	58.3%	85.1%			82.2%	77.5%			78,3%	89,7%		
What are the reason(s) for not informing officials in case of encountering elder abuse and neglect	A. I think the abuse is insignificant, and I remain silent	Yes	9.2%	6.1%	0.909	0.34	6.2%	7.3%	0.191	0.66	6,9%	5,6%	0,182	0,670
		No	90.8%	93.9%			93.8%	92.7%			93,1%	94,4%		
	B. I do not want to get into a family conflict	Yes	18.5%	17.7%	0.023	0.88	16.3%	21.2%	1.543	0.21	18,6%	14,6%	0,782	0,376
		No	81.5%	82.3%			83.7%	78.8%			81,4%	85,4%		
	C. I feel ignorant and incompetent in this regard	Yes	13.8%	34.3%	10.559	0.001	32.6%	27.7%	1.034	0.31	31,2%	29,2%	0,136	0,713
		No	86.2%	66.0%			67.4%	72.3%			68,8%	70,8%		
	D. I do not want to deal with it due to workload	Yes	13.8%	16.6%	0.315	0.58	15.6%	17.5%	0.247	0.62	18,6%	6,7%	7,373	0,007
		No	86.2%	83.4%			84.4%	82.5%			81,4%	93,3%		
	E. I worry that I will be exposed to violence	Yes	32.3%	30.3%	0.101	0.75	27.7%	37.2%	4.057	0.04	31,5%	27,0%	0,692	0,405
		No	67.7%	69.7%			72.3%	62.8%			68,5%	73,0%		
	F. I think that I will be worn out during the legal process	Yes	36.9%	34.8%	0.107	0.744	30.9%	44.5%	7.666	0.006	34,4%	37,1%	0,227	0,634
		No	63.1%	65.2%			69.1%	55.5%			65,6%	62,9%		
	G. I am worried about making mistakes in the diagnosis	Yes	23.1%	34.6%	3.318	0.07	34.5%	29.2%	1.220	0.27	33,5%	30,3%	0,326	0,568
		No	76.9%	65.4%			65.5%	70.8%			66,5%	69,7%		
	H. I think that previous notifications did not work	Yes	30.8%	19.5%	4.203	0.04	20.2%	23.4%	0.568	0.45	21,5%	21,3%	0,001	0,977
		No	69.2%	80.5%			79.8%	76.6%			78,5%	78,7%		
	I. I am concerned that the older person will be harmed further after the notification	Yes	55.4%	63.3%	1.487	0.22	62.2%	62.0%	0.001	0.97	61,0%	67,4%	1,231	0,267
		No	44.6%	36.7%			37.8%	38.0%			39,0 %	32,6%		
	J. In some cases, I suspect abuse, but I cannot clarify it because I cannot obtain enough history to disclose the situation of the older person	Yes	29.2%	32.5%	0.265	0.60	34.5%	26.3%	2.964	0.09	33,0%	30,3%	0,221	0,638
		No	70.8%	67.5%			65.5%	73.7%			67,0%	69,7%		
	K. I think that the provisions of the state for abused and neglected older people are insufficient	Yes	64.6%	46.2%	7.551	0.006	50.2%	46.0%	0.662	0.42	47,3%	53,9%	1,257	0,262
		No	35.4%	53.8%			49.8%	32.6%			52,7%	46,1%		

DISCUSSION

The WHO defines individuals older than 65 years as older person. A study that evaluated the perspectives of university students on older individuals showed that 57.8% of the participants considered individuals who were 60–65 years old as older person, while 27.8% considered individuals aged between 68 and 80 years to be older person (9). In the present study, 56.9% of the physicians considered individuals older than 65 years to be older person, as defined by the WHO, while 21.0% considered individuals older than 70 years to be older person. The reason for this might be an increased mean lifespan in conjunction with developments in medicine during the last years.

While 45.0% of the physicians encountered elder abuse and neglect during their professional practice, they most frequently encountered neglect (37.4%), emotional abuse (25.1%), economic abuse (22.2%), physical abuse (15.7%), and sexual abuse (1.1%). This study, neglect had the highest rate, similar to studies conducted in the Japan (10). Physical abuse was the primary type of abuse demonstrated in studies conducted in the South Korea (11). Sexual abuse was the least common type, similar to studies conducted in Ireland (8). The potential reason for these differences is different cultures and lifestyle in the countries.

Article 280 of the Turkish Penal Code No. 5237 (TCK) states that if a physician identifies a symptom of a crime being committed while performing his/her duties, if he/he does not report it to the authorities or is late in reporting, he/she can be punished with imprisonment for a period of up to one year (12). In the present study, there was a clear consensus (90.6%) among the physicians that elder abuse and neglect is a crime that must be reported to the authorities.

Healthcare staff must consider legal notifications as an exception to patient confidentiality. A physician's obligation to report such cases arises from the need to take precautions in matters involving following up crimes, arresting offenders, and maintaining public health. While this rationale is related to "public interest," it should not be implemented in such a manner as to ignore basic patient rights. If a person requiring treatment is involved in any crime or is victim to any criminal offense committed, it is the obligation of the healthcare professional who has discovered this during their professional practice to notify the appropriate authorities and not keep any information confidential. The present study revealed that 45.0% of the physicians indicated that they encountered elder abuse and neglect but that only 24.3% of them notified the authorities. An investigation into the reasons why physicians did not notify the authorities revealed that their greatest concern was that the older individual would be harmed further after notification (62.3%), followed by the belief that state provisions for abused and neglected older people were insufficient (49.0%; Fig. 1). Same concern about the future life quality of older person was also mentioned in a study conducted in USA (13). Accordingly, there is an apparent clash in legal and ethical responsibilities. On the other hand, it is clear that physicians make their evaluations considering their ethical responsibilities and have an ethical approach to the subject.

From previous studies, it can be seen that within the scope of providing health services, females are more at risk of being verbally violated, while males are more at risk of being physically violated (14). In the present study, it was observed that male physicians were more concerned about "being physically violated" and "being worn out during the legal process" after notifying the authorities than female physicians.

The evaluation of whether the physicians had received any education on elder abuse and neglect showed that only 14.9% of the physicians had received such an education. A statistical comparison of the group that was educated on elder abuse and neglect and the group that had not been educated on elder abuse and neglect, the obligation of notification to the authorities revealed that the group that was educated had higher rates of identifying abuse and neglect as well as notifying the authorities. This is because of the natural awareness of the physicians who had been educated and their increased sensitivity to the subject. It was determined that most physicians do not question geriatric patients about abuse because of inadequate knowledge on detection, management, the protocol surrounding the subject, legislations, and referral to appropriate institutions. Kennedy, Taylor and Schmeidel emphasize similar reasons (15-17). In a study conducted by Polat et al., it was suggested that health professionals have insufficient knowledge, skills, and attitudes about issues such as physical, sexual, emotional, and economic abuse and evaluation, monitoring, reporting, and legal initiatives (18). The group that was educated about elder abuse stated that "they feel sufficient about elder abuse" more than the group that had not received education on the subject. Previous studies have shown that educational intervention has an important influence on gaining experience, awareness, and knowledge (19-21). In the present study, it was determined that the group that was educated about the subject stated that "previous notifications to the authorities were not useful" and "governments did not provide older victims with enough support" at a higher rate than the group that was not educated on the subject. These data are valuable because together with increased knowledge, physicians start the legal process; however, at the end of the process, the result did not meet their expectations.

When the physicians were asked what situations triggered suspicion of elder neglect, 91.4% responded "Inadequate nail, hair, beard, and mouth care; body hygiene; and laundry cleaning." "No communication between family members and the older person other than to meet basic care needs" was the least common response (56.8%). The reason for this situation was thought to be due to a false social perception that only physical needs are met so that the older individual can survive and that the social and emotional needs of the older person can be ignored. Moreover, this false perception was interiorized among physicians in daily life as Sorenson mentioned (22). Due to this fact, during examination of older patient physicians are trying to limit their communication to shorten the duration of visit.

In conclusion, it is very difficult to uncover and identify elder abuse and neglect. This is because of reasons such as concerns of repeated exposure to violence and breaking ties with family members as well as the inability to deal with feelings of guilt due to the complainant.

When a physician finds any evidence of abuse during his/her intervention, it is his/her obligation to notify the appropriate authorities, even if the abuser is a close relative of the victim.

In-house education programs should be organized for physicians to prevent violence and abuse towards the older persons.

Concerns of physicians regarding their legal obligation to notify the authorities and the potential risks associated should be addressed.

Necessary legal arrangements should be made for care of the older person at home, and families providing care for the older person should be financially supported.

The number of organizations, such as shelters and care homes for older people, should be increased where victims can report abuse and violence and receive help.

REFERENCES

1. Yunus RM, Hairi NN, Choo WY. Consequences of elder abuse and neglect: a systematic review of observational studies. Trauma, Violence, & Abuse 2017 February 22;(1):1-17. (PMID:29333999).

2. Krug EG, Dahlberg LL, Mercy JA, et al. World report on violence and health, World Health Organization, Geneva 2002, pp 123-46.

3. Turkish Statistical Institute. Ages by statistics, 2016. [Internet] Available from: http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24644. Accessed: 20.10.2017. (in Turkish).

4. Kalaycı I, Yazıcı SÖ, Özkul M, Küpeli A. Perceptions of the elderly on elderly abuse. Turkish Journal of Geriatrics 2016;19(4):232-7.

5. Health workers' violence research 2013. [Internet] Available from: http://www.sagliksen.org.tr/cdn/uploads/gallery/pdf/fbda8576fd0d6d6de70f52f76b914672.pdf. Accessed: 20.10.2017.

6. Capezuti, E. Recognizing and referring suspected elder mistreatment. Geriatric Nursing 2011;32(3):209-11. (PMID:21645804).

7. Ahmed A, Choo WY, Othman S, et al. Understanding of elder abuse and neglect among health care professionals in Malaysia: An exploratory survey. Journal of Elder Abuse & Neglect 2016;28(3):163-77. (PMID:27149412).

8. O'Brien JG, Riain AN, Collins C, Long V, O'Neill D. Elder abuse and neglect: a survey of Irish general practitioners. Journal of Elder Abuse and Neglect 2014;26(3):291-9. (PMID:24779541).

9. Karadeniz G, Yanıkkerem-Uçum E, Dedeli Ö, Oran S, Talaz D, Sürüm S. University students' consider toward elderly abuse. Family and Community Education Culture and Research Journal 2009;5(17):77–87. (in Turkish).

10. Anme T. A study of elder abuse and risk factors in Japanese families: focused on the social affiliation model. Geriatric and Gerontology International 2004;4:262–3.

11. Oh J, Kim HS, Martins D, Kim H. A study of elder abuse in Korea. International Journal of Nursing Studies 2006;43(2):203–14. (PMID:15913631).

12. Article 280-1 of Turkish Criminal Code numbered 5237. [Internet] Available from: https://www.tbmm.gov.tr/kanunlar/k5237.html.Accessed: 31.01.2018.

13. Rodríguez MA, Wallace SP, Woolf NH, Mangione CM. Mandatory reporting of elder abuse: between a rock and a hard place. Annals of Family Medicine 2006;4(5):403-9. (PMID:17003139).

14. Aydın B, Kartal M, Midik O, Büyükakkus A. Violence against general practioners in Turkey. J Interpers Violence 2009;24(12):1980-95. (PMID:19150889).

15. Taylor DK, Bachuwa G, Evans J, Jackson-Johnson V. Assessing barriers to the identification of elder abuse and neglect: a communitywide survey of primary care physicians. J Natl Med Assoc 2006;98(3):403-4. (PMID:16573305).

16. Kennedy RD. Elder abuse and neglect: the experience, knowledge and attitudes of primary care physicians. Fam Med 2005;37(7):481-5. (PMID:15988632).

17. Schmeidel AN, Daly JM, Rosenbaum ME et al. Health care professionals' perspectives on barriers to elder abuse detection and reporting in primary care settings. J Elder Abuse Negl 2011;24(1):17-36. (PMID:22206510)

18. Polat Ü, Bayrak Kahraman B. Knowledge and attitude of healthcare professionals about violence and abuse against elderly. Turkiye Klinikleri J Psychiatr Nurs-Special Topics 2017;3(2):141-52. (in Turkish).

19. Sugita J, Garrett M. Elder abuse and oral health care providers: an intervention to increase knowledge and self-perceived likelihood to report. J Elder Abuse Negl. 2012;24(1):50-64. (PMID:22206512).

20. Policastro C, Payne B. Assessing the level of elder abuse knowledge preprofessionals possess: implications for the further development of university curriculum. J Elder Abuse Negl 2014;26(1):12-30. (PMID:24313795).

21. Dow B, Hempton C, Cortes-Simonet EN, et al. Health professionals' and students' perceptions of elder abuse. Australasian Journal on Ageing 2013;32(1):48-51. (PMID:23521736).

22. Sorenson H. Verbal abuse and communication neglect in the elderly. In: R. W. Summers and A. M. Hoffman (Eds.). Elder Abuse: A Public Health Perspective. Washington, DC: American Public Health Association, USA 2006, pp 117-29.

- Songül ÖZYURT[1]
- Aziz GÜMÜŞ[2]
- Bilge YILMAZ KARA[1]
- Dilek KARADOĞAN[1]
- Neslihan ÖZÇELİK[3]
- Melek MEMOĞLU[1]
- Ünal ŞAHİN[1]

CORRESPONDANCE

Songül ÖZYURT
Recep Tayyip Erdoğan University, Faculty of
Medicine, Department of Chest Diseases,
Rize, Turkey

Phone: 4642170369
e-mail: drsongul@gmail.com

[1] Recep Tayyip Erdoğan University,
  Faculty of Medicine, Department of Chest
  Diseases, Rize, Turkey
[2] Kumluca Medicus Hospital, Chest Diseases,
  Rize, Turkey
[3] Kaçkar State Hospital, Chest Disease Clinic,
  Rize, Turkey

RESEARCH

CHANGING CLINICAL CHARACTERISTICS OF PULMONARY THROMBOEMBOLISM IN THE ELDERLY

Abstract

Introduction: This study aims to examine the clinical differences between the Pulmonary Thromboembolism patients aged 65 and above and younger patients attending the clinic of chest diseases.

Materials and Method: The study sample included the patients diagnosed with Pulmonary Thromboembolism at the Chest Diseases Clinic of Recep Tayyip Erdoğan University Faculty of Medicine between June 2016 and December 2017. Patients' files were scanned retrospectively and the participants were divided into two groups: elderly patients aged 65 and over (elder) and patients under 65 years of age (younger). These two groups were compared in terms of clinical, laboratory and radiological characteristics of Pulmonary Thromboembolism.

Results: A total of 149 patients consisting of 90 (60%) female and 59 (40%) male patients with an average age of 73±13 years (22-94) were included in the study. The most common symptom was dyspnea and the most frequently observed risk factor was immobility. The prevalence of chest pain was significantly higher in the patients younger group than elder group. Besides, no change in consciousness was observed in the patients in younger group, while altered state of consciousness was observed in 17 (15%) of 113 patients in elder group.

Conclusion: Especially in patients elder, chest pain loses its significance, while unexpected symptoms such as altered state of consciousness can be observed. This should be taken into account; otherwise it may result in a delay in diagnosis.

Keywords: Pulmonary embolism; Diagnosis; Aged; Symptom assessment

ARAŞTIRMA

YAŞLI HASTALARDA PULMONERTROMBOEMBOLİNİN DEĞİŞEN KLİNİK KARAKTERLERİ

Öz

Giriş: Çalışmamızın amacı, kliniğimizde takip edilen Pulmoner tromboemboli hastalarında 65 yaş ve üstü yaşlı hastaların daha genç hastalara göre klinik farklılıklarını araştırmaktır.

Gereç ve Yöntem: Çalışmaya Recep Tayyip Erdoğan Üniversitesi Tıp Fakültesi Göğüs Hastalıkları kliniğinde Haziran 2016- Aralık 2017 tarihleri arasında Pulmoner tromboemboli tanısı ile takip edilen hastalar alındı. Hastaların dosyaları retrospektif olarak taranarak 65 yaş ve üstü yaşlı hastalar (yaşlı) ve 65 yaş altı hastalar (genç) olmak üzere olarak iki gruba ayrıldı. Bu iki grup; klinik, laboratuar, radyolojik özellikleri açısından karşılaştırıldı.

Bulgular: Çalışmaya yaş ortalaması 73±13 (22-94) olan 90'ı (%60) kadın 59'u (%40) erkek olmak üzere toplam 149 hasta alındı. Hastalarda en sık saptanan semptom nefes darlığı, en sık tesbit edilen risk faktörü immobilite idi. Yaşlı grupta göğüs ağrısı genç gruba göre anlamlı olarak düşüktü (p=0.004). Ayrıca genç hastalarda bilinç değişikliği olmazken, yaşlı 113 hastanın 17'sinde (%15) bilinç değişikliği semptomu vardı (p=0.013).

Sonuç: Özellikle yaşlı hastalarda göğüs ağrısı önemini yitirmekte ve bilinç değişikliği gibi pulmoner tromboembolide beklenmedik bulgular görülebilmektedir. Bu durum tanıda gecikmeye neden olabileceğinden akılda bulundurulmalıdır

Anahtar sözcükler: Pulmoner embolizm; Tanı; Yaşlı; Semptom değerlendirme

INTRODUCTION

Pulmonary Thromboembolism (PTE) is a common clinical entity whose incidence increases along with age. Its annual incidence increases dramatically especially over 70 years of age, rising up to 1% (1). It has high mortality. It is one of the most important causes of hospital mortality (2). Short-term mortality rate is higher in the elderly compared to the younger patients (3). Hereditary or acquired risk factors play an important role in the disease etiology. However, the reason behind the disease cannot be found in 20% of cases.

The most common symptom of PTE is dyspnea and the most common sign is tachypnea. Pleuritic chest pain is prominent in more than half of the cases (4). However, clinical symptoms and sings are non-specific. This makes it difficult to establish an accurate diagnosis. Cardiopulmonary diseases which have similar signs and symptoms with PTE are commonly observed in elderly patients, making it more difficult to establish a diagnosis in clinical presentation. Moreover, d-dimer and ventilation perfusion scintigraphy, which are the tests helping to diagnose embolism, have lower diagnostic value in the elderly (5,6). This causes delayed diagnosis and increased mortality in the elderly patients.

This study aims to examine the clinical differences between the patients elder and younger patients diagnosed with pulmonary embolism by performing spiral CT scans of the thorax.

MATERIALS AND METHOD

The study was conducted at the Chest Diseases clinic of Recep Tayyip Erdoğan University Faculty of Medicine. The study sample included the patients hospitalized at the chest diseases clinic due to pulmonary thromboembolism between 01.06.2016-01.12.2017. Patients' files were scanned retrospectively and data was collected. Diagnosis of pulmonary embolism is established in all patients by performing contrast-enhanced spiral CT scans of the thorax (BTPA). Color Doppler ultrasound imaging of lower extremity was performed for the detection of deep vein thrombosis (DVT). Echocardiographic examination was performed for the diagnosis of right ventricular dysfunction. D-dimer and troponin-T testing and arterial blood gas, hemogram and biochemical analyses were performed on all patients. The participants were divided into two groups: elderly patients aged 65 and over (elderly group) and patients under 65 years of age (younger group). These two groups were compared in terms of clinical, laboratory and radiological characteristics of PTE. Besides, 30-day mortality rates were estimated and compared.

Statistical analysis

Statistical analysis was performed using SPSS (SPSS version 16; SPSS Inc., Chicago, IL, USA). Continuous variables were presented as mean±sd and categorical variables were presented as percentages. Chi-square test was used to compare the ratios. The Student's t-test was used to compare the means of parametric variables. $P<0.05$ was considered statistically significant.

RESULTS

A total of 149 patients consisting of 90 (60%) female and 59 (40%) male patients with an average age of 73±13 years (22-94) were included in the study. The patients were divided into two groups as the elderly and younger. Table 1 shows the comparison of such parameters as demographic characteristics, clinical characteristics and arterial blood gas characteristics.

Table 1. Comparison of patients younger group (Age <65) and elder group (Age ≥65).

	Younger group (n=36)	Elder group (n=113)	p
Age (year)	54±9	79±7	<0.001
Sex (M/F)	22/14	37/76	**0.002**
Pulse (/min)	99±19	101±17	0.532
Systolic BP (mmHg)	114±27	115±23	0.849
Diastolic BP (mmHg)	69±10	71±13	0.508
pH	7.43±0.03	7.42±0.09	0.355
PaO_2 (mmHg)	62±15	69±26	0.329
$PaCO_2$ (mmHg)	32±6	33±9	0.354
SaO_2%	89±07	89±10	0.960
PAB (cmH_2O)	46±15	42±15	0.178
D-Dimer	8619±14041	8501±13400	0.951
CRP (mg/dl)	5.7±4.3	4.8±4.2	0.267
Creatinine (mg/dl)	0.92±0.27	1.05±0.32	0.455

F/M: Female/male, PaO_2: Arterial partial pressure of oxygen, PaCO2: Arterial partial pressure of carbon dioxide, SaO2%: Arterial oxygen saturation, PAB: Pulmonary arterial pressure, CRP: C-reactive protein.

The most common symptom was dyspnea. Out of 149 patients, 140 (94%) had dyspnea. 54 patients had chest pain (36.2%), 51 patients had leg swelling (34.2%), 17 patients had altered state of consciousness (11.4%), 16 patients had syncope (10.7%) and 6 patients had haemoptysis (4%). The most commonly detected risk for pulmonary thromboembolism was immobility for more than 3 days with 47 cases (31.5%). Cancer was prevalent in 22 cases (14.7%).

Table 2 shows the comparison of elder group and younger group in terms of symptoms, risk factors, right ventricular dysfunction and mortality. The prevalence of chest pain was significantly higher in the patients younger group than elder group. Out of 113 patients, 34 (30%) had chest pain. Out of 36 patients younger group, 20 (56%) had chest pain.

Table 2. Comparison of patients in terms of symptoms, risk factors, right ventricular dysfunction and mortality.

	All patients (n=149)	Younger group (n=36)	Elder group (n=113)	p
Symptoms				
Chest pain	54 (36.2%)	20 (56%)	34 (30%)	**0.004**
Dyspnea	140 (94%)	35 (97%)	105 (93%)	0.345
Hemoptysis	6 (4%)	2 (6%)	4 (4%)	0.592
Syncope	16 (10.7%)	3 (8%)	13 (12%)	0.593
Altered state of consciousness	17 (11.4%)	-(-)	17 (15%)	**0.013**
Leg swelling	51 (34.2%)	14 (39%)	37 (33%)	0.765
Risk Factors				
Cancer	22 (14.7%)	7 (19%)	15 (13%)	0.363
Immobility for more than 3 days	47 (31.5%)	3 (8%)	44 (39%)	**0.001**
Surgery in the last 1 month	9 (6%)	2 (6%)	7 (6%)	0.889
Previous DVT/PTE	15 (10%)	3 (8%)	12 (11%)	0.691
Chronic heart and/or pulmonary disease	23 (15.4%)	4 (12%)	19 (17%)	0.409
Others	5 (3.4%)	2 (6%)	5 (4%)	0.614
Undetected Etiology	26 (17.4%)	15 (41%)	11 (10%)	<0.001
Positive DVT	64 (43%)	18 (50%)	46 (41%)	0.327
Right Ventricular Dysfunction	66 (44%)	8 (22%)	58 (51%)	**0.002**
30-Day Mortality	10 (6.7%)	3 (8.3%)	7 (6.2%)	0.665

The difference between two groups was statistically significant (p=0.004). Besides, no change in consciousness was observed in 36 patients younger group, while altered state of consciousness was observed in 17 (15%) of 113 patients elder group. The difference between two groups was statistically significant (p=0.013). As a risk factor, immobilization for more than 3 days was significantly prevalent in the elder patients. Immobilization was prevalent in 44 of 113 patients (39%) elder group and 3 of 36 patients (8%) younger group. There was a statistically significance

difference between two groups (p=0.001). Moreover, the prevalence rate of right ventricular dysfunction detected through echocardiography was found to be significantly higher is the patients elder group compared to the patients younger group (51% vs 22%, p=0.002). Although there was higher rate of cardiovascular comorbidity in older group than that of younger group, it was not statistically significant. Chart 1 shows the comparison of two groups in terms of the important symptoms, risk factors and prognostic factors.
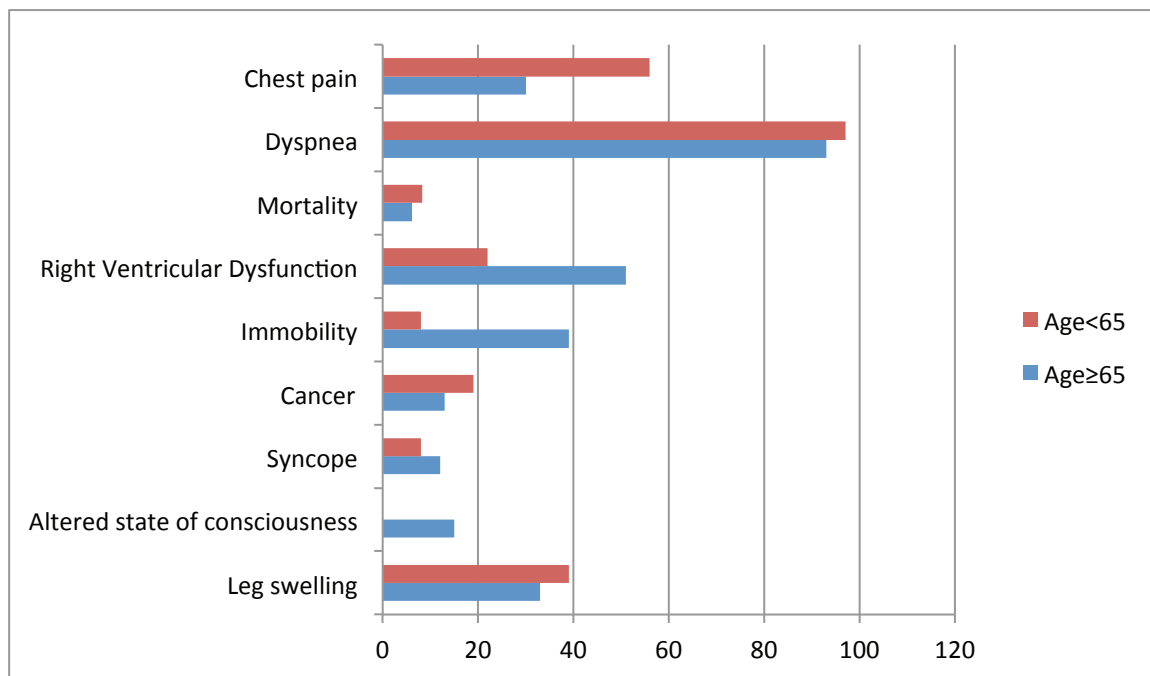
Figure 1. Comparison of the prevalence rates of symptoms, risk factors and prognostic factors in patients younger group (Age <65) and elder group (Age ≥65).

DISCUSSION

Although the symptoms of PTE are non-specific, dyspnea can be said to be the most common symptom. In this study, the most common symptom was found to be dyspnea with a prevalence rate of 94%. The high prevalence rate continues with age. Chest pain was the second most common symptom with a prevalence rate of 36.2%. Miniati M et al. (7) carried out a prospective study with 800 patients diagnosed with PTE and found dyspnea as the most common symptom (81%) and chest pain as the second most common symptom. Similarly, Ji QY et al. (8) found dyspnea as the most frequent symptom (64%) and chest pain as the second most frequent symptom (45%). In this study, the patients were divided into two groups as elder group and younger group. The prevalence of chest pain was significantly higher in the patients younger than those elderly. The prevalence of chest pain was found to be 30% in patients elder group and 56% in the patients younger group. The prevalence of chest pain decreases with age, making it more difficult to diagnose PTE. In their study, Tisserang G et al. (9) divided the patients into two as patients under 75 years and patients over 75 years. They reported that the prevalence of chest pain was significantly lower in the patients over 75 compared to the patients under 75 (36% vs 7%). Similarly, Tomas A. et al. found that the prevalence of chest pain was significantly lower in the patients over 65 compared to the patients under 65 (10). Chest pain generally occurs in peripheral embolies, pleural irritations and in its inflammations. Lesser rate of chest pain observed in the elder patients is that since visceral pleura has less sensitive than that of younger subjects. In addition, with age, perception of pain

also decreases which explains lesser rate of chest pain in elderly subjects. In this study, the prevalence rate of altered state of consciousness was found to be 11.4%. This emerged as an issue that was not reported in the previous studies. Interestingly, altered state of consciousness was not observed in the patients younger, while its prevalence was found to be 15% in the patients elder. The risk of getting hospitalized increases with ageing due to clinical entities such as dementia and cerebrovascular diseases. In our study cerebrovascular diseases rate was 1.76% in elder group. Patients with serious clinical manifestations like PTE may also develop altered state of consciousness such as drowsiness, discomfort and agitation. These symptoms can be associated with the primary disease of a patient, thus resulting in delayed or no diagnosis of embolism. Hereditary and/or acquired risk factors play an important role in the development of pulmonary thromboembolism. In this study, the most commonly detected risk for was found to be immobility for more than 3 days (31.5%). The second most frequently observed risk factor was chronic cardiac and/or pulmonary diseases with a ratio of 15.4%, followed by cancer with a ratio of 14.7%. A recent study by Bakabe A. et al. reported immobilization as the most common risk factor with a ratio of 43% (11,12). Husain SJ. et al. reported bedrest and immobilization as the most common risk factors for PTE with a ratio of 73%. Their findings are in conformity with those obtained in this study. Age-related diseases cause immobilization which is the most important risk factor for PTE.

Findings of right ventricular dysfunction detected in echocardiography (ECHO) are seen in approximately 40% of pulmonary embolus cases. However, accompanying cardiovascular comorbid conditions in elderly patients reduce the diagnostic value. In ECHO, the presence of one or more of the findings of right ventricular hypokinesis or akinesia, right ventricular dilatation,

interventricular septal paradoxical movement, or pulmonary hypertension reflects the finding of right ventricular dysfunction (4).

One of the important findings of this study is that right ventricular dysfunction is more common in older patients. The prevalence rate of right ventricular dysfunction was found to be 51% in the patients elder group and above and 22% in the patients young group. However, the difference between the prevalence rates did not affect prognosis. Moreover, 1-month mortality was found to be similar in both groups (8.3% in the patients younger group and 6.2% in the patients elder group). The findings about the mortality rate can be said to be in conformity with the findings of other studies (11).

This study revealed that there are significant differences in terms of symptoms, risk factors and echocardiographic findings between the elder and younger patients with PTE.

In conclusion, PTE is observed more frequently in persons of advanced age and its clinical manifestation changes with age, making it difficult to establish an accurate diagnosis. Especially in patients aged 65 and over, chest pain loses its significance, while unexpected symptoms such as altered state of consciousness can be observed. Immobilization is an important risk factor that should be taken into account and is expected to gain more importance.

Limitations and strengths

The most important limiting factor in this study is being retrospective. We could not comment because some of the data could not be obtained from the records. Its superiority is since all the cases included in this study were identified with the BTPA angio and the possibility of misdiagnosis was eliminated.

REFERENCES

1. White RH. The epidemiology of venous thromboembolism. Circulation 2003 Jun 17;107 (23 Suppl 1): I4-8. Review. (PMID:12814979).

2. Hoffmann B, Gross CR, Jöckel KH, Kröger K. Trends in mortality of pulmonary embolism--an international comparison Thromb Res 2010 Apr;125(4):303-8. (PMID:19635628).

3. Lilienfeld DE, Chan E, Ehland J, Godbold JH, Landrigan PJ, Marsh G. Mortality from pulmonary embolism in the United States: 1962 to 1984. Chest 1990 Nov;98(5):1067-72. (PMID:2225945).

4. Goldhaber SZ, Visani L, De Rosa M. Acute pulmonary embolism: clinical outcomesin the International Cooperative Pulmonary Embolism Registry (ICOPER). Lancet 1999 Apr 24;353(9162):1386-9. (PMID:10227218).

5. Righini M, Goehring C, Bounameaux H, Perrier A. Effects of age on the performance of common diagnostic tests for pulmonary embolism. Am J Med 2000 Oct1;109(5):357-61. (PMID:11020391).

6. Gal G, Righini M, Roy PM, et al. Differential value of risk factors and clinical signs for diagnosing pulmonary embolism according to age. J Thromb Haemost 2005 Nov;3(11):2457-64. (PMID:16241944).

7. Miniati M, Cenci C, Monti S, Poli D. Clinical presentation of acute pulmonary embolism: survey of 800 cases. PLoS One 2012;7(2):e30891. (PMID:22383978).

8. Ji QY, Wang MF, Su CM, et al. Clinical symptoms and related risk factors in pulmonary embolism patients and cluster analysis based on these symptoms. Sci Rep 2017 Nov 2;7(1):14887. (PMID:29097743).

9. Tisserand G, Gil H, Méaux-Ruault N, Magy-Bertrand N. [Clinical features of pulmonary embolism in elderly: a comparative study of 64 patients]. Rev Med Interne 2014 Jun;35(6):353-6. (PMID:23968563).

10. Ramos A, Murillas J, Mascías C, Carretero B, Portero JL. Influence of age on clinical presentation of acute pulmonary embolism. Arch Gerontol Geriatr 2000 Jun 1;30(3):189-98. (PMID:10867163).

11. Bakebe A, Kashongwe I, Mulenga C, et al. Pulmonary embolism: epidemiological data and diagnosis in Kinshasa hospitals. Int J Tuberc Lung Dis 2017 Aug 1;21(8):875-9. (PMID:28786795).

12. Husain SJ, Zubairi AB, Fatima K, Irfan M, Atif M, Saeed MA. Clinical characteristics, management and outcome of major pulmonary embolism: an experience from a tertiary care center in Pakistan. J Pak Med Assoc 2009 Jun;59(6):372-5. (PMID:19534371).

- Mehmet ARSLAN[1]
- Esra MELTEM KOÇ[2]
- Melih Kaan SÖZMEN[3]

CORRESPONDANCE

Mehmet ARSLAN
Narlıdere Health Directorate, İzmir, Turkey

Phone: 0538 477 9970
Fax: 0232 238 7126
e-mail: mehmt.arslann@gmail.com

[1] Narlıdere Health Directorate, İzmir, Turkey
[2] İzmir Katip Çelebi University, Faculty of Medicine, Department of Family Medicine, İzmir, Turkey
[3] İzmir Katip Çelebi University, Faculty of Medicine, Department of Public Health, İzmir, Turkey

RESEARCH

THE TURKISH ADAPTATION OF THE TILBURG FRAILTY INDICATOR: A VALIDITY AND RELIABILITY STUDY

Abstract

Introduction: Frailty is a dynamic condition that affects individuals who suffer from loss in one or more areas of human functioning (physical, psychological, and social). It is possible to reduce morbidity and mortality by recognizing this condition in the elderly. This study aimed to develop a Turkish adaptation of the Tilburg Frailty Indicator and assess whether it is a valid, reliable tool for the Turkish population.

Materials and Method: Our descriptive cross-sectional study enrolled 271 individuals aged >65 years. The scale was adapted into Turkish before conducting the study. Known groups were tested using confirmatory factor analysis to assess the validity of the scale. The Cronbach's alpha reliability and the Kuder–Richardson Formula-21 internal consistency coefficients were used to assess the reliability.

Results: The median age of the participants was 71 years (range=65–90 years). The average total frailty score was 4.56±3.09. The total Cronbach's alpha coefficient for the Tilburg Frailty Indicator was 0.758. The Kuder–Richardson Formula-21 reliability coefficient was 0.758 for the entire scale. The summary of good agreement findings obtained by confirmatory factor analysis showed that the scale can conceptually define the construct it was designed to measure at a good level.

Conclusion: Based on our results, it has been established that the Turkish adaptation of the Tilburg Frailty Indicator is a valid and reliable tool. We believe that our findings have contributed to early detection of problems related to elderly health and the management of frailty in primary care.

Keywords: Reproducibility of results; Frail elderly; Aging; Turkey

ARAŞTIRMA

TİLBURG KIRILGANLIK ÖLÇEĞİ'NİN TÜRKÇEYE UYARLANMASI: GEÇERLİK VE GÜVENİRLİK ÇALIŞMASI

Öz

Giriş: Kırılganlık, bir veya daha fazla alanda (fiziksel, psikolojik, sosyal) fonksiyon kaybına bağlı, yaşlıları etkileyen dinamik bir durumdur. Bu yaşlılar tanınarak gerekli koruyucu ve tedavi edici önlemlerin alınması sayesinde morbitede ve mortalite değerlerini azaltılabilir. Bu araştırmanın ana amacı yaşlılarda kırılganlığı değerlendirmek için kullanılan bir araç olan Tilburg Kırılganlık Ölçeği'ni Türkçeye uyarlayarak, Türk toplumu için geçerli güvenilir bir araç olup olmadığını incelemektir.

Gereç ve Yöntem: Çalışmanın evrenini 65 yaş üstü 271 kişi oluşturdu. Çalışmaya başlamadan önce Tilburg Kırılganlık Ölçeği, Türkçeye uyarlandı. Ölçeğin geçerliği için doğrulayıcı faktör analizi ile bilinen gruplar sınaması yapıldı. Güvenirlik için Cronbach alfa güvenirlik katsayısı ve Kuder & Richardson-21 iç tutarlılık katsayısı değerlendirildi.

Bulgular: Bireylerin ortanca yaş değeri 71 (min=65, max=90)'dir. Katılımcıların kırılganlık skor ortalaması 4.56±3.09 olarak tespit edildi. TKÖ için Cronbach alfa total ölçümü 0.758 olarak hesaplanmıştır. Alt boyutlarda elde edilen Kuder & Richardson-21 güvenirlik katsayısı ölçeğin bütünü için 0.758 olarak belirlenmiştir. Doğrulayıcı faktör analizi ile elde edilen özet uyum iyiliği bulguları, ölçeğin kavramsal olarak ölçmek istediği yapıyı iyi bir düzeyde tanımlayabildiğini göstermektedir.

Sonuç: Araştırmanın sonuçlarına göre, Tilburg Kırılganlık Ölçeğinin ülkemiz için geçerli ve güvenilir bir araç olduğu ortaya konmuştur. Tilburg Kırılganlık Ölçeği'ni Türkçeye uyarlayarak, yaşlı sağlığı ile ilgili problemlerin erken tespiti ve kırılganlığın birinci basamakta yönetimi için katkı sağladığımızı düşünmekteyiz.

Anahtar sözcükler: Sonuçların yeniden üretilebilirliği; Kırılgan yaşlı; Yaşlanma; Türkiye

INTRODUCTION

According to the World Health Organization (WHO), the geriatric population is estimated to increase to 1.2 billion by 2025 and to 2 billion by 2050 (1). It is believed that this ongoing increase in the elderly population may result in an increase in the frail elderly population and their problems (2). Age-related changes are associated with lifestyle and life events as well as genetic and environmental factors (3,4). Therefore, while some elderly people may remain healthy, others are more frail and vulnerable to stress factors. Recently, the significance of the concept of frailty has substantially increased in studies on old age and the clinical care of the elderly (5).

The definition of frailty is debated; however, it may be defined as an age-related progressive decrease in physiological reserves and a related vulnerability to stressors that increases the risk of health-related adverse outcomes (6–8). Frailty is a dynamic condition that affects individuals who suffer from losses in one or more areas of human functioning (physical, psychological, and social) (9). The frail elderly are defined as individuals with increased vulnerability to external stressors due to age-related functional losses in the neuromuscular, metabolic, and immune systems; reduced mobility and strength; and nutritional disorders (10). Frail individuals are at a higher risk of clinically significant adverse events such as hospitalization, becoming care-dependent, falling, and mortality (3,5,7–9,11–14).

The assessment of frailty should be integrated into clinical practice as a part of routine care for the elderly (15). By doing so, a patient defined as frail can be referred for a more complete geriatric evaluation, and early interventions can be facilitated (12). Because early interventions can reverse frailty, screening and early diagnosis should be prioritized in primary care (12). Primary care doctors have a natural advantage when defining frailty owing to their patient-oriented approach, population-based evaluation role, and proximity and accessibility to the elderly (14). Therefore, primary care doctors require a valid and reliable method to initially diagnose elderly patients with frailty and then analyze and manage the problems detected (16).

In the elderly, frailty can be diagnosed early using appropriate screening methods. Scales developed worldwide must be adapted, and their validity and reliability must be evaluated being used in our country. In this context and based on current findings, the Tilburg Frailty Indicator (TFI) facilitates the screening for frailty in community-dwelling elderly people (5). Asserting that a practical screening tool was required to identify community-dwelling frail elderly people, Gobbens et al. developed the TFI in 2010 (9,13). Gobbens et al. aimed to evaluate frailty among the elderly by developing a scale to assess their physical, psychological, and social conditions based on the WHO definition of health as a complete state of physical, mental, and social well-being (13). The TFI is one of the few frailty scales regarded to be suitable for use in primary care owing to its simplicity and psychometric features that cover the biopsychosocial dimensions of frailty, and it is accepted as a valid and reliable instrument to screen for frailty (12,14,17).

Developing a Turkish adaptation of the TFI and performing its validity-reliability assessment could make it easier for healthcare providers in Turkey to recognize frailty in the elderly and take preventive and therapeutic precautions. The main objective of the present study is to develop a Turkish adaptation of the TFI, which is globally accepted and widely used scale, and assess whether it is a valid and reliable instrument for the Turkish population. Hence, it will become easier to identify frailty and perform the necessary preventive and therapeutic interventions.

MATERIALS AND METHOD

Study design and participants

The population of our study comprised individuals aged >65 years who applied to the Family Medicine Polyclinics and the Training Family Health Centers by a member of the medical faculty. As recommended for validity-reliability studies, the target sample size was 150, in order to represent at least 10 times the number of items. Before the study was conducted, ethical board approval was obtained from the Non-Interventional Clinical Studies Ethical Board on November 2, 2016 (decision number: 273). In our methodological study, data was collected using the TFI. After obtaining informed consent from the participants, surveys were administered using a face-to-face interview technique. The data were collected over a period of three months (01.01.2017 – 31.03.2017). Patients who were aged <65 years, did not want to participate in the study, provided incomplete answers to the questions, or were incapable of answering the questions were excluded from the study.

The Tilburg Frailty Indicator

The TFI comprises 25 questions divided into the following two parts: part A, containing 10 questions about illnesses and sociodemographic factors that determine frailty, and part B, containing 15 questions that evaluate three components of frailty (13). The physical component of the TFI comprises eight subitems: physical health, unwanted weight loss, difficulty in walking, difficulty in maintaining balance, poor hearing, visual difficulty, lack of strength in the hands, and physical tiredness. The psychological component of the TFI comprises four subitems: memory, depression, anxiety, and coping with problems. The social component of the TFI comprises three subitems: living alone, social relationships, and social support (13). Eleven items of the TFI have a double response category:

"yes" and "no." Four items of the TFI have a triple response category: "yes," "sometimes," and "no" (13). The score ranges between 0–15 and scores ≥5 indicate a positive finding of frailty (13).

Language adaptation

Process of language translation and adaptation complied with the recommendations of WHO (18). Two persons proficient in English and Turkish independently translated the TFI into Turkish. The translations were merged into a single Turkish form by a third person with proficiency in English and Turkish. The form created in Turkish was back-translated into English by an additional person proficient in both English and Turkish who was not involved in the other stages of the translation. The final version of the form that was translated from Turkish to English was compared with the original version of the scale and reevaluated. The final Turkish adaptation of the scale was found to be consistent with the original scale. The completed translation of the form was finally evaluated by two experts in the field, and it acquired its final form.

Statistical analysis

The normality of the variables was evaluated using visual (histogram) and analytical (Kolmogorov–Smirnov test) methods. Among the data collected in the study, the average, mean, standard deviation, data range, and categorical data were expressed using descriptive methods such as ratio and percentage. The comparison of the presence or absence of differences between the averages of two independent groups was performed using the Student's t-test. Differences between groups compared by cross-tabulation were assessed using the chi-square or Fisher's exact tests where applicable. In more than two groups, one-way analysis of variance was used to compare variables identified by measurement.

The psychometric features of the scale were analyzed using the confirmatory approach, and

known groups were analyzed by confirmatory factor analysis (CFA) for validity. To test the agreement of the model tested with the data analyzed, several values were calculated including the chi-square; comparative fit index (CFI) of the model being tested; the standardized root mean square residual (SRMR), which gives the average of the differences between the explained and observed covariances; the root mean square error of approximation (RMSEA); the goodness-of-fit index (GFI); and the adjusted goodness-of-fit index (AGFI). The values of goodness of fit of the confirmatory factor analysis model were evaluated using the model of Schermelleh-Engel et al. and these values are given in Table 4 (19). The Cronbach's alpha reliability coefficient was used for the reliability of the Turkish adaptation of the TFI. The internal consistency coefficient for reliability was assessed using the Kuder–Richardson-21 Formula coefficient (KR-21). In statistical group analyses, $p < 0.05$ was regarded as significant. The SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, NY, USA) and LISREL 8.5 statistics package programs (Scientific Software, Mooresville, IN, USA) were used for the analyses.

RESULTS

The continuous data followed a normal-distribution, hence parametric statistical methods were used during analysis as appropriate.

Participant characteristics

This study included 271 individuals with a median age of 71 years (range=65–90 years) and 50.6% males (n=137). Among the participants, 70.8% (n=192) were married, and the education level was equivalent to or under primary education [51.3% (n=139)]. The frailty scores of the participants were identified as 2.35±2.04, 1.14±1.21, 1.06±0.75, and 4.56±3.09 (physical, psychological, social, and total, respectively) (Table 1).

There were no gender differences between the

four items that comprise the frailty components. However, women experienced more difficulty in walking, maintaining balance, vision, and lack of hand strength. Women also struggled more than men with tiredness, memory problems, depression, loneliness, and social support. It was established that men felt physically healthier than women and better coped with problems (Table 2).

Reliability analysis

Reliability was calculated for the total TFI score and the three subcomponents of the TFI. The total value of Cronbach's alpha reliability coefficient for TFI was found to be 0.758, with 0.727 for the physical component, 0.675 for the psychological component, and 0.049 for the social component. The internal consistency coefficient was calculated in the reliability analysis of the scale. The KR-21 reliability coefficient obtained in the subdimensions of the scale was identified as 0.758 for the entire scale. The corrected item correlations for the TFI items are presented in Table 3. The correlations between each item and their dimension total scores are presented in Table 3 and each item showed statistically significant correlation within their dimension.

Validity analysis

In the exploratory factor analysis, CFA was performed to identify whether or not the three-factor model was verified (Figure 1).

The good adjustment values obtained in the CFA are 1.82 for the chi-square/degree of freedom, 0.054 for the RMSEA, and 0.064 for the SRMR. The CFI value was identified as 0.950, the GFI value as 0.928, and the AGFI value as 0.901. Our CFI and GFI values were close to values of good agreement. The values obtained were at least acceptable for all parameters and the summary of good agreement findings obtained by CFA showed that the scale can conceptually define the construct it was designed to measure at a good level (Table 4).

Table 1. The characteristics of the participants.

Characteristics	Male		Female		Total		Statistical analysis	
	n	%	n	%	n	%	x²	p
Age								
65-69	44	32.1	61	45.5	105	38.7		
70-74	41	29.9	37	27.6	78	28.8	5.83	0.054
≥75	52	38.0	36	26.9	88	32.5		
Marital status								
Married/Living together	126	92.0	66	49.3	192	70.8		
Single/Separated	3	2.2	3	2.2	6	2.2	63.23	<0.001***
Widow/widower	8	5.8	65	48.5	73	26.9		
Education level								
Primary school or lower (Low)	48	35.0	96	71.6	144	53.1		
High school or equivalent schools (Moderate)	49	35.8	23	17.2	72	26.6	36.72	<0.001***
College/Faculty or higher (Advanced)	40	29.2	15	11.2	55	20.3		
Income								
1500 TL or under (Low)	28	20.4	73	54.5	101	37.3		
1501 - 3500 TL (Moderate)	70	51.1	48	35.8	118	43.5	37.12	<0.001***
3501 TL or higher (High)	39	28.5	13	9.7	52	19.2		
Health perception								
Healthy	79	57.7	49	36.6	128	47.2		
Nor health nor unhealthy	53	38.7	66	49.3	119	43.9	16.58	<0.001***
Unhealthy	5	3.6	19	14.2	24	8.9		

	mean	sd	mean	sd	mean	sd	p
TFI physical component	1.69	1.88	3.02	1.99	2.35	2.04	<0.001***
TFI psychological component	0.78	1.01	1.51	1.27	1.14	1.21	<0.001***
TFI social component	0.89	0.67	1.23	0.79	1.06	0.75	<0.001***
TFI total score	3.37	2.63	5.77	3.06	4.56	3.09	<0.001***

*p<0.05, **p<0.01, ***p<0.001

Construct Validity was assessed by correlation between the TFI total score and other frailty measures. The Timed Up & Go (TUG) test walking speed showed stronger correlation 0.600 with physical domain and weaker correlations with psychological and social components (r=0.294 and r=0.123 respectively). Poor self-rated health (r=0.372, p<0.001), number of chronic diseases (r=0.193, p=0.001), and quality of life (r=0.419, p<0.001) were correlated with TFI score. Individuals with chronic disease had significantly higher TFI scores compared to their health counterparts (4.65±3.13 vs.3.00±1.73, p=0.003).

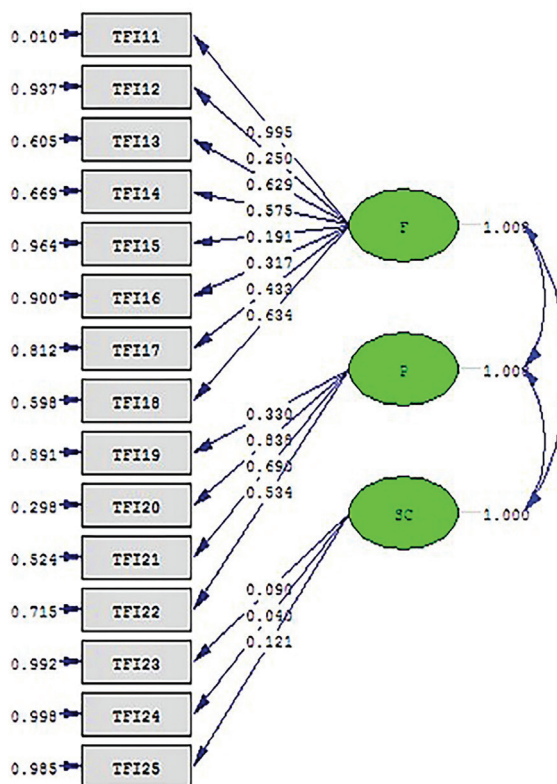**Table 2.** The assessment of TFI items with respect to gender.

TFI items	Male		Female		Total		Statistical analysis	
	Yes	No	Yes	No	Yes	No		
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	x^2	p
Physical components								
11. Do you feel physically healthy?	104 (75.9)	33 (24.1)	62 (46.3)	72 (53.7)	166 (61.3)	105 (38.7)	25.08	<0.001***
12. Have you lost a lot of weight recently without wishing to do so?	7 (5.1)	130 (94.9)	9 (6.7)	125 (93.3)	16 (5.9)	255 (94.1)	0.31	0.575
13. Difficulty in walking?	48 (35.0)	89 (65.0)	88 (65.7)	46 (34.3)	136 (50.2)	135 (49.8)	25.43	<0.001***
14. Difficulty maintaining your balance?	27 (19.7)	110 (80.3)	56 (41.8)	78 (58.2)	83 (30.6)	188 (69.4)	15.54	<0.001***
15. Poor hearing?	42 (30.7)	95 (69.3)	37 (27.6)	97 (72.4)	79 (29.2)	192 (70.8)	0.30	0.581
16. Poor vision?	25 (18.2)	112 (81.8)	38 (28.4)	96 (71.6)	63 (23.2)	208 (76.8)	3.88	0.049*
17. Lack of strength in your hands?	11 (8.0)	126 (92.0)	33 (24.6)	101 (75.4)	44 (16.2)	227 (83.8)	13.72	<0.001***
18. Physical tiredness?	39 (28.5)	98 (71.5)	72 (53.7)	62 (46.3)	111 (41.0)	160 (59.0)	17.88	<0.001***
Psychological components								
19. Do you have problems with your memory?	11 (8.0)	126 (92.0)	26 (19.4)	108 (80.6)	37 (13.7)	234 (86.3)	7.43	0.006**
20. Have you felt down during the last month?	37 (27.0)	100 (73.0)	84 (62.7)	50 (37.3)	121 (44.6)	150 (55.4)	34.89	<0.001***
21. Have you felt nervous or anxious during the last month?	52 (38.0)	85 (62.0)	66 (49.3)	68 (50.7)	118 (43.5)	153 (56.3)	3.51	0.061
22. Are you able to cope with problems well?	130 (94.9)	7 (5.1)	107 (79.9)	27 (20.1)	237 (87.5)	34 (12.5)	13.96	<0.001***
Social components								
23. Do you live alone?	7 (5.1)	130 (94.9)	36 (26.9)	98 (73.1)	43 (15.9)	228 (84.1)	24.01	<0.001***
24. Do you sometimes miss having people around you?	81 (59.1)	56 (40.9)	95 (70.9)	39 (29.1)	176 (64.9)	95 (35.1)	4.12	0.042*
25. Do you receive enough support from other people?	102 (74.5)	35 (25.5)	99 (73.9)	35 (26.1)	201 (74.2)	70 (25.8)	0.01	0.914

*$p<0.05$, **$p<0.01$, ***$p<0.001$

Table 3. Corrected item correlations for the TFI items.

TFI items	Corrected item total correlation	Cronbach's alpha if item deleted	Correlation with total score	Correlation with Physical component total score	Correlation with Psychological component total score	Correlation with Social component total score
Physical components						
11. Do you feel physically healthy? (Fiziksel olarak sağlıklı hissediyor musunuz?)	0.737	0.703	0.802**	0.853**	0.409**	0.190**
12. Have you lost a lot of weight recently without wishing to do so? (Son zamanlarda isteğiniz dışında çok* kilo kaybettiniz mi?*"Çok'tan kasıt: Son 6 ayda 6 kg veya daha fazla0, son bir ayda 3 kg veya daha fazla")	0.159	0.758	0.224**	0.251**	0.094	0.073
13. Difficulty in walking? (Yürümede zorlanma?)	0.474	0.732	0.618**	0.712**	0.283**	0.115
Difficulty maintaining your balance? (Dengenizi sağlamada güçlük?)	0.482	0.732	0.582**	0.629**	0.324**	0.121*
14. Poor hearing? (İşitme güçlüğü?)	0.135	0.766	0.265**	0.396**	0.041	-0.002
15. Poor vision? (Görme güçlüğü?)	0.308	0.749	0.412**	0.441**	0.247**	0.118
16. Lack of strength in your hands? (Ellerinizde güçsüzlük?)	0.457	0.737	0.490**	0.511**	0.316**	0.171**
17. Physical tiredness? (Fiziksel yorgunluk?)	0.479	0.732	0.590**	0.669**	0.295**	0.111
Psychological components						
18. Do you have problems with your memory? (Hafızanız ile ilgili sorun yaşıyor musunuz?)	0.339	0.747	0.398**	0.285**	0.456**	0.137*
19. Have you felt down during the last month? (Son bir ay boyunca çökkünlük hissettiniz mi?)	0.523	0.727	0.649**	0.355**	0.883**	0.241**
20. Have you felt nervous or anxious during the last month? (Son bir ay boyunca sinirli veya endişeli hissettiniz mi?)	0.410	0.739	0.545**	0.297**	0.816**	0.099
21. Are you able to cope with problems well? (Sorunlarla iyi baş edebiliyor musunuz?)	0.450	0.739	0.464**	0.310**	0.575**	0.171**
Social components						
22. Do you live alone? (Yalnız mı yaşıyorsunuz?)	0.167	0.760	0.269**	0.168**	0.095	0.502**
23. Do you sometimes miss having people around you? (Bazen yanınızda birilerinin olmasını özlüyor musunuz?)	0.066	0.774	0.220**	0.023	0.094	0.680**
24. Do you receive enough support from other people? (Başka insanlardan yeterli ölçüde destek alıyor musunuz?)	0.207	0.759	0.332**	0.181**	0.219**	0.548**

Total value of Cronbach alpha= 0.758

Chi-Square=156.74, df=87, P-value=0.00001, RMSEA=0.054

TFI = Tilburg Frailty Indicator, F= TFI physical component, P= TFI psychological component, SC= TFI social component

Figure 1. The pathway of the standardized values of the items of the Tilburg Frailty Scale.

Table 4. The confirmatory factor analysis models of the Tilburg Frailty Indicator.

Fit measure	Good fit	Acceptable fit	Model fit	Interpretation
χ^2 /df	$0 \leq \chi^2/ df \leq 2$	$2 \leq \chi^2/ df \leq 3$	1.82	Good fit
RMSEA	$0 \leq$ RMSEA ≤ 0.05	$0.05\leq$ RMSEA ≤ 0.08	0.054	Acceptable fit
SRMR	$0 \leq$ SRMR ≤ 0.05	$0.05 <$ SRMR $\leq .10$	0.064	Acceptable fit
CFI	$0.97 \leq$ CFI ≤ 1.00	$0.95 \leq$ CFI < 0.97	0.950	Acceptable fit
GFI	$0.95 \leq$ GFI ≤ 1.00	$0.90 \leq$ GFI < 0.95	0.928	Acceptable fit
AGFI	$0.90 \leq$ AGFI ≤ 1.00	$0.85 \leq$ AGFI <0.90	0.901	Good fit

AGFI = Adjusted Goodness-of-Fit-Index, CFI = Comparative Fit Index, GFI = Goodness-of-Fit Index, RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual.

DISCUSSION

Our findings revealed that the Turkish version of the TFI is satisfactory with respect to reliability, the internal consistency coefficient, and construct validity. The internal consistency for the total TFI score was at acceptable levels but the Cronbach's alpha reliability coefficient and adjusted item total correlations showed that the internal consistency reliability coefficients were low for some of the subitems of the TFI, particularly those of the social component. These results are similar to the results obtained for the original version of the TFI and other translated versions (5,13,20). CFA of the scale revealed that the RMSEA and SRMR values were <0.08 and that the CFI, GFI, and AGFI values were >0.90. The CFA goodness-of-fit findings revealed that the scale can conceptually define the construct that it aimed to assess at a good level indicating that the scale is satisfactory with respect to construct validity.

In our study, the total TFI score was 4.56. The total TFI score and the average score of all subdimensions were statistically significantly higher in women than in men (p < 0.001). These results were similar to those of other validity-reliability studies of the TFI performed worldwide (17,20). In the original study, Gobbens et al. developed the TFI with two groups: 245 and 234 people with average ages of 80.3 and 80.2 years with a total TFI score of 4.7/4.7, physical score of 2.6/2.5, psychological component score of 0.9/1.0, and social component score of 1.2/1.3 (13). In our study, similar score averages were found.

In studies that set the TFI cutoff point for frailty at 5, the ratio of frailty was 44.6% in the Italian sample with an average age of 73.4 years, 47.1% in the Dutch sample with an average age of 80.3 years, 40% in the Polish sample with an average age of 68.2 years, 35.6% and 31.7% in two Brazilian samples with average ages of 69.8 and 71.3 years, and 41.4% in the German sample with an average age of 75.3 years (13,17,20–23). In the Portuguese sample that set the cutoff point for frailty at 6, the average age was 79.2 years, and frailty was identified

in 54.8% of the sample population (5). In our study, the cutoff point was set at 5, the average age was 72.4 years, and the ratio of frailty was 45.4%. The ratio of frailty identified using the TFI was similar to ratios identified in other European countries. Although there are differences between countries in the total TFI average scores or the average ages of the participants, in most European countries the ratios of frailty identified using the TFI are similar and independent of these factors. The frequency of frailty is similar in countries such as Holland, Italy, Poland, and Germany, where per capita health expenditure is higher than that in Turkey, which indicates that frailty is associated not only with the socioeconomic development of countries but also with many other factors.

The review of the internal consistency assessments of the TFI subdimensions revealed that that the internal consistency values for the physical and psychological components were good (Cronbach's alpha=0.727 and 0.675, respectively), but the value for the social component was unsatisfactory (Cronbach's alpha=0.049). Gobbens et al. identified the Cronbach's alpha values for the total TFI as 0.73, for the physical component as 0.70, for the psychological component as 0.63, and for the social component as 0.34, and these results are similar to those of our study (13). Our findings were similar to those of the study by Gobbens et al as well as validity-reliability studies conducted in other countries, and the total Cronbach's alpha value for the TFI varied between 0.66 and 0.78, for the physical component varied between 0.57 and 0.79, for the social component varied between 0.43 and 0.53, and for the TFI social component varied between 0.36 and 0.49 (5,17,20,22,23). In other validity-reliability studies of the TFI, the internal consistency of the social component was low, which is similar to the results of our study. This suggests that adding other items to the social component may increase the internal consistency coefficient but could complicate the simple, rapid, and easy application of the scale.

In a study conducted in Holland that included 532 people, the average age was 77.2 years, the ratio of frailty based on the TFI was 40.2%, and the total Cronbach's alpha value was 0.73 (21). The corrected item total correlations varied between 0.18 and 0.58 (21). The corrected item total correlations varied between 0.12 and 0.52 in the Polish validity-reliability study, and it was stated that these values were >0.30 for all items in the Brazilian validity and reliability study (22,23). The German validity-reliability study showed that the corrected item total correlations varied between −0.06 and 0.57 and that the "coping with problems" item exhibited negative correlation (17). In our study, the corrected item total correlations varied between 0.06 and 0.73. The differences between corrected item total correlations could potentially be attributed to sociocultural differences between countries. The low values of the correlation coefficients of some items on the scale did not affect the overall value of the Cronbach's alpha reliability coefficient. Therefore, we concluded that this did not influence the frailty score that the scale aims to measure.

Limitations

The sample was selected solely from community-dwelling elderly people, and further comprehensive studies should be performed using the TFI in elderly people in hospitals and residing in nursing homes. Long-term studies are required to evaluate the prediction of the mid- and long-term adverse effects of frailty and each subcomponent. Studies that evaluate the psychometric features of the TFI are required to obtain better results for the Turkish version of the TFI and identify the adequate cutoff point for use in Turkey.

Some of the correlation coefficient values and internal consistency were low especially for social domain. The first reason might be due to the fact that the measure did not consist of closely related components and tried to explain most important elements of frailty and its domains by using few questions. Another reason is the social domain contains only three items hence it is not surprising that the correlation of these three variables provided low values. It is possible to increase internal consistency by adding other indicators of social frailty in the future. However, the researchers should use and interpret the social dimension scores with caution when they want to use the scale.

In conclusion, it has been established that the Turkish adaptation of the TFI is a valid and reliable instrument. This self-reported scale requires minimal time to administer, is validated for use in primary care, and is a valuable screening instrument. This study is the first step in Turkey toward adopting the use of the TFI which is a multidimensional, specific, cost saving, and easily administered scale applicable for both clinical and scientific purposes. Finally, we believe that our findings have contributed to the early detection of health-related problems in the elderly and the management of frailty in primary care in our country by developing the Turkish version of the TFI. It is a simple and invaluable screening tool that effectively identifies frailty in the elderly using a multidimensional perspective and facilitates effective interventions to prevent adverse outcomes.

Conflict of interest

No conflict of interest was declared by the authors.

REFERENCES

1. World Health Organization launches new initiative to address the health needs of a rapidly ageing population. [Internet] Available from: http://www.who.int/mediacentre/news/releases/2004/pr60/en/. Accessed: 19.05.2017.

2. Aslan D, Keskin C. Public Health Aspect of "Frail" Elderly Concern. Journal of Continuing Medical Education 2015 Mar-Apr;24(2):73-8. (in Turkish).

3. Coelho T, Paúl C, Gobbens RJJ, Fernandes L. Determinants of frailty: the added value of assessing medication. Front Aging Neurosci 2015 Apr 21;7(56):1–8. (PMID:25954195).

4. Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet 2013 Mar;381:752–62. (PMID:23395245).

5. Coelho T, Santos R, Paúl C, Gobbens RJ, Fernandes L. Portuguese version of the Tilburg Frailty Indicator: Transcultural adaptation and psychometric validation. Geriatr Gerontol Int 2015 Aug;15(8):951-60. (PMID:25255891).

6. World Health Organization. Chapter 3: Health in Older Age. World Report on Ageing and Health. Geneva 2015, pp 43-88. [Internet] Available from: http://www.who.int/life-course/publications/2015-ageing-report/en/. Accessed: 19.05.2017.

7. Walston JD. Frailty. UpToDate 2017, pp 1–45. [Internet] Available from: https://www.uptodate.com/contents/frailty. Accessed: 19.02.2017.

8. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: Evidence for a phenotype. J Gerontol A Biol Sci Med Sci 2001;56(3):146–64. (PMID:11253156).

9. Gobbens RJJ, van Assen MALM, Luijkx KG, Wijnen-Sponselee MT, Schols JMGA. Determinants of Frailty. J Am Med Dir Assoc 2010 Jun;11(5):356-64. (PMID:20511103).

10. Şahin S, Cankurtaran M. Geriatrics Syndromes. Ege J Med 2010;49(3):31-7. (in Turkish).

11. Soysal P, Stubbs B, Lucato P, et al. Inflammation and frailty in the elderly: A systematic review and meta-analysis. Ageing Res Rev 2016 Nov;31:1-8. (PMID:27592340).

12. Pialoux T, Goyard J, Lesourd B. Screening tools for frailty in primary health care: A systematic review. Geriatr Gerontol Int 2012 Apr;12(2):189-97. (PMID:22233158).

13. Gobbens RJJ, van Assen MALM, Luijkx KG, Wijnen-Sponselee MT, Schols JMGA. The Tilburg Frailty Indicator: Psychometric Properties. J Am Med Dir Assoc 2010 Jun;11(5):344–55. (PMID:20511102).

14. Vergara I, Rivas-Ruiz F, Vrotsou K, et al. Validation and comparison of instruments to identify frail patientes in primary care settings: Study protocol. BMC Health Serv Res 2016;16(1):354. (PMID:27492438).

15. Dent E, Kowal P, Hoogendijk EO. Frailty measurement in research and clinical practice: A review. Eur J Intern Med 2016 Jun;31:3–10. (PMID:27039014).

16. van Kempen JA, Melis RJ, Perry M, Schers HJ, Rikkert MG. Diagnosis of Frailty after a Comprehensive Geriatric Assessment: Differences between Family Physicians and Geriatricians. J Am Board Fam Med 2015 Mar-Apr;28(2):240-8. (PMID:25748765).

17. Freitag S, Schmidt S, Gobbens RJJ. Tilburg frailty indicator: German translation and psychometric testing. Z Gerontol Geriatr 2016 Feb 8;49(2):86-93. (PMID:25953342).

18. WHO | Process of translation and adaptation of instruments. [Internet] Available from: http://www.who.int/substance_abuse/research_tools/translation/en/#. Accessed:08.03.2018.

19. Schermelleh-Engel K, Moosbrugger H, Müller H. Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit Measures. Methods Psychol Res Online 2003;8(2):23–74.

20. Mulasso A, Roppolo M, Gobbens RJJ, Rabaglietti E. The Italian Version of the Tilburg Frailty Indicator: Analysis of Psychometric Properties. Res Aging 2016 Nov;38(8):842-63. (PMID:26377805).

21. Metzelthin SF, Daniëls R, van Rossum E, de Witte L, van den Heuvel WJ, Kempen GI. The psychometric properties of three self-report screening instruments for identifying frail older people in the community. BMC Public Health 2010 Mar;10(1):176. (PMID:20353611).

22. Uchmanowicz I, Gobbens R, Jankowska-Polanska B, Loboz-Rudnicka M, Manulik S, Loboz-Grudzien K. Cross-cultural adaptation and reliability testing of the Tilburg Frailty Indicator for optimizing care of Polish patients with frailty syndrome. Clin Interv Aging 2014 Jun;9:997-1001. (PMID: 25028543).

23. Santiago LM, Luz LL, Mattos IE, Gobbens RJJ, van Assen MA. Psychometric properties of the Brazilian version of the Tilburg frailty indicator (TFI). Arch Gerontol Geriatr 2013 Jul-Aug;57(1):39-45. (PMID:23538005).

- Ayşe SAĞMAK TARTAR[1]
- Şafak Özer BALIN[1]
- Ayhan AKBULUT[1]

CORRESPONDANCE

Ayşe SAĞMAK TARTAR
Fırat University, Faculty of Medicine, Department of Infectious Diseases and Clinical Microbiology, Elazığ, Turkey

Phone: 5434088468
e-mail: dr.ayse01@gmail.com

[1] Fırat University, Faculty of Medicine, Department of Infectious Diseases and Clinical Microbiology, Elazığ, Turkey

RESEARCH

IS THE DISTRIBUTION OF GERIATRIC INFECTIONS DIFFERENT IN EASTERN TURKEY? RETROSPECTIVE EVALUATION OF GERIATRIC INFECTIONS

ABSTRACT

Introduction: Infections are one of the most important reasons for hospitalization, morbidity and mortality among geriatric patients.

Materials and Method: Between June 2016 and December 2017, patients aged 65 and older who were hospitalized for treatment were retrospectively evaluated at the infectious diseases and clinical microbiology department of Fırat University Hospital.

Results: In total, 900 patients were admitted to our clinic. Of these, 350 (38.8%) of these patients were over 65 years old; 218 (62.3%) were male and 132 (37.7%) were female. The most common reasons for hospitalization were pyelonephritis in 109 patients (31.5%), pneumonia in 78 (22.2%), cystitis in 72 (20.6%) and skin and soft-tissue infection in 32 (9.3%). Extrapulmonary tuberculosis, brucellosis, Crimean Congo haemorrhagic fever, fascioliasis and cutaneous leishmaniasis were the prominent causes of hospitalization. Hypertension and diabetes mellitus were the most common comorbidities. Combination antibiotics were administered to 95 (27.4%) patients, whereas 251 patients received a single antibiotic. Of 245 (70%) patients who required consultation with various departments, 77 (20%) consulted with neurology, 68 (19.4%) with urology and 44 (12.5%) with chest diseases departments. Radiological imaging, most commonly abdominal ultrasound, was performed in 228 (65.1%) patients. Blood infection was detected in 31 patients.

Conclusion: In areas such as our region, where many infectious diseases are endemic, diseases, such as tuberculosis, brucellosis, parasitic diseases, or Crimean Congo haemorrhagic fever, can occur in elderly individuals. Therefore, a multidisciplinary approach is essential to evaluate geriatric infections and a radiologist should be included in this multidisciplinary team.

Keywords: Infection; Geriatrcis; Tuberculosis; Referral and consultation

ARAŞTIRMA

TÜRKİYE'NİN DOĞU BÖLGESİNDE GERİATRİK İNFEKSİYONLARIN DAĞILIMI FARKLI MI? GERİATRİK İNFEKSİYONLARIN RETROSPEKTİF DEĞERLENDİRİLMESİ

ÖZ

Giriş: Enfeksiyon geriatrik hastalarda en önemli hastaneye yatış, mortalite ve morbidite sebeplerinden biridir.

Gereç ve Yöntem: Haziran 2016-Aralık 2017 yılları arasında Fırat Üniversitesi Hastanesi enfeksiyon hastalıkları ve klinik mikrobiyoloji bölümünde tedavi gören 65 yaş ve üzeri hastalar retrospektif olarak incelendi.

Bulgular: On sekiz aylık zaman diliminde kliniğimize 900 hasta yatırıldı. Bu hastaların 350 (%38.8)'si 65 yaş üstü idi. Hastaların 218 (%62.3)'i erkek, 132 (%37.7)'si kadındı. En sık hastaneye yatış sebebi piyelonefrit 109 (%31.5), pnömoni 78 (%22.2), sistit 72 (%20.6), deri ve yumuşak doku enfeksiyonu 32 (%9.3) idi. Ekstrapulmoner tüberküloz, brusellloz, kırım kongo kanamalı ateşi, fascioliasis, cutaneous leishmaniasis dikkat çeken hospitalizasyon sebeplerindendi. En sık eşlik eden kronik hastalık diyabet, hipertansiyon ve serebrovasküler hastalıktı. Doksan beş (%27.4) hastada kombine antibiyoterapi uygulandı. İki yüz elli bir hastada ise tekli antibiyotik ile tedaviye başlandı. 245 (%70) hasta çeşitli bölümler ile konsülte edildi. Hastaların 71 (%20)'i nöroloji, 68 (%19,4)'i üroloji, 44 (%12,5)'ü göğüs hastalıkları ile konsülte edildi. Hastaların 228 (%65,1)'ine radyolojik görüntüleme istendi. En sık yapılan görüntüleme batın ultrasonografisiydi. 31 hastada kan dolaşım enfeksiyonu saptandı.

Sonuç: Bölgemiz gibi bir çok enfeksiyon hastalığı için endemik olan yerlerde, tüberküloz, brusellloz, paraziter hastalıklar, kırım kongo kanamalı ateşi gibi hastalıkların yaşlı bireylerde de görülebileceği akılda bulundurulmalıdır. Geriatrik enfeksiyonlar değerlendirilirken multidisipliner yaklaşım şarttır ve bu ekibin içinde radyolog bulunmalıdır.

Anahtar sözcükler: Enfeksiyon; Geriatri; Tüberküloz; Konsültasyon

INTRODUCTION

Aging is a continuous and universal process occurring in all organisms. It causes a decrease in all functions and describes the entirety of the gradual irreversible structural and functional changes at all levels. The geriatric population (aged ≥ 65 years) constituted 6.2% of the world population in 1992 and is expected to reach 20% by 2050 (1). The number and proportion of elderly people is continually rising in Turkey and worldwide as the death and birth rates decrease (2). Infections are one of the most important reasons for hospitalization, morbidity and mortality among geriatric patients.

Many infectious diseases are more common in the eastern than in the western part of Turkey, including classical infectious diseases, such as brucellosis or tuberculosis. A multidisciplinary approach is required because of the excessive presence of comorbidity in geriatric patients. Consultation support is often needed during the follow-up of patients. In addition, auxiliary diagnostic methods are more frequently needed for elderly patients because of the atypical course of diseases. Radiological imaging is one of the most prominent techniques among these supportive diagnostic methods.

Our hospital is in the eastern part of Turkey. It provides tertiary healthcare services and the patients from the all provinces of the region are transferred to there. In this study, we assessed the epidemiological characteristics, diagnosis and follow-up, required imagings, and consultation distributions of patients over 65 years old who were treated in the infection diseases and clinical microbiology clinic within 18 months. The aim of the study was to evaluate the epidemiological differences in our region in terms of geriatric infections by comparing them with the other regions of Turkey.

MATERIALS AND METHOD

This retrospective study has been conducted in accordance with the principles of the Helsinki Declaration and approved by the local Institutional Review Board (5.1.2018/ Decision number 1/ 3). The consent of patients could not be taken because of retrospective study.

Between June 2016 and December 2017, patients aged 65 years and over were retrospectively evaluated at the infectious diseases clinic. For the study, a form is filled in which consists of a patient's demographic characteristics, laboratory and clinical findings, desired consultation and radiological examinations. The data of the patients were obtained by examining the files and epicrisis reports. Direct radiographic images were excluded from the study. In patients with recurrent hospitalizations, their first hospitalization was included in the study.

Statistical analysis

Data were analyzed using the IBM Statistical Package for Social Sciences v22 (SPSS, Inc., Chicago, IL, USA). Descriptive statistics, such as frequencies or percentages for categorical variables and mean (± standard deviation) and median+interquartile range for continuous variables, were used to describe baseline demographic data and clinical characteristics. The variables were investigated using visual (histograms, probability plots) and analytic (Shapiro-Wilk's test) methods to determine whether they were normally distributed. In addition, the differences in variables were analysed using the analysis of variance or the Kruskal-Wallis tests. P values of <0.05 were considered statistically significant for all analysis.

RESULTS

Of the 900 patients admitted to our clinic during an 18-month period, 350 (38.8%; 218 (62.3%) were

male, 132 (37.7%) were female; median age, 77 (interquartile range, 73.7–84) were aged over 65 years. The diagnoses of patients admitted to the infectious diseases clinic are shown in Table 1. Two-infection focuses occurred at the same time in 32 (9.1%) patients, including pneumonia + cystitis in 16 (4.6%), pneumonia + pyelonephritis in 7 (2%), spondylitis + cystitis in 3 (0.8%), cellulite + cystitis in 3 (0.8%), mucormycosis+pyelonephritis in 1 (0.3%) and wound infection + liver abscess in 2 (0.6%) patients.

Fever of unknown aetiology (FUE) was diagnosed in 4 patients and was related to infections in 2 (50%). Overall, 2 patients were diagnosed with liver abscess, 1 with non-Hodgkin's lymphoma and 1 with multiple myeloma.

In addition, among patients diagnosed with extrapulmonary tuberculosis, 3 (0.9%) had tuberculosis lymphadenitis, 3 (0.9%) had tuberculosis spondylitis, 1 had tuberculosis endometritis, 1 had tuberculous fasciitis, 1 had tuberculous osteomyelitis and 1 had tuberculosis-related brain abscess.

In total, 54 (15.4%), 119 (34%), 65 (18.6%) and 112 (32%) patients had no, 1, 2 and 3 or more associated comorbid diseases, respectively (Table 2).

Antibiotics were administered to 346 (98.9%) patients. Four patients who did not receive treatment had hepatitis B and C. Combination antibiotics were administered to 95 (27.4%) patients, whereas 251 patients were treated with a single antibiotic. Initial antibiotic therapies according to the diagnosis are presented in Table 3.

Table 1. The distribution of patients according to their diagnosis for hospitalization.

Diagnosis	n (%)	Diagnosis	n (%)
Urinary tract infection	188 (53.7)	**Diabetic foot infection**	5 (1.4)
Pneumonia	78 (22.2)	**Fever of unknown origin**	4 (1.1)
Skin and soft-tissue infection	32 (9.3)	**Brucellosis**	2 (0.6)
Extrapulmonary tuberculosis	10 (2.85)	**Crimean_Congo Hemorrhagic Fever**	3 (0.9)
Gastroenteritis	17 (4.9)	**Abscess (in various organs)**	7 (2.0)
Spondylodiscitis	10 (2.85)	**Fascioliasis**	1 (0.3)
Urosepsis	7 (2.0)	**Mucormycosis**	1 (0.3)
Meningoencephalitis	6 (1.7)	**Bloodstream infection**	5 (1.5)
Cutaneous Leishmaniasis	1 (0.3)	***Others**	11(3.2)

*: Hepatitis B, Hepatitis C, Osteomyelitis, Prosthetic joint infection, Septic arthritis

Table 2. Distribution of comorbid diseases.

Chronic Diseases	n (%)
Diabetes Mellitus	114 (32.6)
Hypertension	109 (31.1)
Cerebrovascular attack	36 (10.3)
Malignity	35 (10.0)
Chronic kidney failure	45 (12.8)
Benign prostatic hyperplasia	59 (16.8)
Cardiovascular disease	60 (17.1)
Chronic obstructive pulmonary disease	40 (11.4)
*Others	34 (9.7)

*: Cirrhosis, *organ transplantation, nephrolithiasis, spinal disc hernia, gout*

Table 3. Initial antibiotic regimens according to diagnosis.

Diagnosis	Used Antibiotics n (%)
Pneumonia	Beta-lactam + quinolone 37 (47.4) Beta-lactam + macrolide 8 (10.3) Carbapenem 14 (13.4) Piperacillin Tazobactam 10 (12.8) Ceftriaxone + moxifloxacin+ Oseltamivir 3 (3.8) Moxifloxacin 3 (3.8) Beta-lactam +linezolide 3(3.8)
Urinary tract infection	Piperacillin Tazobactam 49 (25) Ciprofloksasin 2 (1) Carbapenem 110 (56) Vancomycin 3 (1.5) Linezolide 2 (1) Ceftriaxone 30 (15.3)
Gastroenteritis	Ciprofloxacin + Metronidazole 7 (41.2) Ciprofloxacin 4 (23.5) Ceftriaxone 6 (35.3)
Skin and soft-tissue infection	Piperacillin Tazobactam 9 (28.1) Ampicillin sulbactam 9 (28.1) Carbapenem 5 (15.6) Carbapenem +Linezolide 3 (9.4) Tigecycline 3 (9.4) Cefazolin 3 (9.4)

Table 4. The distribution of microorganisms in blood culture according to the infection focus.

Microorganism	n (%)	Infection focus n (%)
E.coli	20 (64.5)	Pyelonephritis 15 (75) Urosepsis 2 (10) Pneumonia 3 (15)
Staphylococcus aureus	4 (12.9)	Primary bloodstream infection 1(25) Catheter-related bloodstream infection 3 (75)
Klebsiella spp	3 (9.7)	Pyelonephritis 1 (33.3) Urosepsis 2 (66.7)
Enterococcus spp.	2 (6.5)	Pyelonephritis 1 (50) Spondylodiscitis 1 (50)
Pseudomonas aeruginosa	1 (3.2)	Urosepsis 1 (100)
Coagulase- negative Staphylococci	1 (3.2)	Catheter-related bloodstream infection 1(100)

Table 5. Various laboratory test values on the admission day of patients according to their diagnosis.

Median (interquartile range)	Pyelonephritis	Pneumonia	Urosepsis	Skin and soft-tissue infection	Gastroenteritis	p
WBC (mm³)	14400 (10900-22000)	11250 (8230-15340)	9300 (8690-23330)	10465 (7712-14865)	8500 (5660-10785)	>0.05
Neutrophil	11200 (9000-19000)	8540 (6000-13000)	8030 (5590-20400)	7580 (4835-0337)	6790 (4190-9790)	>0.05
CRP (mg/L)	104 (64-190)	91 (31-138)	73 (25-209)	103 (43-169)	43 (22-105)	>0.05
ESR (mm/h)	54 (46-92)	39 (19-52)	35 (24-81)	42 (24-70)	28 (19-52)	>0.05
Albumin (g/dl)	2.9 (2.6-3.7)	3.6 (3.2-4)	3.2 (2.9-3.3)	3.9 (3.3-4.1)	3.9 (3.3-4.3)	<0.05

WBC: White blood cell, CRP: C reactive protein, ESR: Erythrocyte sedimentation rate, WBC: 3800-8600 mm³, C-reactive protein: 0-5 mg/L, Erythrocyte sedimentation rate: 0-20, Albumin: 3.5-5.3 g/dl, Neutrofile: 2100-6100. $p<0.05$ significant

In total, 245 (70%) patients consulted with various departments: 1 department in 67 (27.3%), 2 in 58 (23.7%) and 3 or more in 120 (49%). Consultations were requested from neurology, urology, chest diseases, endocrine, cardiology, dermatology, nephrology, otolaryngology, gastroenterology and psychiatry departments in 71 (29%), 68 (27.2%), 44 (18%), 40 (16%), 35 (14%), 33 (13.4%), 24 (9.8%), 19 (7.7%), 18 (7.3%) and 18 (7.3%) patients, respectively. Consultations were requested from other internal and surgical units as well.

Radiological imaging was performed in 228 (65.1%) patients (1, 2 and 3 or more images in 134 (58.7%), 54 (23.6%) and 40 (14.4%), respectively). Abdominal ultrasonography (US) was the most frequently performed radiological imaging technique (n =145, 63.5%), whereas 38 patients (16.6%) underwent lower extremity venous Doppler US, 34 (14.9%) underwent computed tomography (CT) of the brain, 22 (9.6%) underwent superficial soft tissue US, 22 (9.6%) underwent thorax CT, 21 (9.2%) underwent brain magnetic resonance imaging and 17 (7.45%) underwent abdominal CT.

In total, 300 (85.7%) patients were healed and discharged, 21 (6%) were transferred to intensive care unit, 5 (1.4%) were transferred to other clinics, 21 (6%) were discharged with their current medical status, and 3 (0.9%) died.

Blood infection was detected in 31 patients. The distribution of microorganisms in blood culture according to the infection focus is presented in Table 4.

The medians of the various laboratory values according to the diagnosis at admission are presented in Table 5. Although there was a statistically significant difference in the albumin levels among urosepsis patients compared with other diagnostic groups, there was no significant difference in the values of white blood cell (WBC), sedimentation, C-reactive protein (CRP) and neutrophils ($p > 0.05$).

DISCUSSION

Infections are among the top 10 causes of hospitalization and the top 5 causes of mortality for individuals aged over 65 years (3). Overall, 38.8% of the patients hospitalized at our clinic were over 65 years old. This rate has been reported as 28.6%, 13.5%, 33.1% and 40% in different studies from our country (3–6). These studies show that the geriatric patient population tends to increase in infection diseases clinics over years. This may be explained by the increase in the elderly population as well as the widespread use of interference and immunosuppressive drugs. Recent advances in technology mean that it is now possible for the patients to survive for extended periods with diseases that were once fatal.

Concomitant chronic diseases are precipitating factors for infections (7). The concomitant disease rate was 84.6%. Ozen et al. (6) and Temel and Akcam (8) reported chronic diseases in 86.2% and 89% of their patients, respectively. Therefore, comorbid conditions increase the risk of infection in elderly people.

The increased rates of admission of the elderly people to hospitals and additional interventions increase the risk of infection with resistant microorganisms. Therefore, elderly patients with developing infections should be hospitalized. This may be the reason for the excess of comorbid conditions in patients at the infectious diseases clinic.

The patients admitted to our clinic most frequently had urinary tract infection, pneumonia and skin and soft-tissue infections. In the study by Ulug et al. (4), sepsis, pneumonia and acute gastroenteritis were most frequently detected. Ozen et al. (6) reported pneumonia, urinary tract infections and skin and soft-tissue infections most frequently. Internal intensive care units have been established at many hospitals. In the first stage, patients with sepsis are usually monitored in

intensive care units. Therefore, in recent studies, the rate of sepsis might be lower.

Tuberculosis is a common infectious disease in endemic areas, especially among elderly people, and its incidence rate can reach up to 46% (9). The use of immunosuppressive drugs and chronic diseases, such as diabetes mellitus, chronic renal failure, cancer and malnutrition, are factors that trigger tuberculosis reactivation (10). Approximately, 75% of tuberculosis cases comprise active pulmonary tuberculosis. At our clinic, only cases of extrapulmonary tuberculosis were observed and pulmonary tuberculosis was not detected.

Various organ involvements of extrapulmonary tuberculosis were noted in our study. In a recent study involving 853 patients examined in Ankara, only 3 were diagnosed with tuberculosis (6). The study of Ulug et al. (4) in Diyarbakir, where is in the same region with our province, reported that the rate of tuberculosis was found as 2.6%, which is similar to our study. This shows that tuberculosis is still an important problem in the east of Turkey. Tuberculosis can occur in all organs and tissues. As in our study, rare involvement sites can be seen in elderly patients. In geriatric individuals, the cellular immunity and specific cytokines (interleukin (IL)-2) decreases, and the vulnerability to infections due to intracellular pathogens increases. In addition, the sensitivity of tuberculin skin test, which helps for diagnosis, decreased in elderly patients. This makes the diagnosis even more difficult.

Tuberculosis should be considered in the differential diagnosis, especially in endemic areas.

In geriatric patients, the cause of unknown fever is due to infections with a rate of 30% (11). In our study, 4 patients were followed up with a diagnosis of unknown fever: liver abscess was found in 2 and haematological malignancy in 2 patients. Fasciolosis is a zoonotic disease caused by the *Fasciola* species in humans. Kaplan et al. reported the rate of fasciolosis as 2.77% in our province (12). One of our patients had fasciolosis.

Cutaneous leishmaniasis is a parasitic disease caused by the leishmania protozoa *Phlebotomus*, in which infection occurs during the process of blood extraction from the skin (13). Our patient had a nose wound. Promastigotes were observed in the Tzanck smear of the serous fluid from an ulcer at the lesion site.

Mucormycosis is a rare and fatal opportunistic fungal infection that is seen especially in cases where the immune system is suppressed (14). Diabetes is the most common risk factor. Our patient with mucormycosis was diabetic and was transferred to intensive care unit for follow-up.

Degeneration and chronic diseases in elderly individuals also increase the risk of infection. Chronic diseases increase the susceptibility to infection and cause the disease to appear more severe. These factors increase the need for consultation. Of our patients, 70% required consultation with various departments. Our high consultation rate supports the need for a multidisciplinary approach among geriatric patients. The establishment of geriatrics units at universities and education and service hospitals can achieve a multidisciplinary solution for such complex issues. The establishment of geriatrics hospitals at large centres should also be considered. Our centre has no geriatrics department.

The accompanying problems of geriatric patients, such as malnutrition or dementia, can mask the signs and symptoms of infectious diseases. Classical symptoms and signs of infectious diseases may not be present in elderly patients. Auxiliary diagnostic procedures are needed more frequently because of this atypical course. Radiological imaging methods are the most prominent of these procedures. We applied imaging methods in 228 (65.1%) of our patients.

Many diseases, such as embolism, deep vein thrombosis or cerebrovascular disease, which must be supported with radiology for diagnosis,

are more common in elderly patients than in the younger population. Mass or metastases may be confused with the radiological appearance of many infectious diseases such as tularemia, tuberculosis. An experienced radiologist should be included in the multidisciplinary approach in geriatric patients. As in paediatric radiology, the establishment of geriatric radiology units and increased specificity will significantly contribute to an early diagnosis by clinicians.

The rate of development of infections with bacteraemia is higher in elderly patients than in young patients. Weakness of the immune system, comorbid conditions and more frequent invasive procedures increase the risk of bacteraemia (15). Infectious agents in the blood circulation mainly consist of Gram-positive bacteria (16). Lee et al. (17) found Gram-positive microorganisms in 30.4% and Gram-negative microorganisms in 56.2% of cases. In our study, 77.4% Gram-negative and 22.6% Gram-positive microorganisms were determined in bacteraemia. The high levels of Gram-negative bacteria can be explained by the diagnosis made during the hospitalization of the patients in our clinic. Bacteraemia with pyelonephritis and urosepsis was diagnosed in a significant proportion of inpatients.

In case of infection, the increase in leukocytes in elderly patients may be lower than expected. Studies have shown that 32%–49% of geriatric patients have no increase in WBC despite a serious infection (18). However, despite the normal leukocyte count, the increase in young neutrophils is remarkable (19). In our study, the numbers of leukocytes in 41% of our patients and the CRP values in 8.8% were normal. Current scientific literature supports the use of serum CRP levels to detect systemic infection in hospitalized geriatric patients, especially when clinical examinations and first-level diagnostic tests are negative or misleading. The role of CRP elevation in the diagnosis of localized infections in older patients

also needs further investigation (20). The change in serum albumin levels in elderly patients with an infection indicates an acute phase reaction rather than malnutrition. Changes in cytokine and hormone levels occur as part of the acute response. The increase in tumor necrosis factor (TNF)-α and IL-1 and IL-6 in sepsis inhibits albumin synthesis. The value of albumin was significantly lower in patients with urosepsis (p<0.05). The decrease in the albumin level in patients with sepsis may be explained by severe inflammation.

As a result, human life has been prolonged in parallel with rapid progress in the medical world. Comorbid conditions, frequent admissions to the hospital and medical interventions increase the risk of infection with resistant microorganisms among elderly people. Classical symptoms and signs of infectious diseases may not be present in elderly patients. Auxiliary diagnostic procedures are needed more frequently because of this atypical course. The multidisciplinary approach is essential to evaluate geriatric infections and a radiologist must be included in this team. In areas endemic for infectious diseases, tuberculosis, brucellosis, parasitic diseases and Crimean Congolese haemorrhage fever also can occur in elderly individuals. In this respect, doctors should be more sensitive and sceptical in the evaluation of elderly patients. Travel history should be questioned for elderly patients who are suspected to have an infection. These diseases should be considered in the differential diagnosis of individuals with a history of travel to the endemic regions. The limitations of the present study include its retrospective design and being a single-site study. Prospective and multi-site studies would enable acquisition of more accurate information.

Source of funding

Conflicts of interest

The authors have no conflicts of interest to declare.

REFERENCES

1. Cağatay AA, Tufan F, Hindilerden F, et al. The causes of acute fever requiring hospitalization in geriatric patients: comparison of infectious and noninfectious etiology. J Aging Res 2010;380892. (PMID:21151521).

2. Giray H, Meseri R, Saatlı G, Yucetin N, Aydın P, Ucku R. Proposal for elderly health care system in Turkey. TAF Prev Med Bull 2008;7:81-6. [Internet] Available from: http://www.tafmed.org/index.php?iid=2008-7-1.000&jid=1 Accessed: 27.02.2018. (in Turkish).

3. Avkan-Oğuz V, Yapar N, Erdenizmenli M, et al. Effects of community-acquired infections on fever, leukocyte count and the length of stay in elderly. A cross-sectional study of 240 cases. Saudi Med J 2006;27:368-72. (PMID:16532099).

4. Uluğ M, Çelen MK, Geyik MF, Hoşoğlu S, Ayaz C. The evaluation of geriatric infections: Dicle Experience. Nobel Med 2010;6(3):28-33. [Internet] Available from: http://www.nobelmedicus.com/Content/1/18/28-33.pdf Accessed: 27.02.2018. (in Turkish).

5. Saçar S, Cenger DH, Asan A, et al. Evaluation of geriatric infections in 50 cases. Pamukkale medical journal 2008;1(2):84-6. [Internet] Available from: http://www.journalagent.com/ptd/pdfs/PTD_1_2_84_86.pdf Accessed: 10.02.2018. (in Turkish).

6. Özen Y, Tanrıcı Baştuğ A, Öngürü P, et al. Evalutıon of gerıatrıc ınfectıons ın past sıx years. Turkish Journal of Geriatrics 2017;20(2):82-90. [Internet] Available from: http://geriatri.dergisi.org/uploads/pdf/pdf_TJG_975.pdf Accessed: 27.02.2018.

7. Ulutan F. Factors facilitating infection in old age and common features of older infection. Klimik Journal 2004;17:139-41. [Internet] Available from: http://www.klimikdergisi.org/sayilar/24/buyuk/139-141.pdf Accessed: 23.02.2018. (in Turkish).

8. Temel EN, Akçam FZ. The evaluation of infections in geriatric patients. S.D.U Journal of Health Science 2012;3(3):126-32. [Internet] Available from: http://dergipark.ulakbim.gov.tr/sdusbed/article/view/1089003600/1089003139 Accessed: 23.02.2018. (in Turkish).

9. Shanifi Mood B, Metanat M. Spectrum of clinical infectious diseases in hospitalized elderly patients in the southeast of Iran. Turk j Med Sci 2007;37:213-7. [Internet] Available from: http://journals.tubitak.gov.tr/medical/issues/sag-07-37-4/sag-37-4-5-0701-5.pdf. Accessed: 15.02.2018.

10. Common infections in the elderly people, In:Kutsal YG, Selekler K (Eds). Common problems in elderly people. 1st. edition, Ankara 2007, pp 43-62. (in Turkish).

11. Knockaert DC, Vanneste LJ, Bobbaers HJ. Fever of unknown origin in elderly patients. J Am Geriatr Soc 1993;41:1187–92. (PMID:8227892).

12. Kaplan M, Kuk S, Kalkan A, Demirdağ K, Özdarendeli A. Investigation of Fasciola Hepatica Seroprevalence in Elazığ Region. Bulletin Of Microbiology 2002; 36(4);337-42. (PMID:12838669) (in Turkish).

13. Koff AB, Rosen T. Treatment of cutaneous leishmaniasis. J Am Acad Dermatol 1994;31:693-708. (PMID:7523464).

14. Kontoyiannis DP, Lewis RE. Agents of mucormycosis and entomophthoramycosis, In:Mandell GL, Bennett JE, Dolin R (Eds). Infectious Diseases. 7th edition, Churchill Livingstone, USA 2010 pp 3257-69.

15. Corpuz MO. Infections in the elderly, In:Dharmarjan TS, Norman RA (Eds). Clinical Geriatrics. 1st. edition, New York, USA 2003, pp 475-8.

16. Kim HJ, Lee NY, Kim S, et al. Characteristics of microorganisms isolated from blood cultures at Nine University Hospitals in Korea during 2009. Korean J Clin Microbiol 2011;14(2):48-54. [Internet] Available from: https://doi.org/10.5145/KJCM.2011.14.2.48 Accessed: 27.02.2018.

17. Lee CY, Chen PY, Huang FL, Lin CF. Microbiologic spectrum and susceptibility pattern of clinical isolates from the pediatric intensive care unit in a single medical center - 6 years' experience. J Microbiol Immunol Infect 2009;42(2):160-5. (PMID:19597649).

18. Crossley KB, Peterson PK. Infections in the elderly, In:Mandell GL, Bennett JE, Dolin R (Eds). Mandell, Douglas, and Bennett's Principles and Practice in Infectious Diseases. 6th edition, New York, Churchill Livingstone 2005, pp 3517-24.

19. Ulutan F. Infectious Diseases in elderly, In: Kutsal YG (Ed). Basic Geriatrics for Physicians. 1st edition, Ankara 2011, pp 123-31. (in Turkish).

20. Ticinesi A, Lauretani F, Nouvenne A, et al. C-reactive protein (CRP) measurement in geriatric patients hospitalized. Eur J Intern Med 2017;37:7-12. (PMID:27594414).

■ Şebnem BEŞE CANPOLAT[1]

CORRESPONDANCE

Şebnem BEŞE CANPOLAT
Turkish Statistical Institute, Head of Demographic
Statistics Department, Ankara, Turkey

Phone: 3122405215
e-mail: sebnemcanpolat@gmail.com

[1] Turkish Statistical Institute, Head of
   Demographic Statistics Department, Ankara,
   Turkey

RESEARCH

CHANGES IN THE HOUSEHOLD STRUCTURES OF THE ELDERLY: HOUSEHOLD PROJECTIONS FOR TURKEY, 2016–2050

Abstract

Introduction: The main objective of this study was to analyze the current household patterns of the elderly in Turkey and project in what kinds of households the elderly will live in the future.

Materials and Method: The household structure of the elderly population was analyzed using tabulated data from Turkey's Address-Based Population Registration System, for the first time ever. Household projections were produced according to the headship rate method.

Results: The percentage of households with elderly persons will continuously increase, from 22.5% in 2016 to approximately 41% in 2050. The presence of elderly in all household types will continuously increase during that period, except extended-family households. While in 2016 9.9% of nuclear families lived with at least one elderly person, by 2050 this percentage will have risen to 19.6%. One-person elderly households will also continuously increase, from 5.4% in 2016 to 14.7% in 2050.

Conclusion: The elderly population in Turkey will mostly live in one-family households in the future, as is the case at present, but there will be an increase in the number of elderly living in one-person households. In 2050, about 15% of all households in Turkey will be one-person elderly households. The elderly will steadily move from co-residence lifestyles to single-resident lifestyles. The views expressed in this paper are those of the author and do not necessarily represent the official views of the Turkish Statistical Institute.

Keywords: Aged; Family characteristics; Demography; Life style

ARAŞTIRMA

YAŞLI BİREYLERİN HANEHALKI YAPISINDAKİ DEĞİŞİM: TÜRKİYE İÇİN HANEHALKI PROJEKSİYONLARI, 2016-2050

Öz

Giriş: Bu çalışmanın temel amacı Türkiye'de yaşlı nüfusun günümüzde yaşadığı hane halkı yapısının tespit edilmesi ve bu yapı ve değişimden yola çıkarak gelecekte yaşlı bireylerin ne tip hane halkı kompozisyonlarında yaşayacaklarının tespit edilmesi amacıyla hane halkı projeksiyonlarının üretilmesidir.

Gereç ve Yöntem: Yaşlı nüfusun hane halkı yapısı, Adrese Dayalı Nüfus Kayıt Sisteminin sonuçları kullanılarak ilk kez analiz edildi ve hane halkı projeksiyonları, hane halkı reisliği hızı yöntemi kullanılarak üretildi.

Bulgular: 2016 yılında %22.5 olan yaşlı birey içeren hane halkı oranı 2050 yılında sürekli bir artış ile %41'e ulaşacaktır. Hane halkı türündeki değişimi incelediğimizde, yaşlı hane halkları, 2016-2050 döneminde geniş-aile hane halkı tipi dışındaki tüm hane halkı türlerinde sürekli artmaktadır. En az bir yaşlı birey içeren çekirdek aile oranı 2016 yılında %9.9 iken bu oran 2050 yılında %19.6 olacaktır. Tek kişilik yaşlı hane halkı oranı da benzer şekilde sürekli bir artış göstererek 2016-2050 döneminde %5.4'ten %14.7'ye ulaşacaktır.

Sonuç: Yaşlılar Türkiye'de bugün olduğu gibi gelecekte de büyük oranda çekirdek hanelerde yaşayacak ve tek kişilik hane halklarında yaşayan yaşlı nüfus oranında da bir artış meydana gelecektir. 2050 yılında Türkiye'deki toplam hane halkının yaklaşık %15'i tek kişilik yaşlı hane halklarından oluşacaktır. Sonuç olarak, Türkiye'de yaşlıların birlikte yaşam biçiminden tek başına yaşam biçimine geçme eğilimde oldukları görülmektedir. Çalışmada ifade edilen görüşler tamamen yazara ait olup Türkiye İstatistik Kurumunu bağlamaz.

Anahtar sözcükler: Yaşlı; Aile özellikleri; Demografi; Yaşam tarzı

INTRODUCTION

One of the important demographic changes that characterize the early decades of the 21st century is the increasing aging of the human population. Both the number and proportion of people aged 65 years and older are growing, although at different rates in different parts of the world.

Turkey is undergoing a demographic transformation, like many parts of the world. Even though the proportion of elderly in Turkey is small, and other indicators of aging suggest that the age structure of Turkey is still relatively young when compared with the populations of developed countries, the increase in the elderly population in absolute numbers is significant, and the number of older adults is equal to the total populations of some small European countries. One of the major reasons for the aging of the Turkish population is the continuous decline in the total fertility rate, which is also being observed in developed countries. Another reason is the increase in longevity due to the declining mortality rate. In Turkey, life expectancy at birth is 78 years; 75.3 years for men and 80.7 years for women, according to the Turkish Statistical Institute (TurkStat) 2016 Life Table. If the current trends of demographic indicators persist, the Turkish population will continue aging. While the proportion of elderly in the total population was 7.7% in 2013, it reached 8.5% in 2017, and is expected to reach 10.2% in 2023 (1).

Due to the continuously increasing elderly proportion, it is necessary to examine the elderly's needs and concerns to understand how to care for them. The changes in the proportion of the older population, and its size, have profound implications for families. As the population gets older, in society the family performs the function of a buffer that aims to decrease the social and economic impact of population aging. In particular, demographic aging changes both household structure and household size.

In most developing countries, it is assumed that family, as an informal care institution, will continue their traditional role of taking care of the elderly. This approach or view causes the states in those countries to be inactive toward aging issues. Similarly, in Turkey, it is often assumed that households' members or relatives will automatically take on the responsibility of caring for the elderly. However, the traditional family is changing due to modernization, industrialization, and individualism (2,3). Even if there are still strong family ties in Turkey, this familial solidarity is affected by social, economic and demographic changes due to especially transformation from an agricultural to an industrial society and urbanization. Parent-child coresidence is not a norm in contemporary Turkey and adult children prefer to live nearby older family members and to have privacy while maintaining close family ties. Individuals in metropolitan areas might exchange with having "intimacy at a distance" by living nearby. From this perspective, nuclear families can be interpreted as acting functionally extended families (4-6).

In Turkey, the proportion of elders who want to coresidence with his/her children was 40.2%, the proportion of elders desiring to get home care service was 38.6% and the proportion of elders desiring to go nursing home was 7.7% according to the Family Structure Survey in 2016. The most important reason for desiring to stay in the nursing home of elderly individuals was that they do not want to be a burden on his/her children with 48.9%. The second important reason was that facilities in nursing home are more comfortable with 20.2% and the third important reason was that his/her children might not like to coresidence with them with 11.2% (7).

The Ministry of Family and Social Policy is the central institution for proposing, adopting, coordinating and improving social policies regarding older people at national level in

Turkey. In the "2017-2020 Active Aging Strategy Document" by the Ministry, the policies on aging were proposed mainly in the field of care and rehabilitation services. According to the records of the Ministry, in accordance with the Law No. 2022 on the "Providing Old-Age Assistance to Poor, Weakness and Homeless Turkish Republic People who Completed 65 Years Old" the number of beneficiaries who were found to be in need was 620.019, while the proportion was 9.3% in total elderly population in 2016 (7). Although this law seems to provide social protection to elderly, many of old persons cannot reach these salaries and other economical supports due to bureaucratic formalities. The average annual amount of benefit made per the elderly was 2 thousand 548 TL. This amount of salary is not too enough to provide a decent live for the elderly (8).

In 2017, the proportion of old people residing in institutional places is 0.4% in Turkey. This proportion shows us the insufficiency of the number of care facilities to meet the institutional care needs of old people. Due to inadequate formal care services, the unsatisfactory informal caring services have expanded continuously. It is obvious that the number of the older people grows rapidly in Turkey, elderly care needs will increase in the future. Therefore, the policies regarding old people institutional and especially home-based care in Turkey need to be adopted to provide decent lives for the elderly (8,9).

In the light of above mentioned facts, the main objective of this study was to analyze current household patterns in Turkey and project in what kinds of households older-aged people will live in the future, using tabulated data from Turkey's Address-Based Population Registration System (ABPRS). This study produced household projections for the 2020–2050 period, using the extrapolative headship rate household projection method.

MATERIALS AND METHOD

The main tabulated data on family and household typologies used by this study related to household types and were produced by TurkStat using information from Turkey's Central Civil Registration System and ABPRS for the years 2014, 2015, and 2016 (Table 1). Tabulated data was obtained by official data request to TurkStat Data Dissemination Group. For the first time, in May 2016, TurkStat produced and published statistics on household types, officially based on the administrative registers for both the country and its provinces.

These definitions and classifications of household types were adopted in line with international standards. "Household" refers to a person living alone, or a group of persons living at the same address, with or without any kind of kinship. The concept of "household-dwelling" was used as the method.

Headship rates were projected for four household types: one-person households, one-family (nuclear) households, extended-family households, and multi-person households without nuclear families. "One-person household" means a household that consists of a person living alone. Types of "nuclear families" can be grouped as follows: couples without resident children, couples with at least one resident child, and lone parents with at least one resident child. While "extended-family households" cover multi-family households, or at least one nuclear family with non-family member(s), "multi-person households without nuclear families" cover households whose members are not related to each other, as couples or as parent and child.

Generally, household and family projections are used to plan housing and building, the development of public utilities, and the production and distribution of consumer durables for which the units of consumption are households rather than individuals. Specifically, some concern has been

centered on the future growth of the number of families, the number of married couples, and the distribution of families by type (nuclear, patriarchal, etc.).

Although several types of household projection models have been developed over the past few decades (10), most existing household forecasts are based on a headship rate approach (static macro-demographic models). If basic population projections by sex and age are adequate, these can provide a reasonably accurate picture of the future number and composition of households. However, this method cannot take into account the dynamic aspects of household formation, growth, contraction, and dissolution (11,12).

There are some methodological advantages to the headship rate method of household projections over other methods. The headship rate method is based on the assumption that the number of households is equivalent to the number of heads of households (13):

$$h(i, j, t) = \frac{H(i,j,t)}{P(i,j,t)} \quad \text{(Equation 1)}$$

The formula for projecting the number of households may be presented as follows. Suppose that for year t + x (x years from the base year), population projections by sex and age have already been prepared, and the (sex) - age headship rates

*(Number of households)=(number of heads of households)=(total population) * (headship rate)*

The initial number of households and populations were categorized by head of household age. In this study, the oldest member of the household was assumed to be the head of the household. Studies have shown that the oldest member of the family, irrespective of their sex, is commonly declared the head of the household. Age is an important determining factor when declaring a household's head in Turkey.

To clarify the headship rate method, it may be useful to express the steps using an algebraic equation. Let P(i,j,t) be the population of sex i and age j at time t, and let H(i,j,t) be the number of heads of households or families by sex i, age j, and time t. Then, the headship rate specific for sex and age, at time t, h(i,j,t) is expressed using the following formula:

have been prepared using Equation 1, and the headship rates by age have been estimated, then the number of households for the year t + x can be obtained using the following equation:

Total number of future households in year t+x

$$\sum_i \sum_j H(i, j, t + x) = \sum_i \sum_j P(i, j, t + x) \times h(i, j, t + x) \quad \text{(Equation 2)}$$

In this study, an extrapolative method was used to produce household and family projections.

$$h(i, j, t + x) = 1 - \lceil 1 - h(i, j, t - n) \rceil \times \left[\frac{1 - h(i,j,t)}{1 - h(i,j,t-n)} \right]^{\frac{(t+x)-(t-n)}{n}} \quad \text{(Equation 3)}$$

This method implies that headship rates in all age groups will continue to rise indefinitely but at a gradually diminishing pace. In some cases, it is

possible to observe certain age groups showing decreases. However, the application of that formula to these age groups yields decreases in headship

rates at a rather accelerating pace, which is clearly in opposition to the purpose of this study. Accordingly, for these age groups, the following formula is used:

$$h(i, j, t + x) = h(i, j, t - n)\left[\frac{h(i,j,t)}{h(i,j,t-n)}\right]^{\frac{[(t+x)-(t-n)]}{n}}$$ (Equation 4)

Non-institutional population projections are required to make household/family projections. To make a non-institutional population projection, a total of more than 15 non-institutional populations included in the "Household Labor Force Statistics" published by TurkStat and the age distributions of the non-institutional populations obtained for the purposes of the author's PhD thesis calculations were used.

RESULTS

Four main family types were organized under subheadings, and these subheadings were analyzed as to whether they included individuals 65 years of age and over.

According to 2016 ABPRS data, while the proportion of one-family households in Turkey was 67.4% in 2014, one-family households comprised 66.4% of all households in Turkey in 2016. Extended-family households, which cover multi-family households or at least one nuclear family with non-family member(s), comprised 16.3% of all households in 2016. The proportions of one-person households and multi-person households without nuclear families were 14.9% and 2.4%, respectively, in 2016 (Table 1).

Table 1. Household types in Turkey, including elderly persons.

Type of households	Households without elderly			Households with elderly			Total		
	2014	2015	2016	2014	2015	2016	2014	2015	2016
One-person households	8.8	9.1	9.6	5.1	5.3	5.4	13.9	14.4	14.9
One-family households (nuclear family)	57.8	57.1	56.5	9.6	9.9	9.9	67.4	66.9	66.4
Extended-family households	9.6	9.6	9.5	7.1	6.9	6.7	16.7	16.5	16.3
Multi-person households without nuclear families	1.7	1.8	1.9	0.4	0.4	0.5	2.1	2.2	2.4
Total	77.9	77.5	77.5	22.1	22.5	22.5	100.0	100.0	100.0

Source: TurkStat; Available from http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24646 and http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24644 Accessed:12.09.2017.

There was at least one elderly person in 22.5% of all households in Turkey in 2016 (Table 1). In other words, one of every five households in Turkey included at least one elderly person. While 6.7% of households with elderly persons in 2016 were extended-family households, 9.9% of one-family (nuclear) households had elderly persons. The third type of household in which elderly persons lived was the one-person elderly household, type take place with a percentage of 5.4%.

While the above-mentioned rates were computed, two separate formulas exclusive to increases and decreases were utilized, to consider the variations in the years 2014–2016 (Annex 1). By using these computed headship rates and non-institutional population distributions, the distribution of household numbers was obtained (Table 3).

The household type percentages obtained using the headship rate extrapolative method are summarized in Table 2. According to the results of this study, the percentage of households with elderly persons will continuously increase, from 22.5% in 2016 to approximately 41.0% in 2050 (Table 2 and Figure 2). In Turkey, four of every ten households will be "elderly households" in 2050, based on current demographic conditions.

Table 2. Projected percentages of household types by year.

Years	One-person households		One-family households (nuclear family)		Extended-family households		Multi-person households without nuclear families		Total households	
	with elderly	without elderly	with elderly	without elderly	with elderly	without elderly	with elderly	without elderly	with elderly	without elderly
2016	5,4	9,6	9,9	56,5	6,7	9,5	0,5	1,9	22,5	77,5
2020	6,1	11,0	11,1	53,2	6,4	9,1	0,6	2,5	24,2	75,8
2025	7,2	12,5	12,3	49,5	5,8	8,7	0,9	3,1	26,2	73,8
2030	8,6	13,5	14,0	45,4	5,5	8,1	1,1	3,6	29,3	70,7
2035	9,9	14,6	15,0	42,2	5,0	7,7	1,4	4,1	31,4	68,6
2040	11,5	15,3	16,5	38,8	4,7	7,2	1,7	4,5	34,3	65,7
2045	13,1	15,7	18,1	35,4	4,3	6,6	2,1	4,7	37,6	62,4
2050	14,7	15,9	19,6	32,4	3,9	6,2	2,4	5,0	40,6	59,4

While a share of nuclear family and extended-family households show a continuous decline, a continuous increase in one-person and multi-person households will be observed during the 2016–2050 period (Figure 1). The percentages of extended-family and nuclear family households will decrease to 10% and 52%, respectively, in 2050. According to the results of the projections, the percentage of one-person households will reach 30.6% in 2050, a two-fold increase over a 35-year period (Table 2 and Figure 1).
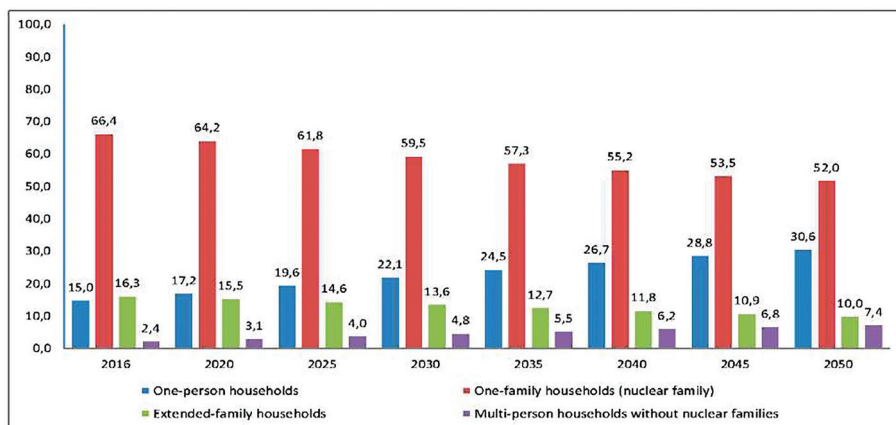
Figure 1. Percentage distributions of household types in Turkey, 2016–2050.

When household types with elderly persons are considered (Table 2 and Figure 2), households that include at least one elderly person will continuously increase during the 2016–2050 period, across all household types, except extended-family households. While the percentage of nuclear families with at least one elderly person was 9.9% in 2016, this percentage will be about 19.6% in 2050. One-person elderly households will also continuously increase during the 2016–2050 period, from 5.4% to 14.7%. The percentage of extended-family households with elderly persons will decrease, from 6.7% in 2016 to 3.9% in 2050.
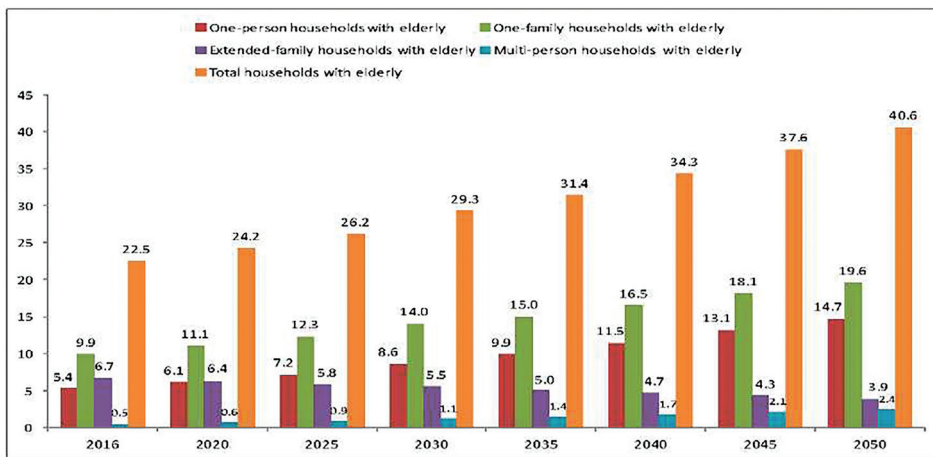

Figure 2. Percentage distributions of elderly households, 2016–2050.

Figure 3 shows the changes in household numbers during the 2016–2050 periods. According to the results of this study, the number of households in Turkey will approximately double between 2016 and 2050 -from 22 million to 41 million- and household growth will outpace population growth during every decade within this period.
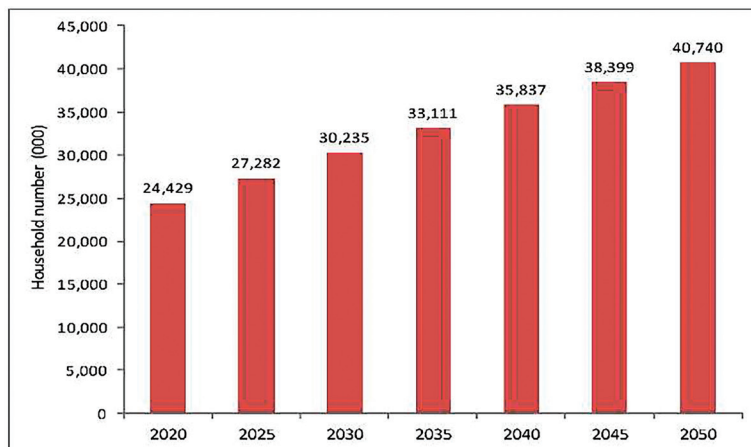

Figure 3. Projected household numbers in Turkey, 2020–2050.

Despite continuous increases in both the number of households and the number of people in Turkey, it can be observed that the average household size has decreased from 5.7 persons in 1955, and will continue to decrease between the present day and 2050, to 2.3 persons (Figure 4).

Table 3. Distribution of household numbers, according to the extrapolative headship rate method, 2020–2050.

| Household numbers - 2020 | | | | |
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families	Total households
<65	2,691,587	12,990,400	2,224,028	612,568	18,518,583
65-69	362,828	1,074,864	476,249	48,150	1,962,090
70-74	357,378	767,967	375,645	37,513	1,538,503
75-79	308,451	451,599	285,696	27,880	1,073,627
80+	469,958	408,801	415,451	41,518	1,335,728
Total	4,190,201	15,693,632	3,777,070	767,628	24,428,531

| Household numbers - 2025 | | | | |
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families	Total households
<65	3,403,527	13,509,359	2,380,614	853,535	20,147,035
65-69	436,129	1,218,966	462,107	70,950	2,188,152
70-74	481,267	1,032,784	400,100	60,129	1,974,279
75-79	433,133	619,416	321,327	44,715	1,418,591
80+	606,437	483,198	407,274	56,816	1,553,725
Total	5,360,494	16,863,724	3,971,421	1,086,144	27,281,782

| Household numbers - 2030 | | | | |
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families	Total households
<65	4,090,924	13,739,667	2,443,788	1,102,566	21,376,945
65-69	589,503	1,563,450	507,394	111,097	2,771,444
70-74	567,833	1,215,686	374,835	81,049	2,239,403
75-79	591,814	828,998	353,689	67,793	1,842,294
80+	849,821	630,595	441,276	83,676	2,005,368
Total	6,689,895	17,978,398	4,120,981	1,446,181	30,235,455

| Household numbers - 2035 | | | | |
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families	Total households
<65	4,826,620	13,976,732	2,549,944	1,363,588	22,716,885
65-69	613,610	1,551,786	431,353	129,412	2,726,162
70-74	756,778	1,615,103	398,047	120,115	2,890,043
75-79	704,176	968,413	340,713	87,767	2,101,069
80+	1,211,491	847,856	493,057	124,614	2,677,018
Total	8,112,676	18,959,890	4,213,115	1,825,495	33,111,176

| Household numbers - 2040 | | | | |
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families	Total households
<65	5,467,857	13,889,947	2,578,212	1,606,809	23,542,825
65-69	790,401	1,914,014	455,938	182,309	3,342,662
70-74	777,193	1,652,371	326,728	134,592	2,890,884
75-79	948,761	1,283,466	373,264	126,873	2,732,364
80+	1,587,965	1,058,601	512,054	169,906	3,328,526
Total	9,572,177	19,798,398	4,246,197	2,220,489	35,837,261

| Household numbers - 2045 | | | | |
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families	Total households
<65	6,011,638	13,574,556	2,551,425	1,823,860	23,961,478
65-69	936,566	2,179,558	445,141	232,454	3,793,719
70-74	990,309	2,096,350	333,677	184,534	3,604,870
75-79	981,980	1,308,841	315,332	139,432	2,745,585
80+	2,137,208	1,367,988	550,863	237,119	4,293,177
Total	11,057,701	20,527,292	4,196,438	2,617,399	38,398,829

| Household numbers - 2050 | | | | |
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families	Total households
<65	6,497,626	13,189,518	2,506,391	2,023,735	24,217,270
65-69	1,025,430	2,300,606	403,032	270,623	3,999,691
70-74	1,163,549	2,451,319	315,011	230,840	4,160,719
75-79	1,261,554	1,659,012	331,772	188,691	3,441,028
80+	2,535,583	1,568,466	526,214	291,003	4,921,266
Total	12,483,741	21,168,922	4,082,420	3,004,892	40,739,975
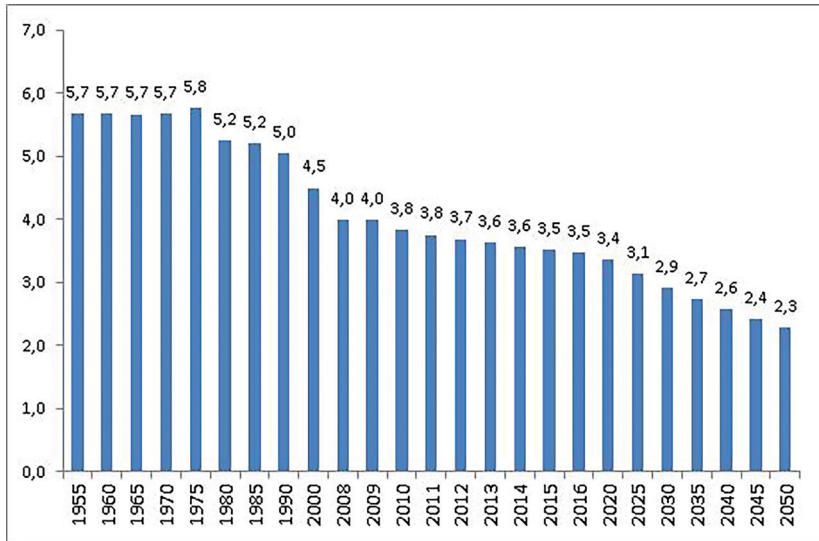
Figure 4. Changes in average household size in Turkey, by total population.

DISCUSSION

In this study, the living arrangements of elderly persons in Turkey have been investigated for the first time, using ABPRS tabulated data. As mentioned in introduction section, main purpose of this study to produce household projection for old people for the first time by using statistics from administrative registers in Turkey in order to raise awareness to living arrangements that is one of the key issues of elderly. It is obvious that there are strong effects of gender, educational level, regional difference, urbanization, religion and financial power of elderly on their living arrangements. There are many studies that include sociological and demographic models in order to examine the effects of these variables on living arrangements. While these studies have maintained their validity even though they were done in the beginning of 2000s, they didn't include any information about long term projection and change in household types. In the light of this study, alternative household projections can be produced in the future according to educational level, gender or urban-rural residential status of the reference person.

In the majority of developing countries, like Turkey, family members are trusted to meet the needs of and care for the elderly. However, families in Turkey are changing; traditional, complex family structures are eroding, and the average household size is decreasing. Changes that occur in the population dynamics affect the family and household structures in the society. The most common household type in Turkey is the one-family (nuclear) household. This study shows that while nuclear households are still common, they will be less common future than they are today, and one-person households will show a significant increase compared with the other household types. The results of this study are compatible with those of other studies that have used DHS data and census records (14-20).

In 2016, one of every five households in Turkey included at least one elderly person. This number will be two of every five households in 2050. The elderly will mostly live in one-family households in the future, as is the case at present, and there will be an increase in the number of elderly persons living in one-person households. Moreover, about 15% of households in Turkey will be one-person

elderly households in 2050. It is expected that a significant number of this households will comprise females. This study's argument is justified by related observations and field studies (18-20).

Theoretically, the composition of households in a country is similar to the size of the households in that country. According to the results of this study, the increase in single-person households and multi-homeless households with no nuclear family, and the decrease in the number of nuclear families and large family households, seem to be consistent with the declines in fertility and average household size in Turkey. In a study carried out by Bongaarts (21), it was determined that countries with relatively older populations tend to have smaller household structures. The decrease that has taken place in respect to fertility in industrialized countries in the 20th century is the main driving force behind the decrease that has taken place in average household sizes in Europe and North America. According to the author (21), the second reason for the decrease in household size is the decrease in the number of adults per household. It is stated that this decrease reflects the transition from the traditional, very complex household structure to the simpler, nuclear household structure in contemporary industrialized communities. The results of this study also show that the same situation is observable in Turkey and that despite continuous increases in both the number of households and people in Turkey, the average household size will decrease.

According to convergence theory, households tend to be less extended, more nuclear, and of smaller average sizes, as societies are industrialized and urbanization rates are increasing. Goode (22) foresaw the convergence of family systems around the world to be the conjugal type: *"Wherever the economic system expands through industrialization family patterns change. Extended kinship ties weaken, lineage patterns dissolve, and a trend toward some form of the conjugal system generally begins to appear – that is, nuclear family becomes*

a more independent kinship unit." According to Goode, the most important indicator of this transition is the weakening of ties with older generations. In commenting on the "weakening of the ties", Goode is referring to the lack of support for the elderly financially and physically, their lack of social interaction, and their increasing tendency to live separately. The same trend was also experienced during the industrialization process of European and North American societies. During the 150-year period 1850–2000, the average household size was dropped from 4 to 6 members to 2 to 3 members (21,22). In those countries, the nuclear family household type is now dominant. Demographic indicators show that the population in Turkey has also entered into this phase of aging. This study has projected the aged population structure after 2030, and its findings relating to the changes in household structures during that time and smaller household sizes are compatible with the results of the above-mentioned study and convergence theory.

In light of the findings of this study, it can be concluded that the elderly in Turkey will steadily move from co-residence lifestyles to single-resident lifestyles and that this transition tends to take away family support in the long-term care of the aging family member (23). In addition, long-term care needs and services are wide-ranging and complex. Under these conditions, the traditional methods that were employed to meet the needs of elderly family members will be insufficient, and the public services provided to this group in Turkey will be increasingly important and in need of intensification. In addition to these, as stated in the 10th Development Plan of Turkey, an effective home care system must be encouraged and supported. There is higher representation of older women in Turkey who are more dependent to another individual and institution from social, economic, cultural and legal point of views (24). In this context, variables such as gender and marital status that will cause fragility should also be taken into account in the policies of elderly care.

Annex 1. Headship rates according to the extrapolative method of the household headship rates.

Household headship rates of 2020				
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families
15-19	0.0024	0.0007	0.0000	0.0004
20-24	0.0444	0.0242	0.0010	0.0086
25-29	0.0642	0.1283	0.0075	0.0152
30-34	0.0514	0.2312	0.0175	0.0142
35-39	0.0438	0.2932	0.0318	0.0115
40-44	0.0448	0.3457	0.0433	0.0116
45-49	0.0493	0.3734	0.0529	0.0125
50-54	0.0542	0.3713	0.0779	0.0119
55-59	0.0710	0.3699	0.1042	0.0140
60-64	0.0895	0.3582	0.1389	0.0138
65-69	0.1230	0.3645	0.1615	0.0163
70-74	0.1708	0.3670	0.1795	0.0179
75-79	0.2315	0.3390	0.2145	0.0209
80+	0.3198	0.2781	0.2827	0.0282

Household headship rates of 2025				
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families
15-19	0.0010	0.0009	0.0000	0.0001
20-24	0.0517	0.0285	0.0013	0.0089
25-29	0.0790	0.1344	0.0084	0.0180
30-34	0.0642	0.2207	0.0188	0.0191
35-39	0.0533	0.2684	0.0382	0.0159
40-44	0.0564	0.3265	0.0520	0.0167
45-49	0.0618	0.3632	0.0552	0.0182
50-54	0.0653	0.3663	0.0706	0.0167
55-59	0.0838	0.3729	0.0875	0.0198
60-64	0.0999	0.3556	0.1223	0.0184
65-69	0.1329	0.3715	0.1408	0.0216
70-74	0.1811	0.3887	0.1506	0.0226
75-79	0.2480	0.3547	0.1840	0.0256
80+	0.3588	0.2859	0.2410	0.0336

Household headship rates of 2030				
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families
15-19	0.0004	0.0010	0.0000	0.0000
20-24	0.0588	0.0328	0.0016	0.0092
25-29	0.0937	0.1406	0.0093	0.0207
30-34	0.0769	0.2107	0.0201	0.0239
35-39	0.0628	0.2456	0.0445	0.0202
40-44	0.0679	0.3083	0.0607	0.0218
45-49	0.0741	0.3533	0.0575	0.0239
50-54	0.0763	0.3614	0.0639	0.0214
55-59	0.0965	0.3758	0.0735	0.0256
60-64	0.1102	0.3530	0.1077	0.0230
65-69	0.1427	0.3784	0.1228	0.0269
70-74	0.1913	0.4096	0.1263	0.0273
75-79	0.2642	0.3700	0.1579	0.0303
80+	0.3957	0.2936	0.2055	0.0390

Household headship rates of 2035				
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families
15-19	0.0002	0.0012	0.0000	0.0000
20-24	0.0660	0.0371	0.0019	0.0095
25-29	0.1081	0.1467	0.0102	0.0234
30-34	0.0895	0.2012	0.0214	0.0288
35-39	0.0721	0.2248	0.0508	0.0244
40-44	0.0792	0.2912	0.0693	0.0269
45-49	0.0863	0.3437	0.0598	0.0296
50-54	0.0872	0.3566	0.0578	0.0262
55-59	0.1090	0.3788	0.0617	0.0313
60-64	0.1203	0.3504	0.0948	0.0275
65-69	0.1523	0.3852	0.1071	0.0321
70-74	0.2014	0.4298	0.1059	0.0320
75-79	0.2800	0.3850	0.1355	0.0349
80+	0.4304	0.3012	0.1752	0.0443

Household headship rates of 2040				
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families
15-19	0.0001	0.0013	0.0000	0.0000
20-24	0.0731	0.0413	0.0022	0.0098
25-29	0.1222	0.1528	0.0111	0.0261
30-34	0.1018	0.1921	0.0227	0.0336
35-39	0.0814	0.2057	0.0570	0.0287
40-44	0.0904	0.2750	0.0778	0.0319
45-49	0.0983	0.3343	0.0620	0.0352
50-54	0.0980	0.3518	0.0524	0.0309
55-59	0.1213	0.3817	0.0518	0.0370
60-64	0.1304	0.3478	0.0835	0.0321
65-69	0.1619	0.3919	0.0934	0.0373
70-74	0.2113	0.4493	0.0888	0.0366
75-79	0.2954	0.3996	0.1162	0.0395
80+	0.4631	0.3087	0.1493	0.0496

Household headship rates of 2045				
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families
15-19	0.0000	0.0014	0.0000	0.0000
20-24	0.0801	0.0456	0.0025	0.0101
25-29	0.1362	0.1588	0.0120	0.0288
30-34	0.1140	0.1834	0.0240	0.0384
35-39	0.0905	0.1883	0.0632	0.0330
40-44	0.1014	0.2597	0.0862	0.0369
45-49	0.1101	0.3252	0.0643	0.0408
50-54	0.1086	0.3471	0.0474	0.0356
55-59	0.1335	0.3846	0.0435	0.0426
60-64	0.1403	0.3453	0.0736	0.0366
65-69	0.1713	0.3986	0.0814	0.0425
70-74	0.2211	0.4681	0.0745	0.0412
75-79	0.3105	0.4139	0.0997	0.0441
80+	0.4940	0.3162	0.1273	0.0548

Household headship rates of 2050				
Age of head	One-person households	One-family households (nuclear family)	Extended-family households	Multi-person households without nuclear families
15-19	0.0000	0.0016	0.0000	0.0000
20-24	0.0870	0.0498	0.0028	0.0104
25-29	0.1499	0.1648	0.0129	0.0315
30-34	0.1261	0.1750	0.0253	0.0431
35-39	0.0996	0.1723	0.0694	0.0372
40-44	0.1124	0.2453	0.0945	0.0419
45-49	0.1218	0.3163	0.0666	0.0464
50-54	0.1191	0.3425	0.0429	0.0402
55-59	0.1454	0.3875	0.0365	0.0483
60-64	0.1502	0.3427	0.0648	0.0411
65-69	0.1806	0.4052	0.0710	0.0477
70-74	0.2308	0.4863	0.0625	0.0458
75-79	0.3253	0.4278	0.0856	0.0487
80+	0.5231	0.3236	0.1086	0.0600

REFERENCES

1. Turkish Statistical Institute. Eldery Statistics, 2017. [Internet] Available from: http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=27595. Accessed:15.03.2018.

2. Kramarow EA. The elderly who live alone in the United States: historical perspectives on household change. Demography 1995 Aug;32(3):335-52. (PMID:8829970).

3. Palloni A. Living arrangements of older persons, In: United Nations Living arrangements of older persons: Critical issues and policy responses. Population Bulletin of the United Nations, Special Issue Nos. 42/43, United Nations, New York 2001, pp 54–110. [Internet] Available from: http://www.un.org/esa/population/publications/bulletin42_43/palloni.pdf. Accessed:11.12.2016.

4. Aytaç IA. Intergenerational living arrangements in Turkey. Journal of Cross-Cultural Gerontology 1998;13:241-64.

5. Aykan H, Wolf DA. Traditionality, modernity, and household composition: Parent–child coresidence in contemporary Turkey. Research on Aging 2000;22(4):95-42.

6. İçli G. Elderly people and adults. Elderly Issues Research Journal/Yaşlı Sorunları Araştırma Dergisi 2008(1):29-38. [Internet] Available from: http://dergipark.ulakbim.gov.tr/yasad/article/view/5000115883. Accessed: 16.3.2018.

7. Turkish Statistical Institute. Elderly Statistics, 2016. [Internet] Available from: http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=24644. Accessed:16.03.2018.

8. Sarıipek DA. Demographic shift and elderly care in Turkey. SGD Journal of Social Security 2016 Oct; 6(2):93-112. [Internet] Available from: http://dergipark.gov.tr/download/article-file/297671. Accessed: 16.3.2018.

9. Bulletin of Statistical Information on Elderly and Disabled People, January 2018. Republic of Turkey Ministry of Family and Social Policies, General Directorate of Services for Disabled and Elderly "online" publications. [Internet] Available from: http://eyh.aile.gov.tr/data/551169ab369dc57100ffbf13/B%C3%BClten-Ocak2018(son).pdf. Accessed:15.03.2018. (in Turkish).

10. Keilman N. Dynamic household models, In: Keilman, Kuijsten and Vossen (Eds). Modelling Household Formation and Dissolution. Clarendon Press of Oxford University Press, Oxford, 1988, pp 123-38.

11. Kono S. The headship rate method for projecting households, In: John Bongaarts, Thomas K. Burch, Kenneth W. Wachter (Eds). Family Demography. Clarendon Press of Oxford University Press, Oxford, 1987, pp 287-308.

12. Linke W. The headship rate approach in modelling households: The case of the Federal Republic of Germany, In:Nico Keilman, Anton Kuijsten, Ad Vossen (Eds). Modelling Household Formation and Dissolution. Clarendon Press of Oxford University Press, Oxford, 1988, pp 108-22.

13. United Nations. Manual VII Methods of Projecting Households and Families. Department of Economic and Social Affairs, Population Studies, No. 54, New York, 1973, pp 31-40. [Internet] Available from: http://www.un.org/esa/population/techcoop/SocInd/manual7/chapter4.pdf. Accessed:13.12.2017.

14. Ünalan T. Changing family structure in Turkey, 1968-1998, In: Tuljapurkar, Shripad, Pool, Ian, Prachuabmoh, Vipan (Eds.). Population, Resources and Development, International Studies in Population, Riding The Age Waves, Volume 1, Part III, The Netherlands, Springer, 2005 pp 181-201.

15. Kunt G. Family structure and fertility, In: Population Structure and Population Issues in Turkey. Hacettepe University Publications D–25, Ankara 1978, pp 133-46. (in Turkish).

16. Hancıoğlu A. Family types and household types in Turkey. The Turkish Journal of Population Studies/ Hacettepe University Institute of Population Studies 1985;7:61-76.

17. Özbay F. Family and Household Structure in Turkey: Yesterday, Today, and Tomorrow. In: Hacımirzaoğlu (Eds). Women and Men in 75 Years – Balance-sheet 98. İş Bankası Press, İstanbul, 1998, pp 155-172. (in Turkish).

18. Koç İ. The timing of leaving parental home and its relationship with other life course events in Turkey. Marriage and Family Review 2007;42(1):15-22.

19. Ünalan T. The status of the old age population in Turkey. The Turkish Journal of Population Studies/ Hacettepe University Institute of Population Studies 2000;22(1):25-35.

20. Koç İ, Özgören A, Şirin H. Quality of Life among Elderly in Turkey and the Impact of Family Structure (Chapter 7). In: Fertility, Reproductive Health and Ageing in Turkey. HUIPS, Ministry of Health, SPO and TUBİTAK, Ankara, ISBN 978-975-491-290-6, 2010, pp 231-83. [Internet] Available from: http://www.hips.hacettepe.edu.tr/turkiyede_dogurganlik_ureme_sagligi_yaslilik_160910.pdf . Accessed:08.09.2017. (in Turkish).

21. Bongaarts J. Household size and composition in the developing world. Population Council 2001, Working Paper No 144. [Internet] Available from: https://pdfs.semanticscholar.org/f3d9/07bdc2a5018d9f508cc48fa1ee9974cc74fa.pdf. Accessed:08.09.2017.

22. Cherlin AJ. Goode's world revolution and family patterns: a reconsideration at fifty years. Population and Development Review 2012;38(4):577-607.

23. Eryurt MA. Elderly Population in Turkey and Preferences for Elderliness, In: Research on Family Structure in Turkey Findings, and Recommendations. T.R. Ministry of Family and Social Policies General Directorate of Family and Community Services, ISBN: 978-605-4628-55-1, Ankara, 2014, pp 90-111. [Internet] Available from: http://ailetoplum.aile.gov.tr/data/54292ce0369dc32358ee2a46/taya2013eng.pdf. Accessed:12.09.2017.

24. Arun Ö. Widowhood: the most salient problem for elderly women in Turkey. Gaziantep University Journal of Social Sciences 2011 ;10(4):1515-27. (in Turkish).

■ Ferdane Özlem AKARSU[2]
■ Ferdi KÖŞGER[1]
■ Altan EŞSİZOĞLU[1]
■ Belgin Demet
   ÖZBABALIK ADAPINAR[3]

CORRESPONDANCE

Altan EŞSİZOĞLU
Eskişehir Osmangazi University, Faculty of
Medicine, Department of Psychiatry, Eskişehir,
Turkey

Phone: 2222392979
Fax: 2222392979
e-mail: altanessizoglu@gmail.com

[1] Eskişehir Osmangazi University, Faculty of
   Medicine, Department of Psychiatry,
   Eskişehir, Turkey
[2] Eskişehir Osmangazi University, Faculty of
   Medicine, Department of Neurology,
   Eskişehir, Turkey
[3] Eskişehir Acıbadem Hospital, Neurology
   Clinic, Eskişehir, Turkey

THEORY OF MIND IN AMNESTIC MILD COGNITIVE IMPAIRMENT AND ITS RELATIONSHIP WITH LANGUAGE AND MEMORY FUNCTIONS

ABSTRACT

Introduction: Although it has been proven that theory of mind functions is deteriorated in amnestic type mild cognitive impairment, the relationship between this deterioration and cognitive functions has not been researched. The aim of this study is to compare amnestic type mild cognitive impairment patients with healthy individuals in terms of theory of mind functions and to determine the relationship between theory of mind functions and the functions of language and memory in amnestic type mild cognitive impairment patients.

Materials and Method: Thirty-eight patients with amnestic type mild cognitive impairment were compared with 34 healthy individuals in this study. The Reading the Mind in the Eyes Test, Hinting Test, Boston Naming Test, Wechsler Adult Intelligence Scale-Revised Vocabulary Test Score, Öktem Verbal Memory Process Test, and Clock Drawing Test were used for evaluation.

Results: The scores of the amnestic type mild cognitive impairment group in the tests evaluating theory of mind functions and the functions of language, memory and Clock Drawing Test were lower than those of the control group. The scores of the amnestic type mild cognitive impairment group in the tests evaluating the theory of mind functions were not associate with the tests evaluating the functions of language and memory.

Conclusion: Amnestic type mild cognitive impairment patients perform worse in terms of affective and cognitive theory of mind functions compared with healthy aging individuals. The impairment of theory of mind functions in amnestic type mild cognitive impairment patients is thought to be independent of the deterioration of language and memory functions.

Keywords: Cognitive dysfunction; Theory of mind; Memory; Language

AMNESTİK TİP HAFİF KOGNİTİF BOZUKLUKTA ZİHİN KURAMI VE DİL VE BELLEK İŞLEVLERİ İLE İLİŞKİSİ

ÖZ

Giriş: Amnestic tip hafif kognitif bozuklukta, zihin kuramı işlevlerinin bozulduğu ortaya konmasına karşın bu bozulmanın bilişsel işlevlerle olan ilişkisi araştırılmamıştır. Bu çalışmanın amacı amnestic tip hafif kognitif bozuklukta bulunan hastalar ile sağlıklı kişileri zihin kuramı işlevleri bakımından karşılaştırmak ve amnestic tip hafif kognitif bozuklukta zihin kuramı işlevlerinin dil ve bellek işlevleri ilişkisini belirlemektir.

Gereç ve Yöntem: Bu çalışmada 38 amnestic tip hafif kognitif bozukluk hastası ile 34 sağlıklı katılımcı karşılaştırılmıştır. Değerlendirme amacıyla Gözlerden Zihin Okuma Testi, İmayı Anlama Testi, Boston Adlandırma Testi, Wechsler Yetişkinler İçin Zeka Ölçeği Revize Formu Sözcük Dağarcığı Alt Testi, Öktem Sözel Bellek Süreçleri Testi, Saat Çizme Testi kullanılmıştır.

Bulgular: Bu çalışmada amnestic tip hafif kognitif bozukluk grubu kontrol grubuna göre zihin kuramı işlevlerini değerlendiren testler ile dil ve bellek işlevlerini değerlendiren testlerden ve Saat Çizme Testi'nden kontrol grubuna göre daha düşük puan almıştır. Amnestic tip hafif kognitif bozukluk grubunun zihin kuramı işlevlerini değerlendiren testlerden aldığı puanların dil ve bellek işlevlerini değerlendiren testler ile ilişkili olmadığı saptanmıştır.

Sonuç: Amnestic tip hafif kognitif bozuklukta hastaları ile sağlıklı yaşlanan kişiler arasında affektif ve kognitif zihin kuramı işlevi açısından daha kötü performans göstermektedir. Amnestic tip hafif kognitif bozuklukta hastalarındaki zihin kuramı işlevlerindeki bozulmanın dil ve bellek işlevlerindeki bozulmadan bağımsız olduğu düşünülmüştür.

Anahtar sözcükler: Kognitif bozukluk; Zihin kuramı; Bellek; Dil

INTRODUCTION

Mild cognitive impairment (MCI) accompanied by complaints about memory is called amnestic type MCI (aMCI). The diagnostic criteria for aMCI are complaints about memory confirmed by a patient's relative, an ordinary course of general cognitive functions and daily life activities, the existence of a memory disorder determined by age and education norms, and the absence of dementia (1).

The concept of theory of mind (ToM) is defined as an individual's ability to realize that others have different mind from his/her own and to understand and represent his/her own and others' mental status as intentions, belief, desires, and level of knowledge. Two types of ToM have been defined as cognitive ToM and affective ToM (2).

The importance of evaluating the functions of ToM to make predictions about the possibility of MCI transforming into Alzheimer's disease (AD) has motivated researchers to conduct studies, which have identified that patients with aMCI perform worse in terms of ToM functions (3). The relationship between cognitive and ToM functions in patients with aMCI has not been studied.

The purpose of this study is to compare aMCI patients with healthy individuals in terms of ToM functions and to determine the relationship between ToM functions and the functions of language and memory in aMCI patients.

MATERIALS AND METHOD

Sample

The study sample was composed of patients admitted to the neurology polyclinic between October 2012 and June 2014 with complaints of dysmnesia. Those who were diagnosed with aMCI, and accepted to participate in the study were assigned to the patient group, while those who were not diagnosed with aMCI but were willing to take part in the study were assigned to the control group. The inclusion criteria for both groups were age 50 years or older, literate, scoring 24 or over on the Standardized Mini-Mental State Examination, scoring 0.5 or lower on the Clinical Dementia Rating Scale, and scoring 3 or lower on the Hachinski Ischaemic Scale. Meeting the Petersen Criteria was an additional criterion for inclusion in the aMCI group. Taking a type of medication affecting cognitive function, having a history of head trauma, scoring 14 or over on the Geriatric Depression Scale, having focal brain injury, and alcohol and drug abuse were the exclusion criteria. Seven patients were excluded due to the changes observed in brain MR imaging, four patients were excluded due to alcohol use, and three patients were excluded due to nonacquiescence to participate in the study. Therefore, data collection methods were applied to 38 patients diagnosed with aMCI and 34 individuals in the control group.

Data collection methods

Sociodemographic characteristics and clinical features information form: The features of age, gender, marital status, education status, income level, employment and economic status, and information related to the patient's and his/her relatives' accounts about amnesia, dementia family history, head trauma, general anesthesia intake after 50 years of age, smoking, and alcohol and substance use were collected through this form.

Clinical Dementia Rating (CDR) Scale: This scale was developed to evaluate the functional destruction in AD (4); it is used to measure a patient's cognitive and functional performance. The purpose of using this scale in the study is to identify whether the participant meets the necessary criteria for participation in the study.

Standardized Mini-Mental State Examination (SMMSE): This is a commonly used cognitive survey tool (5), and the validity and reliability of its Turkish version have been completed (6).

The Reading the Mind in the Eyes Test (Eyes Test): Eyes Test was developed to evaluate affect

recognition (7). The validity and reliability of the Turkish version have been assessed (KR_{20} was 0.72) (8). During the administration of the test, the participant is instructed to check the choice that best suits his/her thoughts and feelings about the eyes in the image. A high score indicates good affective ToM function.

Hinting Test: One of the stories applied to second-tier ToM functions was used in this study (9). Through this story, the ability to uncover the real intention behind implicitly stated expressions is evaluated. The participant is told a story, wherein Elif, whose birthday is coming, tells her father that she loves animals, especially dogs. Then, the participant is asked what Elif's real intention is and scores two points if he/she gives the correct answer. If the participant cannot give the correct answer, then the story is continued by recounting another of Elif's statements, wherein she asks her father whether pet shops are open on her birthday. Then, the participant is asked what Elif wants her father to do. The correct answer scores one point at this stage. If there is no correct answer, the participant does not score any points. This story has been used in previous studies in Turkey. In this study, a similar methodology has been used in terms of statistics (10).

Boston Naming Test (BNT): This test is used to evaluate naming ability skill (11). The shortened version containing 31 images was used in this study. The Turkish adaptation and norm determination study of the test is completed but not has been published yet.

Wechsler Adult Intelligence Scale-Revised Vocabulary Subtest (WAIS-R): Developed by Wechsler (12), this vocabulary subtest (WAIS-R/VTS) is used to measure the abilities of vocabulary use and self-expression, sensitivity to new information, storage in the long-term memory, and re-grouping when necessary. The Turkish standardization study of the test has been completed (13).

Öktem Verbal Memory Process Test (Öktem-VMPT): This test has been developed to research verbal learning and memory in terms of multiple factors. The Öktem-VMPT has been standardized, and normal scores have been identified for the variables age, gender, and education (14). The Immediate memory, Learning, Achieving Criteria, Spontaneous Recall, and Recognition subtests were used in this study. This test was also used to identify the criteria for determination of memory impairment (the case in which the score for episodic memory is lower than normal values as 1.5 standard deviation) when adapted to the Petersen Criteria.

Clock Drawing Test (CDT): This test is a part of the Boston Diagnostic Aphasia Examination (15), and the validity and reliability of the Turkish version have been assessed (16). The cognitive features measured by the test are comprehension, planning, visual memory and reconstruction, visual-spatial ability, motor planning and method, digital information, abstract thinking, inhibiting the tendency created by the physical features of the stimulant, concentration, and tolerance against detention.

Geriatric Depression Scale (GDS): Based on self-report assessment, this scale is used to identify depression in the elderly (17). The validity and reliability of the Turkish version have been assessed (18).

Functional Activities Questionnaire (FAQ): Based on self-report assessment, this questionnaire evaluates 10 mixed daily activities (19). A Turkish adaptation study of the FAQ suitable for the 50 years and older age group has been completed (20).

Statistical analysis

The data obtained were analyzed in Statistical Package for Social Sciences 21.0 version. The Kolmogorov–Smirnov test was applied in order to show the normal distribution (95% confidence interval). The groups were compared in terms of normally distributed, continuous numerical variables by t-test, non-normally distributed variables by

Mann–Whitney U test, and categorical variables by Pearson's Chi-Square test. For the purpose of identifying the variables predicting the scores of the aMCI group on the Eyes Test and Hinting Test, linear regression analysis was applied to the variables that were determined to have statistical significance.

RESULTS

The proportion of participants who graduated from primary school in the aMCI group was significantly higher than that in the control group, whereas the duration of education and monthly income of the aMCI group were found to be significantly lower (X^2=8.943 and p= 0.011; z=-2.36 and p=0.018; z=-2.09 and p=0.036, respectively) (Table 1).

The FAQ scores of the aMCI group were significantly higher than those of the control group (z=-2.921 and p<0.01). The aMCI group scored significantly lower than the control group on the Eyes Test; SMMSE; Immediate Memory, Learning Score, Spontaneous Recall, Recognition, BNT, WAIS-R/VST; CDT; and Hinting Test (t=-5.013 and p<0.001; z=-5.681 and p<0.001; z=-4.487 and p<0.001; z=-6.009 and p<0.001; z=-6.925 and p<0.001; z=-3.346 and p<0.01; z=-3.543 and p<0.001; z=-5.249 and p<0.001; z=-3.710 and p<0.001; z=-3.386 and p<0.01, respectively) (Table 3).

According to the result of linear regression analysis, the score of the aMCI group on the Eyes Test and Hinting Test were not predicted by the independent variables (Table 4 and 5).

Table 1. Comparison of the aMCI and control groups in terms of sociodemographic data.

	aMCI (n= 38)	Control (n= 34)		
	mean±sd	mean±sd	t/z	P
Age	64.89±6.00	62.38±5.03	1.911	0.060
Duration of education (year)*	8.92±4.21	11.53±4.41	−2.36	0.018
Monthly income*	2329.47±1751.11	3295.88±2319.50	−2.09	0.036
	n (%)	n (%)	x^2	P
Gender			1.583	0.208
Female	19(46.3%)	22(53.7%)		
Male	19(61.3%)	12(38.7%)		
Marital Status			0.632	0.729
Single	2 (40.0%)	3(60.0%)		
Married	31 (52.5%)	28 (47.5%)		
Widowed/divorced	5 (62.5%)	3 (37.5%)		
Education Level			8.943	0.011
Primary school	22 (73.3%)	8 (26.7%)		
High school	8 (42.1%)	11(57.9%)		
University	8 (34.8%)	15(65.2%)		
Employment			1.496	0.473
Housewife	13 (61.9%)	8 (38.1%)		
Employed	3 (37.5%)	5 (62.5%)		
Retired	22 (51.2%)	21 (48.8%)		

* Mann–Whitney U test

Table 2. The comparison of aMCI and control groups in terms of some characteristics.

	aMCI (n=38)	Control (n=34)		
	n (%)	n (%)	x^2	p
Amnesia (relative)			5.105	0.024
Yes	20 (69.0%)	9 (31.0%)		
No	19 (61.3%)	12 (38.7%)		
Amnesia (self-report)			3.512	0.061
Yes	31 (59.6%)	21 (40.4%)		
No	7 (35.0%)	13 (65.0%)		
History of head trauma			2.316	0.128
Yes	1 (20.0%)	4 (80.0%)		
No	37 (55.2%)	30 (44.8%)		
Family dementia history			1.116	0.291
Yes	12 (61.9%)	7 (38.1%)		
No	26 (49.1%)	27 (50.9%)		
History of psychiatric treat.			3.453	0.063
Yes	8 (80.0%)	2 (20.0%)		
No	30 (48.4%)	32 (51.6%)		
General anesthesia after 50			0.317	0.574
Yes	10 (47.6%)	11 (52.4%)		
No	28 (54.9%)	23 (45.1%)		
Smoking			0.399	0.819
Yes	6 (54.5%)	5 (45.5%)		
No	22 (50.0%)	22 (50.0%)		
Gave up	10 (58.8%)	7 (41.2%)		

Table 3. Comparison of the aMCI and control groups in terms of neurocognitive tests, ToM, and scales.

	aMCI (n=38)	Control (n=34)		
	mean±sd	mean±sd	t/z	p
Eyes Test	15.00±4.15	19.82±3.98	−5.013	<0.001
SMMSE*	27.60±1.28	29.47±0.74	−5.681	<0.001
Immediate Memory*	5.07±1.66	7.38±2.01	−4.487	<0.001
Learning*	103.39±18.32	130.82±11.57	−6.009	<0.001
Achieving Criteria*	4.00±4.23	5.26±2.01	−1.182	0.237
Spontaneous Recalling*	10.34±1.69	14.11±1.00	−6.925	<0.001
Recognition*	13.55±1.75	14.67±0.58	−3.346	<0.01
BNT*	28.00±2.73	30.00±1.45	−3.543	<0.001
WAIS-R (VTS)	47.78±10.28	60.41±6.37	−5.249	<0.001
CDT*	4.42±0.85	4.97±0.17	−3.710	<0.001
Hinting Test*	1.52±0.55	1.91±0.28	−3.386	<0.01
GDS*	11.50±6.18	9.73±4.82	−1.175	0.240
FAQ*	0.65±1.23	0.06±0.34	−2.921	<0.01

* Mann–Whitney U

Table 4. Regression analysis results of the factors predicting the total score of the aMCI group on the Eyes Test.

Independent Variables	B	SE	Standardized β	t	p
Constant	-2.428	22.251	-	-0.109	0.914
Education	-1.372	1.736	-0.427	-0.790	0.439
Period of education	0.308	0.517	0.311	0.596	0.558
Monthly income	0.001	0.001	0.367	1.124	0.275
Amnesia (relative)	-2.110	1.773	−0.282	-1.190	0.249
SMMSE	0.445	0.761	0.138	0.585	0.565
Immediate memory	0.003	0.746	0.001	0.004	0.997
Learning	0.062	0.091	0.265	0.677	0.507
Spontaneous recalling	0.757	0.839	0.303	0.902	0.379
Recognition	-0.832	0.766	−0.319	-1.087	0.291
BNT	-0.273	0.553	−0.178	-0.493	0.628
WAIS-R (VTS)	0.210	0.169	0.512	1.245	0.228
CDT	0.056	1.275	0.11	0.44	0.965
Hinting test	2.155	1.658	0.288	1.304	0.208
FAQ	0.144	1.023	0.034	0.112	0.912

Table 5. Regression analysis results of the factors predicting the total score of the aMCI group in the Hinting Test.

Independent Variables	B	SE	Standardized β	t	p
Constant	4.800	2.747	-	1.748	0.097
Education	−0.26	0.235	−0.061	-0.113	0.912
Period of education	-0.018	0.069	−0.134	-0.256	0.800
Monthly income	-1.915	0.000	−0.061	0.181	0.858
Amnesia (relative)	-0.034	0.244	−0.034	-0.139	0.891
SMMSE	-0.109	0.099	−0.254	-1.105	0.283
Immediate memory	-0.109	0.096	−0.328	-1.137	0.270
Learning	0.009	0.012	0.296	0.763	0.455
Spontaneous recalling	-0.104	0.111	−0.310	-0.930	0.364
Recognition	0.002	0.105	0.005	0.016	0.987
BNT	0.015	0.074	0.075	0.208	0.837
WAIS-R (VTS)	0.009	0.023	0.168	0.396	0.696
CDT	-0.034	0.169	−0. 051	-0.200	0.843
FAQ	-0.185	0.129	−0.413	-1.429	0.169
Eyes Test	0.038	0.029	0.285	1.304	0.208

DISCUSSION

The number of primary school graduates in the aMCI group was higher than those in the control group, whereas the mean of duration of education and the average monthly income of the aMCI group was lower than those of the control group. Although it is not exactly known to what extent a higher level of education affects AD, it has been indicated that a higher level of education may have an important function, because people with higher education more easily develop strategies to compensate for the possible adverse effects of cognitive impairment in the early stages of AD, and hence the effects of symptoms on daily life present late (21). The risk of developing AD decreases at a rate of 17% for each extra year of education, while having a lower economic level and a lower status occupation poses an increased risk of AD development (22). Considering that aMCI poses a risk of AD development, the results of this study suggest that duration of education and economic level also influence the risk of aMCI. Since there are few studies, there is a need for more studies to be performed on this aspect.

When the groups were compared in terms of complaints about amnesia, the relatives of the aMCI group reported more cases of amnesia complaints than those of the control group. Concurrently, the aMCI group scored lower than the control group on the Öktem-VMPT (Immediate Memory, Learning, Spontaneous Recalling, and Recognition), which was performed to evaluate verbal memory. Among the clinical diagnostic criteria for aMCI are the items of "memory problem expressed by the patient himself" and "identifying the memory problem adjusted for age" (1). The scores of the aMCI group on the FAQ were higher than those of the control group. However, the average score of the aMCI group was within the normal limits when the normal scores for these age

groups was considered. Therefore, the aMCI group met the "the daily life activities of the patient are normal with regard to his/her age" criterion, which is requisite for the diagnosis of aMCI.

The language skills scores of the aMCI group in the BNT and WAIS-R/VST were lower than those of the control group. Impaired language skills in aMCI patients have also been proven by similar studies performed with the same tests as those used in this study (23). The aMCI group scored lower than the control group on the Hinting Test. While ToM functions are typically impaired with increasing age, several studies have indicated that particularly second-tier ToM functions are deteriorated in aMCI patients, posing a risk for AD development (24). For this reason, as the deterioration of ToM functions in aMCI patients could be observed in clinical presentation, it is important that this deterioration has the potential to identify patients who will develop AD. This result agrees with that of a similar study in which aMCI patients scored lower than healthy elderly in terms of first- and second-tier false-belief tasks. The performance of aMCI patients in the Eyes Test was also lower than that of the control group, although the difference was not significant. The aMCI group was also compared with healthy controls in terms of ToM functions by using brain imaging methods, and it was concluded that activation of the superior temporal sulcus (STS) in the right hemisphere, which is related to affective ToM, is lower in aMCI patients than in healthy controls. Researchers have indicated that the decrease in STS activation in aMCI patients is an early neural finding of the deterioration of affective ToM functions that will develop in the future (24). According to the results of this study, the Eyes Test performance of aMCI patients was significantly lower than that of healthy controls, which disagrees with the aforementioned study. The possible reason for this difference may be that this study was performed on a larger sample.

It was indicated in this study that language and memory functions expected to deteriorate in aMCI patients did not predict the impaired cognitive and affective ToM functions, contrary to the case in healthy controls. It has been reported that ToM and cognitive functions are independent of each other (10). Our study supports this result, and we conclude that cognitive and affective ToM functions also become impaired independently of language and memory functions in aMCI patients.

The limitations of this study are that it is of a cross-sectional nature, was conducted on a small sample, did not evaluate first-tier ToM functions, and there were differences between the groups in terms of period of study and the level of income.

The fact that the Hinting Test used in this study is easier to administer than other tests measuring the second-tier ToM functions and the narrow scoring range may have affected the results. On the other hand, this test may be insufficient in terms of measuring ToM functions compared to complex tests. The inadequacy of SMMSE in the differential diagnosis of MCI is another limitation of our study.

Finally, this study indicates that cognitive and affective ToM functions deteriorate independently of language and memory functions in aMCI patients. There is a need for further detailed studies to determine whether cognitive and affective ToM functions play a role in the evaluation of the risk of aMCI transformation into AD.

REFERENCES

1. Petersen RC. Mild cognitive impairment as a diagnostic entity. J Intern Med 2004;256(3):183-94. (PMID:15324362).

2. Tager-Flusberg H, Sullivan K. A componental view of theory of mind: evidence from syndrome. Cognition 2000;76(1):59-90. (PMID:10822043).

3. McCade D, Savage G, Guastella A, Lewis SJG, Naismith SL. Emotion recognition deficits exist in mild cognitive impairment, but only in the amnestic subtype. Psychol Aging 2013;28(3):840-52. (PMID:24041005).

4. Hughes CP, Berg L, Danziger WL, Coben LA, Martin RL. A new clinical scale for the staging of dementia. Br J Psychiatry 1982;140:566-72. (PMID:7104545).

5. Folstein MF, Folstein SE, Mc Hugh PR. "Mini-mental state." A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12(3):189-98. (PMID:1202204).

6. Güngen C, Ertan T, Eker E, Yaşar R, Engin F. Reliability and validity of the standardized mini mental state examination in the diagnosis of mild dementia in Turkish population. Turkish Journal of Psychiatry 2002;13(4):273-81. (PMID:12794644).

7. Baron-Cohen S, Wheelwright S, Hill J, Raste Y, Plumb I. The "Reading the mind in the eyes" test revised version: a study with normal adults, and adults with Asperger Syndrome or high-functioning autism. J Child Psychol Psychiatry 2001;42(2):241-51. (PMID:11280420).

8. Yıldırım EA, Kaşar M, Güdük M, Ateş E, Küçükparlak İ, Özalmete EO. Investigation of the reliability of the "Reading the Mind in the Eyes Test" in a Turkish population. Turkish Journal of Psychiatry 2011;22(3):177-86. (PMID:21870307).

9. Corcoran R, Mercer G, Frith CD. Schizophrenia, symptomatology and social inference: investigating "theory of mind" in people with schizophrenia. Schizophr Res 1995;17(1):5-13. (PMID:8541250).

10. Eşsizoğlu A, Köşger F, Akarsu FÖ, Özaydın Ö, Güleç G. Theory of mind and selective attention, response inhibition, cognitive flexibility in patients with schizophrenia. Arch Neuropsychiatry 2017;54(2):162-7. (PMID:28680315).

11. Kaplan E, Goodglass H, Weintraub S. The Boston Naming Test. Lea & Febiger, Philadelphia 1983, pp 1-60.

12. Wechsler D. WAIS-R Manual: Wechsler Adult Intelligence Scale-Revised. The Pschological Corporation, New York 1981, pp 1-156.

13. Sezgin N, Baştuğ G, Yargıcı Karaağaç S, Yılmaz B. Turkish standardization of Wechsler Adult Intelligence Scale-Revised (WAIS-R): pilot study. Ankara University Journal of Languages and History-Geography 2014;54(1):451-80. (in Turkish).

14. Tanör ÖÖ. Handbook of Öktem Verbal Memory Process Test (Öktem-VMPT). Publication of Turkish Psychological Association, Ankara 2011, pp 1-97. (in Turkish).

15. Goodglass H, Kaplan E. The assessment of aphasia and related disorders. Philadelphia, Lea and Febiger 1983, pp vii-70.

16. Cangöz B, Karakoç E, Selekler K. The norm determination and validity-reliability studies of clock drawing test on Turkish adults and elderlys (ages 50 and over). Turkish Journal of Geriatrics 2006;9(3):136-42.

17. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, Leirer VO. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatric Research 1983;17(1):37-49. (PMID:7183759).

18. Ertan T, Eker E. Reliability, validity and factor structure of the Geriatric Depression Scale in Turkish elderly: are there different factor structures for different cultures. Int Psychogeriatr 2000;12(2):163-72. (PMID:10937537).

19. Pfeffer RI, Kurosaki TT, Harrah CH, et al. Measurement of functional activities in older adults in the community. J Gerontol 1982;37:323-9.

20. Selekler K, Cangöz B, Karakoç E. Adaptation and norm determination study of the Functional Activities Questionnaire (FAQ) on Turkish adults (ages 50 and over). Turkish Journal of Neurology 2004;10(2):102-7.

21. Cho H, Jeon S, Kim C, et al. Higher education affects accelerated cortical thinning in Alzheimer's disease: a 5-year preliminary longitudinal study. Int Psychogeriatr 2015;27(1):111-20. (PMID:25226082).

22. Evans DA, Hebert LE, Beckett LA, et al. Education and other measures of socioeconomic status and risk of incident Alzheimer disease in a defined population of older persons. Arch Neurol 1997;54(11):1399-405. (PMID:9362989).

23. Balthazar FLM, Cendes F, Damasceno BP. Semantic error patterns on the Boston Naming Test in normal aging, amnestic mild cognitive impairment and mild Alzheimer's disease: is there semantic disruption. Neuropsychology 2008;22(6):703-9. (PMID:18999343).

24. Baglio F, Castelli I, Alberoni M, et al. Theory of mind in amnestic mild cognitive impairment: an fMRI study. J Alzheimers Dis 2012;29(2):25-37. (PMID:22156049).

■ Nilgün MESCİ[1]
■ Erkan MESCİ[2]

CORRESPONDANCE

Nilgün MESCİ
University of Health Sciences, Haydarpaşa
Numune Training and Research Hospital,
Department of Physical Medicine and
Rehabilitation, İstanbul, Turkey

Phone: 02165664000
e-mail: nilgunbilgili@yahoo.com

[1] University of Health Sciences, Haydarpaşa
  Numune Training and Research Hospital,
  Department of Physical Medicine and
  Rehabilitation, İstanbul, Turkey
[2] Medeniyet University, Goztepe Training and
  Research Hospital, Department of Physical
  Medicine and Rehabilitation, İstanbul, Turkey

RESEARCH

ASSOCIATION OF ULTRASONOGRAPHIC MEASUREMENTS OF UPPER ARM AND THIGH MUSCLE THICKNESS WITH FUNCTIONAL CAPACITY AND BALANCE IN ELDERLY INDIVIDUALS

Abstract

Introduction: Muscle loss is associated with increased frailty in the geriatric population. In this study, we aimed to explore the association of ultrasonographic measurements of extremity muscle thickness with functional capacity, balance and falls.

Materials and Method: Fifty patients aged >65 years were enrolled. Upper arm and thigh muscle thicknesses were measured using ultrasound, and hand grip strength was measured using a handheld dynamometer. The functional capacity of lower extremity was assessed on the basis of walking speed and a chair stand test. The timed up and go test and four square step test were used to evaluate dynamic balance. The fear of falling was assessed using Tinetti's Scale.

Results: The mean age of patients was 71.8±5.7 years. Measurements of the thigh muscle thickness of patients were negatively correlated with walking speed, timed up and go test, four square step test and the fear of falling (p<0.01) and positively with chair stand test (p<0.05) and hand grip strength (p<0.001). Hand grip strength was positively correlated with chair stand test and negatively with walking speed, timed up and go test, four square step test and Tinetti's scores (p<0.01). Measurements of upper arm muscle thickness were positively correlated with hand grip strength (p<0.01).

Conclusion: Ultrasonographic assessment of lower extremity muscle thickness seems to improve the predictability of decline in functional capacity and loss of balance, possibly contributing to prevention of falls in the elderly.

Keywords: Muscular atrophy; Sarcopenia; Ultrasonography

ARAŞTIRMA

YAŞLI BİREYLERDE ULTRASONOGRAFİ İLE ÖLÇÜLEN ÜST KOL VE UYLUK KAS KALINLIKLARININ FONKSİYONEL KAPASİTE VE DENGE İLE İLİŞKİSİ

Öz

Giriş: Yaşlı popülasyonda kas kayıplarının kırılganlığı artırdığı bilinmektedir. Bu çalışmada ultrasonografi ile ölçülen ekstremite kas kalınlıklarının fonksiyonel kapasite, denge ve düşmeler ile ilişkilerini incelemeyi amaçladık.

Gereç ve yöntem: Çalışmaya 65 yaş üstü 50 olgu dahil edildi. Ultrasonografi ile üst kol ve uyluk kas kalınlıkları, el dinamometresi ile el kavrama kuvveti ölçüldü. Alt ekstremite fonksiyonel kapasitesi 10 metre yürüme hızı ve otur kalk testi ile değerlendirildi. Dinamik dengenin değerlendirilmesinde zamanlı kalk yürü testi ve dört kare adım testi kullanıldı. Düşme korkusu Tinetti ölçeği ile değerlendirildi.

Bulgular: Elli olgunun yaş ortalaması 71.8±5.7 yıl olarak saptandı. Hastaların uyluk kas kalınlıkları; yürüme hızı, zamanlı kalk yürü testi, dört kare adım testi ve düşme korkusu ile negatif (p değerleri<0.01), otur kalk testi (p<0.05) ve el kavrama kuvveti (p<0.001) ile pozitif yönde ilişkili idi. El kavrama kuvveti de otur kalk testi ile pozitif, yürüme hızı, zamanlı kalk yürü testi, dört kare adım testi ve Tinetti skorları ile negatif yönde ilişkili bulundu (p<0.01). Üst kol kas kalınlıkları ise sadece el kavrama kuvveti ile pozitif yönde ilişkili idi (p<0.01).

Sonuç: Yaşlılarda ultrasonografi ile alt ekstremite kas kalınlıklarının değerlendirilmesi, fonksiyonel kapasite ve denge kayıplarının öngörülebilirliğini artırarak; düşmelerin önlenmesine katkı yapabilir gibi görünmektedir.

Anahtar sözcükler: Kas atrofisi; Sarkopeni; Ultrasonografi

INTRODUCTION

The loss of muscle mass associated with ageing has adverse effects on muscle functioning in the geriatric population (1). The evaluation of muscle mass, muscle strength and physical performance is required for the diagnosis of sarcopenia in the geriatric population. To this end, dual-energy X-ray absorptiometry (DXA), bioimpedance analysis (BIA), anthropometric measurements, the assessment of hand grip strength (HGS) and walking speed (WS) and some physical performance tests are performed in clinical practice (2). HGS is a simple measure of muscle strength, and the age-related reduction in HGS strongly correlates with the loss of strength in other muscle groups (3).

Ultrasonography has been increasingly used in recent years to evaluate muscle mass and quality. Ultrasound is a safe and effective method for the assessment of muscle mass and offers several advantages such as low cost, the ease of use and relative accessibility (4). As has been reported in the literature, sarcopenia is not a uniform condition but affects postural muscles more than non-postural muscles (5,6). Therefore, since general modalities such as DXA and BIA fail to clearly establish sarcopenia, it is recommended that loss of muscle mass be evaluated using ultrasound in a site-specific manner to obtain an early and definite diagnosis (7,8). Some studies have shown that the manifestations of sarcopenia appear first in the thigh, particularly involving the quadriceps, before whole-body sarcopenia can be diagnosed (9). Thigh sarcopenia may be detected using ultrasonography as an initial finding before sarcopenia develops in the entire body (10).

Sarcopenia increases the risk of falls and frequency of fractures because of the accompanying loss of muscle strength and performance (11). Associations between low muscle mass and reduced muscle strength, HGS,

WS and functional capacity have been investigated in the geriatric populations (12). However, limited data exist on the potential associations of the measurements of ultrasonographic muscle thickness (MT) and balance and the risk of falls. The ultrasound-assessed extremity MT may improve the predictability of potential balance problems and the risk of falls in the geriatric population. In this study, we aimed to investigate correlations between the ultrasonographic measurements of upper and lower extremity MT and HGS, WS, lower extremity functional capacity tests, the fear of falling, number of falls and dynamic balance tests.

MATERIALS AND METHOD

Patients aged >65 years who presented with chronic musculoskeletal problems at our physical therapy and rehabilitation outpatient clinics were enrolled. Approval to conduct the study was obtained from the local ethics committee of our hospital. All patients provided written informed consent before participating in the study.

Elderly patients with advanced lumbar spine pathology with postural and neurological disorders, advanced-stage osteoarthritis, cognitive dysfunction, chronic neurological disorders affecting mobility, impaired vision, vestibular pathology or vertigo causing imbalance were excluded. Demographic characteristics, including age, sex, body mass index (BMI), were recorded for all patients.

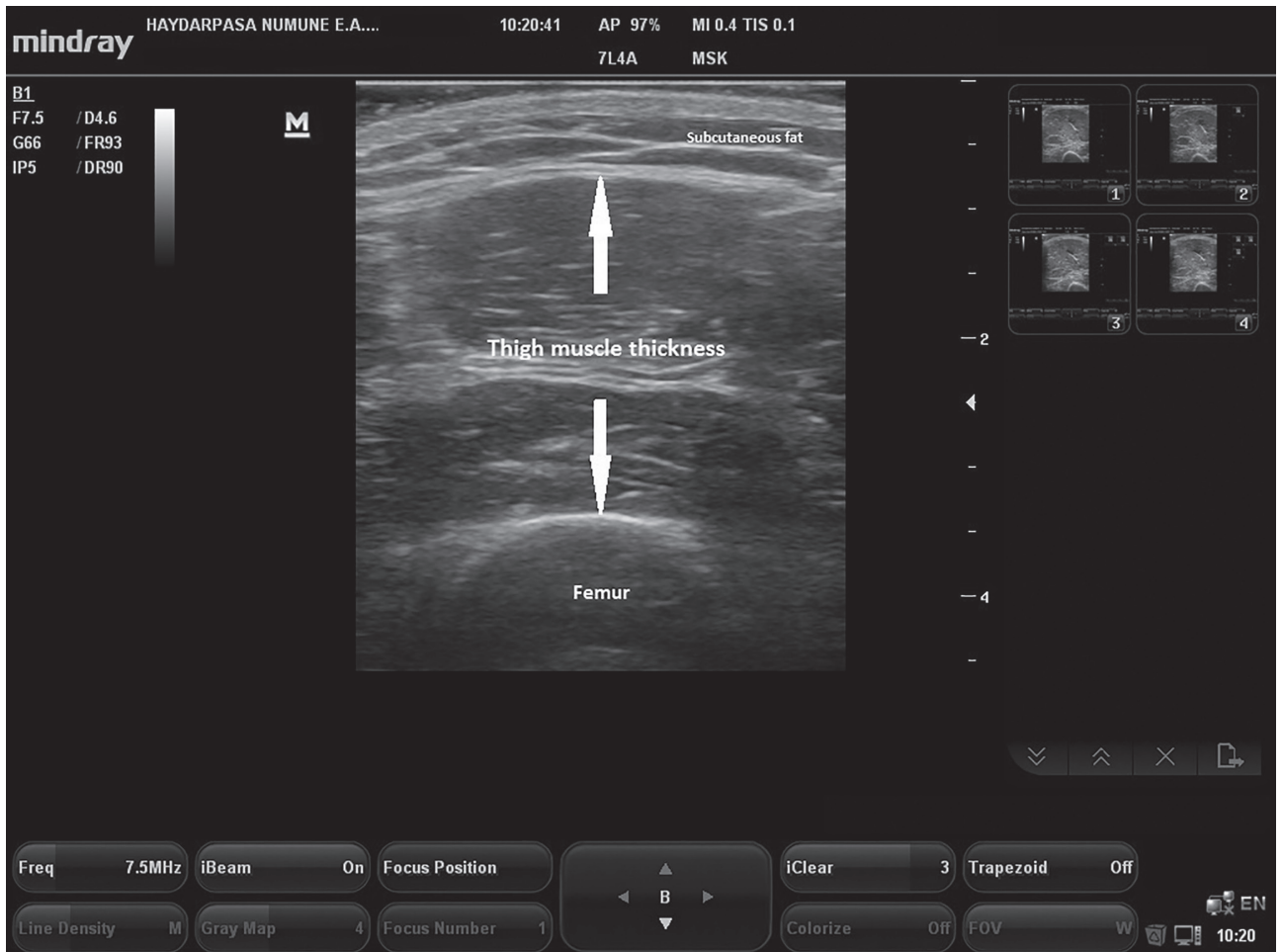### Measurement of extremity muscle thickness

Upper arm and thigh muscle thicknesses were measured using a Mindray DC-T6 ultrasound device (China) using a 5–10 MHz linear probe. All measurements were performed by a certified physiatrist with expertise in musculoskeletal ultrasonography. Upper arm MT was obtained from the anterior surface of the dominant arm,

60% distal from the distance between the acromial process of the scapula to the lateral epicondyle of the humerus while the elbow was in the extended and supinated position (12). Thigh MT was measured at the anterior surface of the dominant thigh, two-thirds distal from the anterior superior iliac spine to the upper pole of the patella with the patient lying in supine position and the knee extended (13). The distance from the fascia of the biceps muscle to the humerus was measured for the upper arm and that from the fascia of the rectus femoris muscle to the femur was measured for the thigh, with the probe placed in the transverse plane on the respective muscles (14) (Figures 1 and 2). MT data (in mm) averaged for three static measurements, each obtained from the upper arm and thigh, were included in the analysis. Because the height and body weight of the individual affects the extremity MT, muscle thickness must be estimated in proportion to the height, weight or BMI (7). In this study, we estimated thigh and arm MT in proportion to BMI.

Figure 1. Ultrasound measurement of thigh muscle thickness.
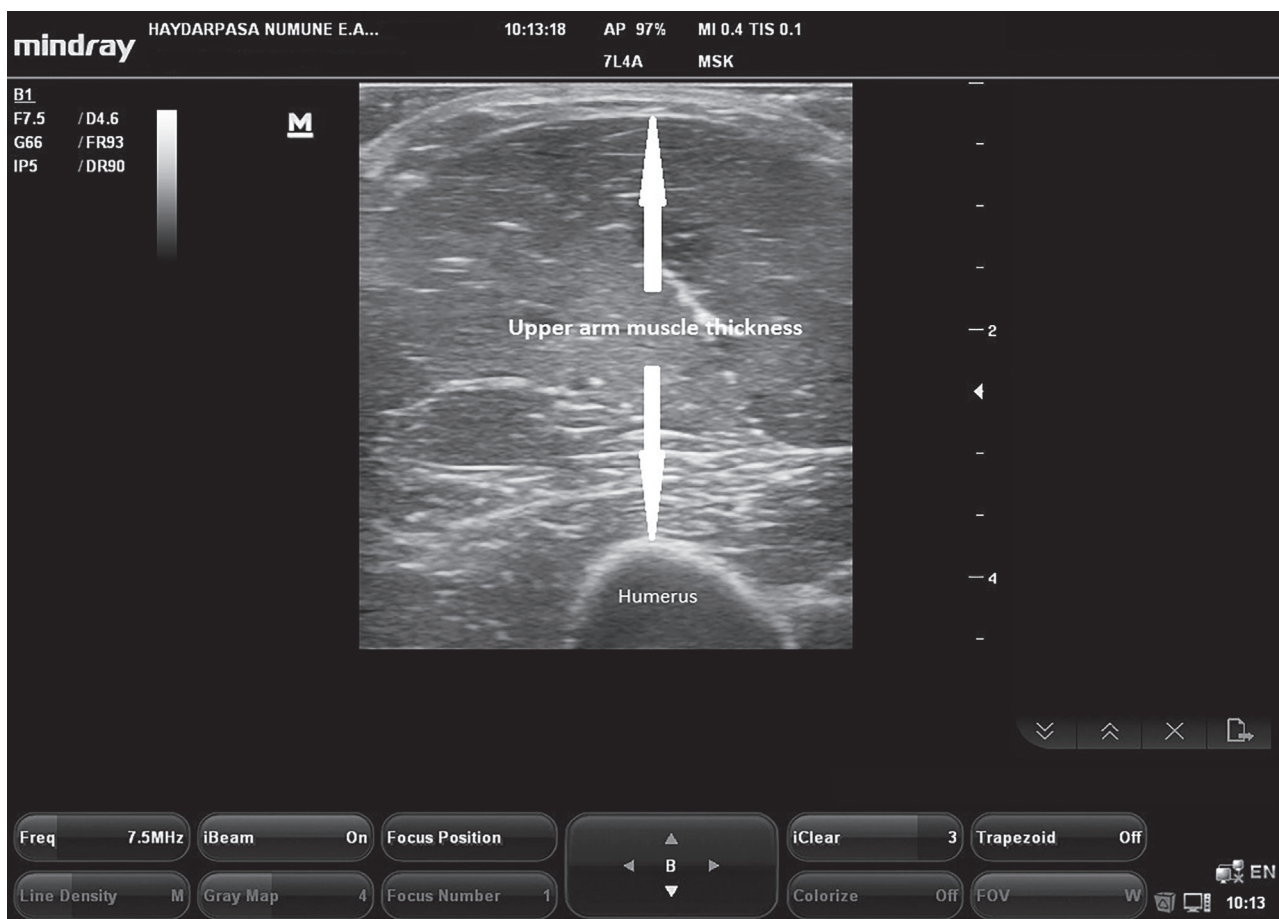
Figure 2. Ultrasound measurement of upper arm muscle thickness.

Assessment of hand grip strength

Hand grip strength of patients was measured from the dominant extremity using the Baseline hydraulic hand dynamometer (Irvington, NY, USA) while patients sat with their elbows at 90° flexion and shoulders at 0° abduction in neutral position (15). Patients were asked to grip as hard as they could. Three measurements were taken, each at 30-s intervals, and the average value (in kg) was calculated.

Assessment of functional capacity of lower extremity

The 10-m walk test and chair stand test (CST) were performed to evaluate the functional capacity of the lower extremity. To estimate the 10-m WS, the time spent (in s) by the patient in walking on a predetermined 10-m walkway was measured and recorded. For the CST, the patient was seated at the centre of a 43-cm high chair with the back in upright position and hands placed on contralateral shoulders. The test score was determined on the basis of the number of chair stands taken during the 30-s period.

Assessment of dynamic balance

Dynamic balance was evaluated using the timed up and go test (TUGT) and four square step test (FSST). The TUGT is a measurement of the time (in s) that a person takes to rise from a chair, walk 3 m,

turn around, walk back to the chair and sit down. The TUGT is recommended as an indicator of dynamic balance in the geriatric population (16).

In the FSST, a square is formed using four canes resting flat on the floor. The patient is asked to step as fast as possible into each square, sequentially numbered in a clockwise direction, with both feet contacting the floor in each square without touching the canes. The patient starts from the first square and moves into the second, third and fourth squares in a clockwise direction and then in the reverse direction to complete the sequence (17).

Assessment of number of falls and fear of falling

All patients were asked the number of falls that they had had in the previous year. The Falls Efficacy Scale (FES), developed by Tinetti, was used to evaluate the fear of falling (FOF). The FES is a 10-item questionnaire that is designed to assess patients' confidence in their ability to perform 10 daily tasks without falling, acting as an indicator of the impact of patients' FOF on their physical performance. The total possible score ranges from 0 and 100, higher scores indicating greater fear of falling (18).

Statistical analysis

Descriptive statistics (mean±sd and minimum, median and maximum) were used to summarise continuous variables. Correlation between normally distributed continuous variables was analysed using Pearson's coefficient of correlation and that between non-normally distributed variables was analysed using Spearman's coefficient of correlation. The statistical significance level was set at 0.05. Based on the sample estimation study using Pearson's coefficient of correlation, the sample size was calculated as 41 according to the correlation between thigh MT/BMI and the CST. Type I error rate was set at 5% and testing power at 80%. The analysis and sample size determination were conducted using MedCalc Statistical Software, version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2013).

RESULTS

Of the 50 patients, 41 (82%) were female and nine (18%) were male. The mean±sd age of patients was 71.8±5.7 years, and the mean BMI was 28.1±4.1 kg/m^2. Demographic characteristics of patients are shown in Table 1. Twenty-four percent of patients were illiterate, 36% were primary school graduates, 24% were high school graduates and 16% were university graduates.

Average values for upper and lower extremity MT, HGS, lower extremity functional capacity indicators and balance and fall scales are presented in Table 1. Correlation analyses showed that the thigh MT/BMI ratios of patients were negatively correlated with the 10-m walk test (p=0.004), TUGT (p=0.000) and FSST (p=0.005) and positively correlated with the CST (p<0.05) and HGS (p=0.000). However, the upper arm MT/BMI ratio was not correlated with the 10-m walk test, the CST, TUGT, or FSST but was positively correlated with HGS (p=0.001). Tinetti's FES scores were negatively correlated with thigh MT/BMI ratios but not with upper arm MT/BMI ratios. While the thigh MT/BMI ratios were negatively correlated with the number of falls, the upper arm MT/BMI ratios showed no such correlation (Table 2).

Hand grip strength was positively correlated with the CST and negatively correlated with 10-m walk test, TUGT, FSST, Tinetti's FES scores and the number of falls. The CST scores showed strong negative correlations with the 10-m walk test, balance tests (TUGT and FSST), FES scores and the number of falls. However, the 10-m walk test showed strong positive correlations with dynamic balance test (TUGT and FSST) and Tinetti's FES scores. TUGT and FSST scores showed highly significant associations with FES scores, indicating a FOF. FSST, TUGT and FES scores were also positively correlated with the number of falls (Table 3).

Table 1 . Demographic characteristics of patients.

Characteristics of the study sample (n=50)	
Age, years	71.8±5.7 (65-86)
Sex (% females)	41 (%82)
BMI, kg/m^2	28.1±4.1
Thigh MT/BMI	0.89±0.17
Upper arm MT/BMI	0.96±0.18
Handgrip, kg	18 (9-30)[a]
Chair stand test	9 (6-16)[a]
10 meter walk test, s	10 (6.5-17)[a]
Timed up and go test, s	11 (7-18)[a]
Four square step test, s	14.6±3.2
Tinetti	12 (9-33)[a]
Falls	0 (0-3)[a]

[a] Median (minimum-maximum), BMI: body mass index, kg: kilogram, m: meter, MT: muscle thickness, s: second

Table 2. Correlation analyses of muscle thickness with other parameters.

		ARM MT/BMI	THIGH MT/BMI
HANDGRIP	r	,461[1]	,512[2]
	P	,001**	,000***
CHAIR STAND TEST	r	151	,298[1]
	P	,297	,036*
10 METER WALK TEST	r	-,182	- ,404[1]
	P	,206	,004**
TIMED UP AND GO TEST	r	-,174	- ,475[1]
	P	,227	,000***
FOUR SQUARE STEP TEST	r	-,152	-,391[1]
	P	,293	,005**
TINETTI	r	-,236	-,416[1]
	P	,099	,003**
FALLS	r	-,099	-,297[1]
	P	,495	,037*

∗ p<0,05, ∗∗ p<0,01, ∗∗∗ p<0,001. [1] low correlated, [2] moderately correlated. BMI: body mass index, MT: muscle thickness

Table 3. Correlation analyses of balance, falls and functional capacity parameters.

		FALLS	HANDGRIP	CST	10-M WT	TUGT	FSST	TINETTI
HANDGRIP	r	1,000						
	P							
CST	r	,435[1]	1,000					
	P	,002**						
10-M WT	r	- ,413[1]	-,790[3]	1,000				
	P	,003**	,000***					
TUGT	r	-,475[1]	-,784[3]	,924*	1,000			
	P	,000***	,000***	,000***				
FSST	r	-,433[1]	-,790[3]	,769[3]	,786[3]	1,000		
	P	,002**	,000***	,000 ***	,000***			
TINETTI	r	-,447[1]-,447	-,684[2]	,661[2]	,670[2]	,699[3]	1,000	
	P	,001**	,000***	,000***	,000**	,000**		
FALLS	r	-,309[1]	-,431[1]	,286	,300[1]	,425[1]	,483[1]	1,000
	P	,029*	,002**	,044*	,034*	,002*	,000***	

* p<0,05, ** p<0,01, *** p<0,001. [1] low correlated, [2] moderately correlated, [3] highly correlated, [4] very highly correlated. CST: chair stand test, FSST: four square step test, TUGT: timed up and go test, 10-M WT: 10 meter walk test

DISCUSSION

Falls and related injuries are one of the major health problems among the geriatric population. Sarcopenic elderly adults carry a considerably greater risk of falling than healthy elderly adults (19). Our results showed that reduced thigh MT has adverse effects on the functional performance of the lower extremities and postural stability and increases the frequency of falls and FOF in our geriatric patients. In line with our findings, Abe et al has revealed an inverse relationship between mid-thigh MT ratios, as measured by ultrasound, with zigzag walking time in geriatric patients (10). Decreased thigh muscle mass is a recognised predictor of the decline in gait speed (20). Age-related ultrasonographic changes in thigh muscle quality have been shown to be associated with reduced muscle strength (21). Our findings suggest that measurements of thigh MT are positively correlated with HGS, which is an indicator of upper extremity performance. Similarly, Guerreiro et al have demonstrated a significant association between quadriceps MT and HGS, gait speed and the TUGT (22). In the context of the literature data, our results suggest that ultrasonographic measurements of thigh MT

can predict declines in the functional capacity of the lower extremity and loss of dynamic balance in the geriatric population.

In our results, upper arm MT was positively correlated with HGS (an indicator of upper extremity performance) but not with lower extremity functional performance and dynamic balance tests. Similar findings supporting the association of upper extremity MT with HGS have been previously reported. The lack of association between upper extremity MT and gait speed at advanced ages as reported in literature also lends support to our findings. Abe et al have reported the correlation of forearm MT with HGS but not with gait speed. Thus, they suggested that forearm MT is a useful parameter for the assessment of HGS and total muscle mass (12). We did not identify any study in the literature that could allow us to make direct comparisons with our findings showing the lack of association between upper extremity MT with balance tests, FOF and the number of falls.

Hand grip strength is an important component of the diagnostic algorithm of sarcopenia and a well-known predictor of lower extremity functional capacity in the geriatric population (3,23,24). Consistent with previous findings, HGS was associated with lower extremity performance tests in our study. Additionally, we showed that HGS was negatively correlated with balance tests, FOF and the number of falls, which had not been previously demonstrated. Thus, we believe that measurements of HGS can be a used as a predictor of reduced postural stability and the risk of falls.

Low muscle mass and reduced muscle strength and physical performance are risk factors for an increased FOF in the sarcopenic geriatric population (25). An early detection of the functional disability and loss of postural control associated with sarcopenia is crucial to preventing falls, fractures and related morbidity and mortality in the geriatric population. An inability to test functional capacity and postural control because

of age-related physiological deterioration or various health problems is common in the geriatric population. Devising a simple, convenient and time-saving tool that could be used irrespective of the physical status of the patient to predict the loss of balance, reduced functional capacity and the presence of sarcopenia in the geriatric population would greatly improve geriatric patient care and preventive rehabilitation efforts for the geriatric population. In that regard, the association between the measurements of thigh MT and HGS with both lower extremity performance and dynamic balance tests and the number of falls, as demonstrated in this study, represents a major finding.

Our study has a number of limitations. First, postural stability in our study population was not assessed using one of the more objective methods, such as posturography. Second, MT was measured for only one muscle group from each of the upper and lower extremities. Third, our study was designed as a cross-sectional study. Prospective studies involving long-term follow-up for falls and development of fractures in the geriatric population, with ultrasonographic MT data available, are needed.

In conclusion, reduced thigh muscle thickness is associated with lower functional capacity, balance problems and falls in the geriatric population. While reduced muscle mass in the lower extremities results in a loss of balance, upper extremity muscle thickness may not be a determinant of balance performance. The ultrasonographic measurements of thigh muscle thickness and determination of HGS could assist in the prevention of fractures related to falls by improving the early detection of the loss of balance and decreased functional capacity in the geriatric population.

Conflict of interest

None.

REFERENCES

1. Cruz-Jentoft AJ, Baeyens JP, Bauer JM, et al. Sarcopenia: European consensus on definition and diagnosis: Report of the European Working Group on Sarcopenia in Older People. Age Ageing 2010;39(4):412-23. (PMID:20392703).

2. Eyigör S, Kutsal YG. Reason of progressive loss of function and frailty in elderly: Sarcopenia (Review). Turkish Journal of Geriatrics 2013;16(4):454-63.

3. Lauretani F, Russo CR, Bandinelli S, et al. Age-associated changes in skeletal muscles and their effect on mobility: an operational diagnosis of sarcopenia. J Appl Physiol (1985) 2003;95(5):1851-60. (PMID:14555665).

4. Boutin RD, Yao L, Canter RJ, Lenchik L. Sarcopenia: Current concepts and imaging implications. Am J Roentgenol 2015;205(3):W255-66. (PMID:26102307).

5. Narici MV, Maffulli N. Sarcopenia: Characteristics, mechanisms and functional significance. Br Med Bull 2010;95:139-59. (PMID:20200012).

6. Mitchell WK, Williams J, Atherton P, Larvin M, Lund J, Narici M. Sarcopenia, dynapenia, and the impact of advancing age on human skeletal muscle size and strength; a quantitative review. Front Physiol 2012;11(3):260. (PMID:22934016).

7. Minetto MA, Caresio C, Menapace T, et al. Ultrasound-Based detection of low muscle mass for diagnosis of sarcopenia in older adults. American Academy of Physical Medicine and Rehabilitation 2016;8(5):453-62. (PMID:26431809).

8. Abe T, Loenneke JP, Thiebaud RS, Fukunaga T. Age-related site-spesific muscle wasting of upper and lower extremities and trunk in Japanese men and women. Age 2014;36(2):813-21. (PMID:24243442).

9. Abe T, Thiebaud RS, Loenneke JP, Loftin M, Fukunaga T. Prevalence of site-specific thigh sarcopenia in Japanese men and women. Age 2014;36:417-26. (PMID:23686131).

10. Abe T, Patterson KM, Stover CD, et al. Site-specific thigh muscle loss as an independent phenomenon for age-related muscle loss in middle-aged and older men and women. Age 2014;36:1353-58. (PMID:24569919).

11. Cederholm T, Cruz-Jentoft AJ, Maggi S. Sarcopenia and fragility fractures. Eur J Phys Rehabil Med 2013;49:111-17. (PMID:23575205).

12. Abe T, Thiebaud RS, Loenneke JP, Ogawa M, Mitsukawa N. Association between forearm muscle thickness and age-related loss of skeletal muscle mass, handgrip and knee extension strength and walking performance in old men and women: A pilot study. Ultrasound in Medicine and Biology 2014;40(9):2069-75. (PMID:25023107).

13. Delaney S, Worsley P, Warner M, Taylor M, Stokes M. Assessing contractile ability of the quadriceps muscle using ultrasound imaging. Muscle Nerve 2010;42:530-38. (PMID:20665511).

14. Abe T, Kawakami Y, Kondo M, Fukunaga T. Comparison of ultrasound-measured age-related, site-specific muscle loss between healthy Japanese and German men. Clin Physiol Funct Imaging 2011;31(4):320-25. (PMID:21672141).

15. Wuori JL, Overend TJ, Kramer JF, MacDermid J. Strength and pain measures associated with lateral epicondylitis bracing. Arch Phys Med Rehabil 1998;79:832-7. (PMID:9685101).

16. Nnodim JO, Yung RL. Balance and its clinical assessment in older adults-A Review. J Geriatr Med Gerontol 2015;1(1):003. (PMID:26942231).

17. Işık Eİ, Altuğ F, Cavlak U. Reliability and validity of four step square test in older adults. Turkish Journal of Geriatrics 2015;18(2):151-5.

18. Tinetti ME, Richman D, Powell L. Falls efficacy as a measure of fear of falling. Journal of Gerontology 1990;45(6):239-43. (PMID:2229948).

19. Landi F, Liperoti R, Russo A, et al. Sarcopenia as a risk factor for falls in elderly individuals: Results from the ilSIRENTE study. Clinical Nutrition 2012;652-58. (PMID:22414775).

20. Beavers KM, Beavers DP, Houston DK, et al. Associations between body composition and gait-speed decline: Results for the Health, Aging, and Body Composition Study. Am J Clin Nutr 2013;97:552-60. (PMID:23364001).

21. Watanabe Y, Yamada Y, Fukumoto Y, et al. Echo intensity obtained from ultrasonography images reflecting muscle strength in elderly men. Clinical Interventions in Aging 2013;8:993-98. (PMID:23926426).

22. Guerreiro AC, Tonelli AC, Orzechowski R, Dalla Corte RR, Moriguchi EH, Bandeira de Mello R. Bedside ultrasound of quadriceps to predict rehospitalization and functional decline in hospitalized elders. Frontiers in Medicine 2017;31(4):122. (PMID:28824911).

23. Fragala MS, Alley DE, Shardel MD, et al. Comparison of handgrip and leg extension strength in predicting slow gait speed in older adults. J Am Geriatr Soc 2016;64(1):144-50. (PMID:26782864).

24. Martien S, Delecluse C, Boen F, et al. Is knee extension strength a better predictor of functional performance than handgrip strength among older adults in three different settings? Archives of Gerontology and Geriatrics 2015;60:252-58. (PMID:25496605).

25. Trombetti A, Reid KF, Hars M, et al. Age-associated declines in muscle mass, strength, power, and physical performance: impact on fear of falling and quality of life. Osteoporos Int 2016;27:463-71. (PMID:26194491).

- Elif DOĞAN BAKİ[1]
- Ahmet YÜKSEK[1]
- Bilal Atilla BEZEN[1]
- Tuba Berra SARITAŞ[1]
- Remziye SIVACI[1]

CORRESPONDANCE

Elif DOĞAN BAKİ

Afyon Kocatepe University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Afyon, Turkey

Phone: 02722294509
e-mail: elifbaki1973@mynet.com

[1] Afyon Kocatepe University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Afyon, Turkey

RESEARCH

RETROSPECTIVE ANALYSIS OF ANESTHESIA IN GERIATRIC PATIENTS DURING ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY ABSTRACT

Abstract

Introduction: With the advancement in healthcare, the proportion of elderly population is increasing. We aimed to retrospectively investigate intensive care admission, complications, and mortality rates in elderly patients who underwent Endoscopic Retrograde Cholangiopancreatography.

Materials and Method: We retrospectively analyzed 1320 patients aged ≥65 years who underwent Endoscopic Retrograde Cholangiopancreatography under sedation in our hospital between October 1, 2013 and October 1, 2016. Patients were divided into two groups based on their age: group 1 (65–79 years) and 2 (≥80 years). Data on patient gender, American Society of Anesthesiologists (ASA) distribution, early mortality (7 days), postoperative intensive care needs, doses of anesthetic drugs administered, and complications were compared.

Results: Comparison of data between groups 1 (926 patients) and 2 (394 patients) revealed that the use of propofol and ketamine was significantly lower in group 2 than in group 1, whereas that of midazolam was similar in both the groups. The number of patients with complications, those requiring intubation, rate of intensive care need, and mortality were significantly higher in group 2 than in group 1; there were no significant differences in the type of complications (cardiac or respiratory) (p=0.198).

Conclusion: Endoscopic Retrograde Cholangiopancreatography is a painful and stressful procedure that usually requires analgesia or sedation. Geriatric patients account for majority of the patient population undergoing endoscopic retrograde cholangiopancreatography. However, because elderly patients are more sensitive to the negative effects of anesthetic drugs, taking appropriate measures for performing sedation and analgesia during Endoscopic Retrograde Cholangiopancreatography in elderly patients is critical.

Keywords: Cholangiopancreatography, Endoscopic Retrograde; Geriatrics; Anesthesia

ARAŞTIRMA

ENDOSKOPİK RETROGRAD KOLANJİOPANKREATOGRAFİ UYGULANAN GERİATRİK HASTALARDA ANESTEZİ DENEYİMLERİMİZİN RETROSPEKTİF İNCELENMESİ ÖZ

Öz

Giriş: Gelişen sağlık standartları sayesinde dünya nüfusu giderek yaşlanmaktadır. Bu çalışmanın amacı sedasyon altında Endoskopik Retrograd Kolanjiopankreatografi uygulanan yaşlı hastaların yoğun bakıma giriş, komplikasyonlar ve mortalite açısından retrospektif olarak incelenmesidir.

Gereç ve Yöntem: Çalışmamızda 01.10.2013 ve 01.10.2016 arasında hastanemizin Endoskopik Retrograd Kolanjiopankreatografi ünitesinde sedasyon altında uygulama yapılan 65 yaş üzeri hastaların bilgisayar kayıtları retrospektif olarak incelenmiştir. Bu hastalarda kendi içinde 65-79 (Grup 1) yaş arası olanlar ve 80 yaş ve üzeri (Grup 2) olarak iki gruba ayrılmıştır. Bu hastaların cinsiyetleri, American Society of Anesthesiologists (ASA) dağılımları, erken dönem mortalite (7gün), post operatif yoğun bakım ihtiyacı, kullanılan anestezik ilaç dozları ve komplikasyonlar karşılaştırıldı.

Bulgular: Altmış beş yaş ve üzeri 1320 hastanın verilerine ulaşıldı, bunlardan 926'sı 65-80 yaş arasında (Grup 1) iken, 394 tanesi 80 yaş ve üzeriydi (Grup 2). Propofol, ketamin kullanımları Grup 2'de anlamlı olarak düşükken midazolam kullanımı her iki grupta benzerdi. Komplikasyon gelişen, entubasyon gereken hasta sayısı, yoğun bakıma çıkış ve mortalite hızı Grup 2'de anlamlı olarak daha yüksekti. Gelişen komplikasyonların cinsi (kardiyak, solunumsal, diğer) açısından gruplar arasında farklılık gözlenmedi (p=0.198).

Sonuç: Endoskopik Retrograd Kolanjiopankreatografi işlemi ağrılı ve stresli bir prosedür olmasından dolayı çoğunlukla analjezi veya sedasyon ihtiyacı olmaktadır. Geriatrik hasta grupları endoskopik retrograd kolanjiopankreatografi uygulanan hasta popülasyonunda da önemli bir yer tutmaktadır. Ancak bu hastalar anestezik ilaçların olumsuz etkilerine karşı daha duyarlı oldukları için ve bu işlem genellikle ameliyathane günübirlik uygulandığı için yaşlı hastalarda Endoskopik Retrograd Kolanjiopankreatografi sırasında sedasyon ve analjezi uygulaması dikkat ve önem arz etmektedir.

Anahtar sözcükler: Endoskopik Retrograd Kolanjio Pankreatografi, Geriatri, Anestezi

INTRODUCTION

The increase in life expectancy has led to an increase in the geriatric population. According to a survey conducted in 2015, 8.5% (617 million) of individuals worldwide were aged >65 years, and this rate is expected to reach 17% by 2050, constituting 1.6 billion individuals in the geriatric age group (1). Physiological and psychological changes as well as delayed healing processes associated with aging require more medical and surgical intervention. Therefore, it is necessary to design a special system for anesthesia applications in the geriatric population.

Endoscopic retrograde cholangiopancreatography (ERCP) is the imaging of the ducts that provide drainage of the pancreas, gall bladder, bile ducts, and liver using a duodenoscope and X-rays with contrast agents. The common channel is cannulated by endoscopically viewing the ampulla vateri. ERCP is also employed for endoscopic sphincterotomy, choledocholithic stone extraction, malignant and biliary stent application, and biopsy. Thus, ERCP plays a very important role in the diagnosis and treatment of pancreaticobiliary pathologies. However, as this procedure is painful and stressful, it is imperative that analgesia and sedation be applied. ERCP also plays an important role in geriatric patient population. However, elderly patients are more sensitive to the adverse effects of anesthesia (2,3).

The present study was a comparative retrospective analysis of geriatric patients aged 65–79 and ≥80 years who underwent ERCP under anesthesia.

MATERIALS AND METHOD

The hospital records and files of patients aged >65 years (n=1320) who underwent ERCP under sedation by the same surgeon (general surgeon, endoscopy certified) between October 2013 and October 2016 were retrospectively examined. The data regarding patient's gender, American Society of Anesthesiologists (ASA) physical status, early mortality (7 days), intensive care requirement, anesthetic drug doses administered, and complications were recorded. The development of cardiac (hypotension, rhythm disturbances, and cardiac arrest), respiratory (prolonged sedation and desaturation conditions requiring entubation), and other (pancreatic, emergency surgery requirement, and neurological) conditions were considered as complications. The data were compared between patients belonging to groups 1 (65–80 years) and 2 (≥80 years). The study protocol was approved by the local Ethics Committee of the Afyon Kocatepe University (2011-KAEK-2).

IBM SPSS Statistics version 20 was used for all statistical analysis. Data was expressed as mean and standard deviation. The Mann–Whitney U test and Student's t-test were used to compare the quantitative data. The Chi-square test was used to compare the categorical variables. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 2084 patients who undergone ERCP procedure for three years (between October 2013-October 2016) were obtained from hospital data. Of these, 1320 patients aged 65 years or older were included in the study. Then, patients were divided into two groups based on their age: group 1 (65–79 years) and 2 (≥80 years).

Group 1 included 498 female and 428 male patients, while group 2 included 223 female and 171 male patients. There were no gender differences between the two groups (p=0.346) (Table 1). In group 1, 724 patients belonged to ASA class 2, 98 to ASA class 3, and one to ASA class 4. In group 2, 251 patients belonged to ASA class 2, 110 to ASA class 3, and two to ASA class 4 (Table 1).

Distribution of anesthetic agents that were used during the operation were shown in Table 2. 2.1% of the patients used only midazolam, wheras the use of propofol + midazolam was 17.4%, the use of ketamine + midazolam was 25.7%, and the use of propofol + midazolam + ketamine was 54.8% (Table 2). The amount of midazolam used was similar between the two groups, whereas propofol and ketamine amounts were significantly lower in group 2 than in group 1 (Table 2). The number of patients requiring intubation, number of intensive care unit (ICU) discharge, and mortality rate were significantly higher in group 2 than in group 1

(Table 3). After the procedure, 96.4% of patients in group 1 were transferred to surgery ward and 3.1% to the ICU, whereas 78.4% of patients in group 2 were transferred to surgery ward and 21.6% to the ICU; these differences between the groups were statistically significant (p=0.002) (Table 3). Complications occurred perioperatively with a rate of 2.1% in group 1 and 19.8% in group 2; the differences were statistically significant (p=0.000) (Table 4). There were no significant differences in the types of complications (cardiac, respiratory, and other) between the groups (p=0.198) (Table 4).

Table 1. Patients' gender and ASA status.

	Group 1 (n=926)	Group 2 (n=394)	Total (n=1320)	p
Gender (female / male, n)	498 / 428	223 / 171	721 / 594	0.346
ASA I, n	103	31	134	
ASA II, n	724	251	975	0.000
ASA III, n	98	110	208	
ASA IV, n	1	2	3	

Group 1; ages between 65 and 79, Group 2; age of ≥80,
ASA; American Society of Anesthesiologists.

Table 2. Drug distribution and doses used between groups.

Drugs	Group 1 (n=926)	Group 2 (n=394)	Total (n=1320)	p
Only M, n (%)	1 (0.1)	27 (6.9)	28 (2.1)	
P+M, n (%)	124 (13.4)	106 (26.9)	230 (17.4)	0.000
K+M, n (%)	209 (22.6)	130 (33.0)	339 (25.7)	
P+M+K, n (%)	592 (63.9)	131 (33.2)	723 (54.8)	
Propofol, mg	40 (0-200)	20 (0-200		0.000
Ketamin, mg	60 (0-180)	30 (0-160)		0.000
Midazolam, mg	3.04±1.53	3.04±1.95		0.170

Group 1; ages between 65 and 79, Group 2; age of ≥80, Patients' data are expressed as mean±SD (standard deviation) and median (minimum –maximum).
M: midazolam, P: propofol, K: Ketamine

Table 3. Comparison of patients according to the necessity of intubation, mortality and postoperative discharge.

Characteristics	Group 1 (n=926)	Group 2 (n=394)	p
Intubation necessity,			
Yes, n (%)	10 (1.1)	57 (14.5)	0.000
No, n (%)	916 (98.9)	337 (85.5)	
Mortality, n (%)	14 (1.5)	35 (8.9)	0.000
Postoperative discharge			
Surgery ward, n (%)	897 (96.9)	309 (78.4)	0.000
ICU, n (%)	29 (3.1)	85 (21.6)	
Hospital stay, day, median (min-max)	2 (1-52)	1 (1-32)	0.002

Group 1; ages between 65 and 79, Group 2; age of ≥80, ICU; intensive care unit

Table 4. Distribution of complications according to groups.

Complication	Group 1 (n=926)	Group 2 (n=394)	Total (n=1320)	p
Developed, n (%)	19 (2.1)	78 (19.8)	97 (7.3)	0.000
Not developed, n (%)	907 (97.9)	316 (80.2)	1223 (92.7)	
Cardiac, n (%)	6 (31.6)	25 (32.1)	31 (32)	0.198
Respiratory, n (%)	9 (47.4)	22 (28.2)	31 (32)	
Others, n (%)	4 (21.1)	31 (39.7)	35 (36.1)	

Group 1; ages between 65 and 79, Group 2; age of ≥80

DISCUSSION

Owing to the tremendous advancement in healthcare practices, the average longevity in humans has significantly increased. As a result, the current world population has a significant proportion of elderly individuals. Generally, age is not a contraindication to anesthesia and surgery; however, greater perioperative morbidity and mortality have been reported in the elderly than in younger patients undergoing surgery. The current study revealed that complications, intubation necessity, and intensive care need were significantly greater in elderly patients than in middle-aged patients. In addition, the mortality rate was 8.9% in elderly patients and 1.5% in middle-aged patients. Furthermore, the use of propofol and ketamine was significantly lower in the elderly, whereas that of midazolam was similar between the two groups. Outpatient anesthesia applications are becoming increasingly important due to increasing number of patients and medical techniques (MR, endoscopy,

ECT, ERCP, EBUS, angiography). Elderly patients who undergo ERCP form the most vulnerable group of patients, similar to newborns, in MR. Moreover, the risk of complications increases for procedures that are performed outside the operation theater; therefore, such procedures require specialized teams (4).

Generally, with advancing age, systemic diseases tend to increase. In our study, most patients belonged to ASA class 2 in both the groups. However, a past study reported that the complication rate increases with increasing ASA scores (3). Moreover, it has been suggested that the ASA score does not adequately reflect the risk ratio in nonoperating anesthesia applications (5).

A retrospective study of 16,045 patients revealed that the mean age of patients who developed complications in anesthesia applications performed outside the operation theater was 73.35 years. This finding suggested that patients in the geriatric age group are more sensitive to the risk of anesthesia complications. In our study, patients aged >80 years developed significantly more complications than those aged 65–80 years (6).

Mortality, morbidity, and length of hospital stay were greater in patients suffering from post-surgery complications. Iyilikçi et al. (6) reported that the complication rate was 6.2% in their entire outpatient anesthesia practice. We found a complication rate of 7.3% in patients aged >65 years, 2.1% in patients aged 65–80 years, and 19.8% in patients aged >80 years. In addition, ICU exits were also higher in elderly patients due to the necessity of intubation. Increased stay in ICU also increases the mortality rate.

Studies in geriatric patients advocate the use of short-acting agents to reduce the complication rates. Our results suggested that short-acting drugs, such as midazolam and propofol, are more frequently used in geriatric patients. Although propofol may be an ideal induction agent in elderly patients due to its rapid elimination, it is more likely

to cause apnea and hypotension in such patients than in younger patients. Thus, the use of propofol is limited in elderly patients (7,8). The use of propofol and ketamine were lower in the elderly patients in the present study, which was insufficient in reducing reduce complications in these patients.

Previous studies have shown that the use of propofol with ketamine provides enhanced hemodynamic stability (9). In our study, ketamine was used in both the groups, but its use was reduced in the elderly, similar to that of propofol. This reduced use may be attributed to the low anesthetic needs of elderly patients and their unstable hemodynamics (7). In addition, the fact that geriatric patients are mostly hypertensive before anesthesia induction reduces the use of ketamines (10). However, as a limitation of our study, information about patients' secondary illnesses, such as hypertension, diabetes, and COPD, could not be obtained due to incomplete data entry.

With age, the distributional volume of benzodiazepines increases, thus extending its half-life. The need for midazolam has been reduced by 50% in geriatric patients (7). In our study, the use of midazolam was similar in both the age groups. Although the use of propofol and ketamine were reduced in the elderly group, midazolam was used without dose reduction according to the availability of its recycler. However, there is insufficient information regarding the routine use of benzodiazepine-group medications with their reverse agents. There is a concern that geriatric patients may have an increased risk of postoperative complications considering that reverse drugs have a shorter effect than that of midazolam. There is a huge scope of research on the use of fewer cardioprotective drugs with the subsequent antagonism of their effects.

Our results indicated that geriatric patients aged >80 years, defined as the elderly, are at a greater risk of complications than other patient groups. The anesthetic evaluation of geriatric patients

should therefore be performed more carefully, with perioperative observation under the guidance of skillful and experienced team of anesthesiologists. Guidelines have been published to standardize the outpatient anesthesia practice (11,12). We believe that geriatric patients should be considered while formulating such guidelines.

In conclusion, we believe that the physiological and psychological changes as well as delayed healing processes associated with aging require more medical and surgical intervention in elderly patients than in younger patients, warranting the need to device a special system for the use of anesthesia in geriatric patient groups.

Conflict of interest

None. The authors declare no conflicts of interests.

REFERENCES:

1. Wan He, Goodkind D, Kowal P. International Population Reports, An Aging World: 2015, U.S. Government Publishing Office, Washington 2016, pp 11-2. [Internet] Available from:https://www.census.gov/content/dam/Census/library/publications/2016/demo/p95-16-1.pdf. Accessed:01.08.2017.

2. Cohen S, Bacon BR, Berlin JA, et al. National Institutes of Health State-of-the-Science Conference Statement: ERCP for diagnosis and therapy, January 14-16, 2002. Gastrointest Endosc 2002;56 (6):803-9. (PMID:12447289).

3. Aurini L, White PF. Anesthesia for the elderly outpatient. Curr Opin Anaesthesiol 2014;27(6):563-75. (PMID:25318569).

4. Melloni C. Morbidity and mortality related to anesthesia outside the operating room. Anestesiol 2005;71(6):325-34. (PMID:15886596).

5. Inadomi JM. Editorial: endoscopic sedation: who, which, when? Am J Gastroenterol 2017;112(2):303-5. (PMID:28154379).

6. İyilikçi L, Çakmak Ş, Ögdül E, et al. Remote location anesthesia: Experience of our team. Turk J Anaesth Reanim 2006;34(3):169-76.

7. Butterworth JF, Mackey DC, Wasnick JD. Geriatric anesthesia. Morgan & Michails Clinical Anesthesiology. 5th edition, Lange, Mc Graw Hill, USA 2013, pp 907-15.

8. Çakar KS, Denker ÇE. Geriatric anesthesia. J Surg Med Sci 2006;2(6):126-36.

9. Andolfatto G, Abu-Laban RB, Zed PJ, et al. Ketamine-propofol combination (ketofol) versus propofol alone for emergency department procedural sedation and analgesia: a randomized double-blind trial. Ann Emerg Med 2012;59(6):504-12. (PMID:22401952).

10. Mustafaeva MN, Mizikov VM, Kochneva ZV. Drug sedation during digestive tract endoscopy: current trends. Anesteziol Reanimatol 2009;(4):32-8. (PMID:19824413).

11. Kulkarni S, Harsoor S, Chandrasekar M, et al. Consensus statement on anaesthesia for day care surgeries. Indian J Anaesth 2017;61(2):110-24. (PMID:28250479).

12. ASA, Statement on nonoperating room anesthetizing locations committee of origin: Standards and practice parameters 2013, pp 1-2. [Internet] Available from: http://www.asahq.org/~/media/Sites/ASAHQ/Files/Public/Resources/standards-guidelines/statement-on-nonoperating-room-anesthetizing-locations.pdf. Accessed: 01.08.2017.

- Neşe ÖLMEZ SARIKAYA[1]
- Feray KOÇ[2]
- Veysi Emre ERDEN[2]

CORRESPONDANCE

Neşe ÖLMEZ SARIKAYA
İzmir Atatürk Training and Research Hospital,
Physical Medicine and Rehabilitation
Department, İzmir, Turkey

Phone: 232 2444444
e-mail: neseo@hotmail.com

[1] İzmir Atatürk Training and Research Hospital,
Physical Medicine and Rehabilitation
Department, İzmir, Turkey
[2] İzmir Atatürk Training and Research Hospital,
Ophtalmology Department, İzmir, Turkey

RESEARCH

NEUROMUSCULOSKELETAL CAUSES OF SEVERE DISABILITY IN A TERTIARY HOSPITAL IN TURKEY

Abstract

Introduction: Aging of the population leads to an increasing number of older people with a severe disability, in need of long-term care, which is a major public health problem. Herein, we attempted to find out the main pathologies that cause severe disability, including neuromusculoskeletal disability, in elderly and young adults.

Materials and Method: In this descriptive observational study, we retrospectively reviewed the medical records of 20,790 subjects admitted to the Health Council of the İzmir Atatürk Training and Research Hospital over the last two years. Subjects identified as severely disabled and >18 years old were in§cluded. Age- (19–64 or 65+ years) and gender-specific causes of severe disability were identified.

Results: Overall, 1,117 (631 female, 486 male) subjects were severely disabled. Mean age was 65.9±18.1 years; 60% were >65 years old. Main pathologies leading to severe disability were nervous system (61%), eye (11%), mental and behavioral (9.3%), musculoskeletal (8.4%), neoplasms (2.8%), respiratory (2.7%) and other diseases. Distribution of the pathologies were statistically different between age subgroups (p<0.001), but not between gender subgroups (p>0.05). Dementia and stroke were the most frequent neurological conditions. Knee osteoarthritis was the leading musculoskeletal cause of severe disability.

Conclusion: This study may provide a baseline indication of pathologies commonly causing severe disability. Most severely disabled subjects were female and of older age. Neurological diseases were the most frequent causes of severe disability. Preventive and rehabilitative health service planning should be undertaken to decrease the disability caused by these conditions.

Keywords: Disability; Aged; Adult; Turkey

ARAŞTIRMA

TÜRKİYE'DE BİR ÜÇÜNCÜ BASAMAK BİR HASTANEDE AĞIR YETİ YİTİMİNİN NÖROMUSKULOSKELETAL SEBEPLERİ

Öz

Giriş: Nüfusun yaşlanması, artan sayıda, ağır yeti yitimi olan, uzun süreli bakım gerektiren ileri yaştaki populasyona neden olur ve büyük bir halk sağlığı problemidir. Bu çalışmada yaşlı ve genç erişkin popülasyonda ağır yeti yitimine neden olan genel ve nöromusküler ana patolojileri belirlemek amaçlanmıştır.

Gereç ve Yöntem: Bu tanımlayıcı gözlemsel çalışmada son iki yılda İzmir Atatürk Eğitim ve Araştırma Hastanesi sağlık kuruluna başvuran 20,790 hastanın tıbbi kayıtları retrospektif olarak incelenmiştir. Ağır yeti yitimi olarak tanımlanan 18 yaş üzeri vakalar çalışmaya dahil edilmiştir. Yaş (19-64 yaş ve 65 yaş ve üzeri) ve cins spesifik ağır yeti yitimi sebepleri belirlenmiştir.

Bulgular: Toplamda 1,117 (631 kadın, 486 erkek) ağır yeti yitimi olan hasta saptanmıştır. Ortalama yaş 65.9±18.1 yıl idi. Vakaların %60'ı 65 yaş ve üzeri idi. Ağır yeti yitimine sebep olan ana patolojiler sinir sistemi (%61), göz (%11), ruhsal ve davranışsal (%9.3), kas iskelet (%8.4), neoplazmlar(%2.8), solunum (%2.7) ve diğer daha seyrek görülen hastalıklar idi. Patolojilerin dağılımı yaş grupları arasında farklılık gösterirken(p<0.001) cinsiyet açısından farklılık saptanmamıştır. Demans ve strok ağır yeti yitimine en sık sebep olan nörolojik hastalıklardı. Diz osteoartriti ağır yeti yitimine en sık neden olan kas iskelet patolojisi idi.

Sonuç: Bu araştırma yaşlı ve genç erişkinlerde ağır yeti yitimine neden olan en sık patolojiler konusunda bir temel oluşturabilir. Ağır yeti yitimi olanların çoğu kadınlar ve ileri yaşlı popülasyondu. Ağır yeti yitiminin en sık sebepleri nörolojik hastalıklar özellikle demans ve strok idi. Bu hastalıklara bağlı yeti yitimini azaltmaya yönelik önleyici ve rehabilitatif sağlık planlamaları yapılmalıdır.

Anahtar sözcükler: Yeti yitimi; Yaşlı; Erişkin; Türkiye

INTRODUCTION

Population aging, accompanied by both increased longevity and increasing disability, is an issue of concern in Turkey and internationally. However, there are few studies that have analyzed the potential determinants of disability. Disability presents according to varying severity levels. Hospitalization rates, home care visits, admission to nursing homes, and death all increase with increasing disability severity level, and result in higher overall disability costs, health-related expenditure, and assistance with daily care and transportation costs (1). To establish strategies to reduce disability, it is essential to define the diseases that cause severe disability.

The World Health Survey estimates that 110 million people (2.2% of the global population) have significant difficulties in functioning. The Global Burden of Disease Study estimates that 190 million people (3.8% of the global population) have "severe disability." The severe disability rate increases to 10.2% in patients aged $\geq$60 years (2). A stable prevalence of severe (2–3%) disability was observed in the Belgian population between years 1997 and 2008 (3).

Turkey can be classified as an upper/middle income country, although the socioeconomic, geographic, and ethnic characteristics of its regions vary. The Turkish Statistical Institute declared the prevalence of total disability in 2002 to be 12.29% (4). Few studies have been performed with the Turkish population regarding the causes of various levels of disability (5,6). Izmir is the third most populated city of Turkey, located in the south-west part of the country (7).

This study aimed to define the neuromusculoskeletal causes of severe disability, according to age and gender, in a tertiary hospital in Izmir, Turkey.

MATERIALS AND METHOD

Subjects

In this descriptive observational study, the medical records of 20,790 subjects admitted to the Izmir Atatürk Training and Research Hospital Health Council to obtain a health certificate over the last two years, were reviewed retrospectively. Subjects were included in the study using a consecutive sampling method. We did not obtain informed consent in this retrospective chart review because all data analysed were collected as part of routine diagnosis and treatment and the sample size was too large to contact all individuals. The study protocol was approved by the Ethics Committee of the Izmir Atatürk Training and Research Hospital.

Reasons for application to the Health Council were to obtain a health report for candidacy for several academies and professions, move to elderly care centers, obtain a driving license, receive disability benefits like tax discounts, nursing services at home, financial support, and be included in the disabled people employment quota. Of those, the records of only subjects who applied to receive disability benefits like tax discounts, nursing services at home, and financial support, and inclusion in the disabled people employment quota, were then reviewed. Patients>18 years old, who were labeled as severely disabled, and who had complete medical records were included in the analysis. Of the 20,790 medical records, 1,168 subjects were labeled severely disabled and considered eligible for inclusion in the study. Twenty-five subjects were excluded because of their incomplete medical records. Twenty-six cases who were $\leq$18 years old were excluded. In total, 1,117 subjects were included in the analysis.

Definition of severe disability

Total body disability rating and disability severity were determined by a health board that included physicians in a tertiary center specializing in internal medicine, ophthalmology, ear-nose-throat, general surgery or orthopedics, neurology and psychiatry, physical medicine, and rehabilitation. The Balthazar formula was used to identify a given subject's total body disability rating. The International Classification of Functioning, Disability and Health developed by the World Health Organization has

been used as a classification system in studies of disabled individuals (8).

Severe disabilities were defined using the Council of Ministers' "Regulation on disability criteria, classification and medical commission reports given to disabled people," published on December 16, 2010 in the Official Gazette of the Republic of Turkey, issue number 27787.

Subjects with a disability rating over 50%, who were not able to care for themselves (feeding, dressing, bathing, etc.) and were not able to move and/or communicate without help were defined as "severely disabled" (9).

Data analysis

Severely disabled subjects were divided into two groups: 19–64 years old (Group 1) and ≥65 years old (Group 2). The condition with the highest disability rating was assumed to be the subject's main pathology that caused their severe disability, and was categorized according to ICD-10 codes (10). The pathologies leading to neuromusculoskeletal disability were considered diseases of the nervous system (ICD-10 codes G00-G99) and musculoskeletal and connective tissue system (ICD codes M00–M99). Age (19–64 or 65+ years) and gender-specific causes of severe disability were identified.

Statistical analysis

Descriptive analyses of the data were performed using Statistical Package for the Social Sciences (SPSS) for Windows Version 15. All data were reported in the form of mean±standard deviation. For the quantitative data, we used t-tests to compare groups with normally distributed parameters. Pearson's chi-square test was performed to compare the qualitative data. Statistical significance was set at $p < 0.05$. Gender was tested as a confounder variable. No statistically significant differences were observed in the distribution of main pathologies according to gender. As such, gender was not thought to be a confounder variable, and no adjustments were made.

RESULTS

One thousand one hundred-seventeen subjects (631 female, 486 male), were classified as severely disabled. The mean age was 65.9±18.1 years. The mean total disability rating was 88.7±9.

Severely disabled subjects were more commonly female (56.5% of the sample) and elderly (60% of the sample). The female to male ratio differed between age groups (p<0.001). Among severely disabled elderly, the rate of females (%67.4) was higher than males (%32.6). In the 19–64 years age group, the rate of severely disabled males (%59.8) was higher than females (%40.2).

The distribution of common pathologies was found to be statistically different between the 19–64 and 65+ years age subgroups (p<0.001), but not between the gender subgroups (p>0.05). The distribution of pathologies causing severe disability in the age and gender subgroups is displayed in Table 1 and Figure 1.

Neurological diseases were the leading cause of severe disability. In 681 (283 males, 398 females) subjects with diseases of the nervous system, 67.1% were ≥65 years old. Neurological conditions were dementia (n=332), stroke (n=235), spinal cord injury (n=72), Parkinson's disease (n=44), aphasia (n=39), epilepsy (n=28), cerebral palsy (n=13), polio (n=13), multiple sclerosis (n=10), traumatic brain injury (n=7) and others.

Ninety-four subjects (9.3% of the total sample; 27 males, 67 females) had musculoskeletal system and connective tissue diseases that cause severe disability. Seventy subjects (74.5% of the total sample) were ≥65 years old. The mean age of the patients was 73.95±14.82 years. Musculoskeletal system and connective tissue diseases were knee osteoarthritis (n=42), arthroplasty (n=15), inflammatory joint diseases including Rheumatoid arthritis, Ankylosing Spondylitis and Behcet's disease (n=13), hip fracture (n=13), amputation (n=12), hip osteoarthritis (n=7),

lower back problems (n=6) and other less frequent diseases. The first three most frequent causes of

neurological and musculoskeletal and connective tissue diseases are shown in Table 2.
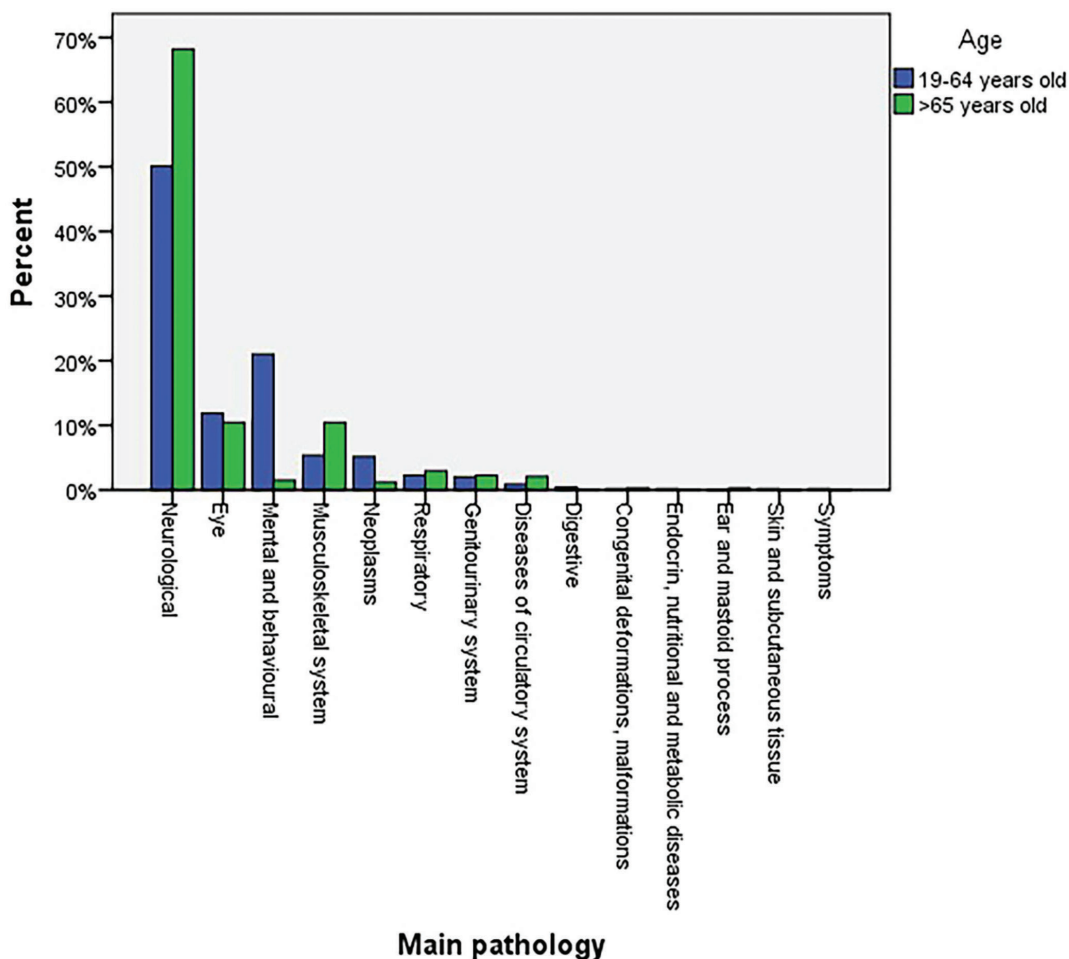
Figure 1. Distribution of the main pathologies that cause severe disability in age groups (19-64 vs 65+).

DISCUSSION

The number of people with disabilities is growing, because worldwide populations are aging and older people are at higher risk of severe disability (11). This study aimed to determine the pathologies that cause severe disability and investigate whether the distribution of causative pathologies were different

between age and gender subgroups. The medical records of subjects admitted to a Health Council to obtain a health certificate were reviewed in a tertiary hospital in Izmir, Turkey. The results showed that females and elderly were more likely to be severely disabled. In the elderly group with severe disability, the rate of females was higher than males. This is consistent with the findings of previous literature.

Table 1. Distribution of the leading diseases that cause severe disability in gender and age subgroups.

Pathologies ICD-10 codes	Groups						Total N(%)
	19-64years old			65+ years old			
	M N(%)	F N(%)	Total N(%)	M N(%)	F N(%)	Total N(%)	
Neurological G00-G99	134(52.5%)	90(46.9%)	224(50.1%)	149(64.5%)	308(70.2%)	457(68.2%)	681(61%)
Eye diseases H00-H59	28(11%)	25(13)	53(11.9%)	33(14.3%)	37(8.4%)	70(10.4%)	123(11%)
Mentaland behavioral F00-F99	50(19.6%)	44(22.9%)	94(21%)	4(1.7%)	6(1.4%)	10(1.5%)	104(9.3%)
Musculoskeletal and connective tissue M00-M99	9(3.5%)	15(7.8%)	24(5.4%)	18 (7.8%)	52(11.8%)	70(10.4%)	94(8.4%)
Neoplasm C00-D48	11(4.3%)	12(6.3%)	23(5.1%)	28(0.9%)	6(1.4%)	8(1.2%)	31(2.8%)
Respiratory J00-J99	7(2.7%)	3(1.6%)	10(2.2%)	11(4.8%)	9(2.1%)	20(3%)	30(2.7%)
Genitourinary N00-N99	7(2.7%)	2(1%)	9(2%)	5(2.2%)	10(2.3%)	15(2.2%)	24(2.1%)
Circulatory system I00-I99	3(1.2%)	1(0.5%)	4(0.9%)	7(3%)	7(1.6%)	14(2.1%)	18(1.6%)
Digestive K00-K93	2(0.8%)	-(-)	2 (0.4%)	1(0.4%)	0(0%)	1(0.1%)	3(0.3%)
Congenital deformations, malformations Q00-Q99	1(0.4%)	-(-)	1(0.2%)	1(0.4%)	1(0.2%)	2(0.3%)	3(0.3%)
Endocrine E00-E90	1(0.4%)	-(-)	1(0.2%)	-(-)	1(0.2%)	1(0.1%)	2(0.2%)
Ear and mastoid process H60-H95				-(-)	2(0.5%)	2(0.3%)	2(0.2%)
Skin and subcutaneous tissue L00-L99	1(0.4%)	-(-)	1(0.2%)				1(0.1%)
Other							1(0.1%)
Total (%)	255 (100%)	192(100%)	447(100%)	231(100%)	439(100%)	670(100%)	1117(100%)
p	0.333			0.096			
	<0.001*						

*Statistically significant

Table 2. First three most common neurological and musculoskeletal causes of severe disability.

Rank of diseases	19-64 years old n=447	≥65 years old n=670	Total n=1117
Neurological 1st rank 2nd rank 3rd rank	Stroke Spinal cord injury Dementia	Dementia Stroke Parkinson's disease	Dementia Stroke Spinal cord injury
Musculoskeletal 1st rank 2nd rank 3rd rank	Amputation, Inflammatory diseases* Knee osteoarthritis,	Knee osteoarthritis Arthroplasty ** Hip fracture	Knee osteoarthritis Arthroplasty Inflammatory disease

*Inflammatory joint diseases (Rheumatoid arthritis, Ankylosing Spondylitis, Behcet's disease)
**Hip and/or Knee arthroplasty

From 60 years and older, more than half the subjects were reported to have severe or worse disability. Severe disability was more common with increasing age (12). In Turkey, although disability studies exist, the prevalence and causes of severe disability have not been well-defined. According to data from the Turkish Statistical Institute Statistical Yearbook 2015, the rate of patients >15 years old who are not able to care for themselves, as defined by their performance in various domains of daily activities (feeding, dressing, bathing, ability to move freely, etc.) was 2.8–3.8%. The proportion of subjects who had difficulties with mobility (for example, who cannot walk without help from another person) was 7.3%, and 75.5% of subjects >65 years old. The current population aged >65 years old is 5.9 million (approximately 8% of the total population) in Turkey, and has been projected to reach over 8.5 million (approximately 10% of the total population) in 10 years' time, which may lead to an increased number of elderly people with severe disability in the future (13).

Females, people in the poorest wealth quintile, and older people had a higher prevalence of disability across all countries (2). In many studies, dependence is reported to be more common among females, and increases with age. Greater longevity and comorbidity in females, and the higher mortality experienced by older males compared to females, may be the causes of this gender difference (14).

Distribution of diseases that cause severe disability

Across all disability severity levels and all age groups, back and neck pain were among the most prevalent diseases in males and females (2,3), but the distribution of diseases that cause severe disability differed. In many studies, neurological disorders have been found to contribute most to severe disability (3,5,15). This is consistent with the findings of our study.

There are few studies that have evaluated the distribution of diseases that cause severe disability in our country. Kıvanç et al. (5) reported a study based on Health Council medical records of subjects >64 years old from the Erzurum region of Turkey. The most common disabilities were neurological and those resulting from eye diseases, consistent with the findings of our study.

Neurological diseases

In this study, the most common neurological diseases causing severe disability were dementia, stroke, and spinal cord injury, in decreasing order of frequency.

The absolute number of dementia cases increases with increasing life expectancy (12). Among dependent elderly people, the prevalence of dementia has been reported to be 49–73% (16) and has been found to be highly predictive of severe/extreme disability in those aged ≥75 years (17). Advances in the prevention and treatment of aging-related diseases, such as dementia and Alzheimer's disease, should improve the health of and reduce disability in older-age people.

Stroke was reported to be among the most disabling diseases, with a higher degree of disability than other neurological problems (18). Stroke was the most frequent neurological cause of severe disability in subjects aged 19–64 years, and the second most frequent cause in those aged 65 years and older in this study. Although there have been advances in the prevention and treatment of stroke, including reperfusion therapies, stroke continues to be a major cause of disability. The development of efficacious therapies for stroke is needed to reduce disability and improve long-term outcomes associated with stroke (19).

Parkinson's disease was the third most common neurological cause of severe disability in elderly subjects in this study. Parkinson's disease was reported to be more common at older ages, and results in severe disability in the performance of daily activities (3,20).

Several studies from Turkey that have evaluated the neurological causes of disability, as determined by a health board in a tertiary center, have reported that stroke and dementia were two of the most common neurological diseases, consistent with the findings of our study (6,21,22). The patient populations of these studies were younger than that of our study's, and included all severity levels. We only included cases of severe disability. This implies that stroke and dementia are the main diseases that cause neurological disability, across all severity levels.

Eye diseases

Turkish data from the Institute for Health Metrics and Evaluation data showed that sense organ diseases were the second leading cause of years lost due to disability in 2015 (12). Consistent with this finding, eye diseases were found to be the second most frequent cause of severe disability in elderly in this study. In a study from Turkey by Kıvanç et al, eye diseases were also found to be the second most frequent cause of disability, with a frequency of 17.1% in the severely disabled elderly (5).

Musculoskeletal disorders

Musculoskeletal disorders were the third most common cause of severe disability in the elderly in our study. Although musculoskeletal disorders were reported to be the leading cause of disability (12), their contribution to severe disability was found to be small, and to rarely cause dependence (15).

The frequency of musculoskeletal disorders increases with age, and these disorders pose a great threat to mobility (17). The most commonly affected daily activities in both mildly and severely disabled individuals have been reported to be those that involve the lower extremity functions. For example, limitations in mobility of the knee are common in arthritis (23). In this study, knee osteoarthritis was the leading musculoskeletal cause of severe disability in elderly. Amputation was the leading musculoskeletal cause of severe disability in young adults. Strategies to reduce the disability caused by musculoskeletal disorders are needed, because these disorders have an impact on both difficulty and dependence (3).

In this study, we have reported the frequencies of primary diseases that contribute to disability severity. The condition with the highest disability rating was assumed to be the main pathology. Chronic health problems often occur together, and the interaction of several conditions, rather than a single condition, contributes to disability (24). There is a clear need to study the coexistent chronic conditions that contribute to disability severity.

The main strength of our study is that its results may represent the causes of severe disability in general, because of the high number of subjects we included. Thus, our data are valuable to policy makers.

The main limitation of our study was that it relied on data collected by the Health Council and maintained in their archives. However, all reports were based on examinations completed by specialists in their fields; therefore, the level of accuracy of the data was assumed to be high.

Studies about severe disability have some challenges. The definition of "severe disability" varies from one country/survey to another.

Assessment and definition of severe disability at the international level are needed (3).

In conclusion, this research may provide a baseline indication of the diseases that commonly cause severe disability. Females and the elderly were more likely to experience severe levels of disability. Neurological diseases—mainly dementia and stroke—were found to be the most common causes of dependence. There was no gender difference in the distribution of pathologies causing severe disability, but there were significant differences in age. On the basis of our results, preventive and rehabilitative health service planning should focus on neurological disorders—mainly dementia and stroke, to decrease the disability caused by these conditions.

REFERENCES

1. Mitra S, Palmer M, Kim H, Mont D, Groce N. Extra costs of living with a disability: a review and agenda for research. Disabil Health J 2017;10(4):475-84. (PMID:28501322).

2. World Health Organization. World Health Organization Report on Disability 2011. Geneva: World Health Organisation Press. [Internet] Available from: http://www.who.int/disabilities/world_report/2011/report.pdf. pp 29-44. Accessed: 4.1.2018.

3. Yokota RT, Van der Heyden J, Demarest S, et al. Contribution of chronic diseases to the mild and severe disability burden in Belgium. Arch Public Health 2015;73(1):37. (PMID:26240753).

4. Turkish Statistical Institute [Internet]. Turkey Disability Survey 2002. 2nd ed. State Institute of Statistics, Printing Division - Ankara, September 2009. [Internet] Available from: http://www.turkstat.gov.tr/Kitap.do?metod=KitapDetay&KT_ID=11&KITAP_ID=14. p 5. Accessed: 29.7.2017.

5. Kıvanç SA, Akova-Budak B, Olcaysu OO, Çevik SG. Sociodemographic status of severely disabled and visually impaired elderly people in Turkey. Arq Bras Oftalmol 2016;79(1):24-9. (PMID:26840162).

6. Olcaysu OO, Kıvanç SA, Altun A, Çinici E, Altinkaynak A, Ceylan E. Causes of disability, low vision and blindness in old age. Turk J Geriatr 2014;17(1):44-9.

7. Turkish Statistical Institute [Internet]. Life tables 2013-2014. [Internet] Available from: http://www.turkstat.gov.tr/UstMenu.do?metod=temelist (2014). Accessed: 29.7.2017.

8. Üstün T, Chatterjı S, Bıckenbach J, Kostanjsek N, Schneıder M. The International Classification of Functioning, Disability and Health: a new tool for understanding disability and health. Disabil Rehabil 2003;25(11-12):565-71. (PMID:12959329).

9. Council of Ministers, "Regulation on disability criteria, classification and medical commission reports given to disabled people," published on 16.12.2010 in the Official Gazette of the Republic of Turkey, issue no 27787. [Internet] Available from: http://www.resmigazete.gov.tr/eskiler/2010/12/20101216M1-1.htm. Accessed: 29.7.2017.

10. World Health Organization. International Statistical Classification of Diseases and Related Health Problems 10th Revision. [Internet] Available from: http://apps.who.int/classifications/icd10/browse/2016/en. Accessed: 3.1.2018.

11. Fontana L. Modulating human aging and age-associated diseases. Biochim Biophys Acta 2009;1790(10):1133-8. (PMID:19364477).

12. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet 2016;388(10053):1545-602. (PMID:27733282).

13. Republic of Turkey. Social Security Institution [Internet]. Statistical yearbook 2015. [Internet] Available from: http://www.saglik.gov.tr/TR,11588/istatistik-yilliklari.html. pp 3-57. Accessed: 29.7.2017.

14. Gill TM, Gahbauer EA, Lin H, Han L, Allore HG. Comparisons between older men and women in the trajectory and burden of disability over the course of nearly 14 years. J Am Med Dir Assoc 2013;14:280-6. (PMID:23410010).

15. Palazzo C, Ravaud JF, Trinquart L, Dalichampt M, Ravaud P, Poiraudeau S. Respective contribution of chronic conditions to disability in France: results from the national Disability-Health Survey. PLoS One 2012;7:44994. (PMID:23024781).

16. Aguero-Torres H, Fratiglioni L, Guo Z, Viitanen M, Winblad B. Dementia is the major cause of functional dependence in the elderly: 3-year follow-up data from a population based study. Am J Public Health 1998;88(10):1452-6. (PMID:9772843).

17. Virués-Ortega J, de Pedro-Cuesta J, del Barrio JL, et al. Spanish Epidemiological Study Group on Aging. Medical, environmental and personal factors of disability in the elderly in Spain: a screening survey based on the International Classification of Functioning. Gac Sanit 2011;25(2):29-38. (PMID:22088902).

18. Mollaoglu M, Fertelli TK, Tuncay FO. Disability in elderly patients with chronic neurological illness: stroke, multiple sclerosis and epilepsy. Arch Gerontol Geriatr 2011;53(2):227-31. (PMID:21176976).

19. Bosetti F, Koenig JI, Ayata C, et al. Translational stroke research: vision and opportunities. Stroke 2017;48(9):2632-7. (PMID:28751554).

20. Shulman LM. Understanding disability in Parkinson's disease. Mov Disord 2010;25(1):131-5. (PMID:20187231).

21. Evlice A, Demir T, Aslan K, et al. Disability at neurological diseases. Cukurova Med J 2014;39(3):566-71.

22. Güzel V, Çabalar M, Selçuk Ö, et al. Evaluation of neurological disabilities by the disability scale Published on 16.12.2010. İstanbul Med J 2014;15:178-82.

23. Jagger C, Arthur AJ, Spiers NA, Clarke M. Patterns of onset of disability in activities of daily living with age. J Am Geriatr Soc 2001;49(4):404-9. (PMID:11347783).

24. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. Lancet 2007;370(9590):851-8. (PMID:17826170).

- Emre HORUZ[1]
- Hande AYDEMİR[2]
- Nihal PİŞKİN[2]
- Deniz ATAKENT[3]
- Güven ÇELEBİ[2]
- Furuzan KÖKTÜRK[4]

CORRESPONDANCE

Emre HORUZ
Zonguldak Maternity and Children Hospital,
Infectious Diseases and Clinical Microbiology,
Zonguldak, Turkey

Phone: 05053985822
e-mail: dremrehoruz@gmail.com

[1] Zonguldak Maternity and Children Hospital,
   Infectious Diseases and Clinical Microbiology,
   Zonguldak, Turkey
[2] Bülent Ecevit University, Faculty of Medicine,
   Department of Infectious Diseases and Clinical
   Microbiology, Zonguldak, Turkey
[3] Ufuk University, Dr. Rıdvan Ege Training and
   Research Hospital, Department of Infectious
   Diseases and Clinical Microbiology,
   Ankara, Turkey
[4] Bülent Ecevit University, Faculty of Medicine,
   Department of Biostatistics,
   Zonguldak, Turkey

RESEARCH

DIFFERENCES IN CLINICAL FEATURES, ETIOLOGY, TYPES, AND RISK FACTORS FOR COMPLICATIONS BETWEEN YOUNG AND OLDER PATIENTS WITH SKIN AND SOFT TISSUE INFECTIONS

ABSTRACT

Introduction: This study investigated differences in clinical features, types, etiology, and risk factors for complications between young and older patients with skin and soft tissue infections. Futhermore, age-related differences in healthcare-associated and complicated infections were identified.

Materials and Method: This retrospective study included 206 skin and soft tissue infection patients hospitalized during an 8-year period. Data were collected using a form: patients' characteristics, clinical features, laboratory values, prior antibiotic use, causative microorganisms, and antibiotic treatment. For cases with clinically diagnosed, samples were taken from the suspected infection sites. Gram staining, deep swab, deep tissue and blood culture results were evaluated.

Results: The incidence of diabetes mellitus was significantly higher among patients aged ≥65 years. Among these old patients, Escherichia coli (11/31, 35.5%) and Pseudomonas aeruginosa (8/31, 25.8%) were the most frequently isolated pathogens. Approximately half of the Staphylococcus aureus and Staphylococcus epidermidis strains isolated from patients with health care-associated infection were resistant to methicillin (8/15, 53.3%), and these patients produced higher levels of extended-spectrum beta-lactamase. Venous insufficiency (p=0.008) and prior hospitalization (p=0.001) were identified as risk factors for complication in patients aged ≥65. The median time- to -clinical response was 7 days in older patients with non-complicated infection (p=0.007).

Conclusion: Diabetes mellitus was the most common co-morbid factor in older patients. Risk factors for complication may differ by age. Gram-negative pathogens were more commonly isolated in older patients. The time- to -clinical response was significantly longer in older patients with non-complicated infection than young patients.

Keywords: Cellulitis; Diabetic foot; Aged; Cross Infection; Risk factors

ARAŞTIRMA

DERİ VE YUMUŞAK DOKU ENFEKSİYONLU GENÇ VE YAŞLI HASTALAR ARASINDA KLİNİK ÖZELLİKLER, TİP, ETİYOLOİ VE KOMPLİKE EDİCİ RİSK FAKTÖRLERİ AÇISINDAN FARKLILIKLAR

ÖZ

Giriş: Bu çalışmada, deri ve yumuşak doku enfeksiyonu tanısı alan genç ve yaşlı hastalar arasında klinik özellikler, tip, etiyoloji ve komplike edici risk faktörleri açısından farklılıklar araştırıldı. Ayrıca sağlık bakımı ilişkili ve komplike deri ve yumuşak doku enfeksiyonlu hastalarda yaşla ilişkili farklılıklar belirlendi.

Gereç ve Yöntem: Bu retrospektif çalışmaya sekiz yıllık süre içinde deri ve yumuşak doku enfeksiyonu tanısı alıp yatırılan 206 hasta alındı. Hastaların karakteristik ve klinik özelliklerini, laboratuvar değerlerini, öncesinde antibiyotik kullanımlarını, izole edilen etken mikroorganizmaları ve antibiyotik tedavilerini içeren veriler bir forma kaydedildi. Klinik olarak deri ve yumuşak doku enfeksiyonu tanısı koyulanların şüpheli enfeksiyon bölgelerinden örnekler alındı. Gram boyama, derin sürüntü, doku ve kan kültürleri değerlendirildi.

Bulgular: Diabetes mellitus, 65 yaş ve üzerindeki hastalarda yüksekti. Bu yaşlı hastalar arasında Escherichia coli (11/31, %35,5) ve Pseudomonas aeruginosa (8/31, %25,8), en sık izole edilen patojenlerdi. Sağlık bakımı ilişkili hastalardan izole edilen Staphylococcus aureus ve Staphylococcus epidermidis suşlarının yaklaşık yarısı (8/15, %53,3) metisiline dirençliydi ve bu hastalarda genişlemiş spektrumlu beta laktamaz üretimi de yüksekti. Venöz yetmezlik (p=0.008) ve önceden hastanede yatış (p=0.001), 65 yaş ve üzerindeki hastalarda komplike edici risk faktörleri olarak belirlendi. Ortalama klinik yanıt alma zamanı, komplike olmayan yaşlı hastalarda ortalama 7 gündü (p=0.007).

Sonuç: Diabetes mellitus, yaşlı hastalar arasında en yaygın komorbid faktördü. Komplike edici risk faktörlerinin yaşla ilişkili değişebildiği gözlendi. Yaşlı, deri ve yumuşak doku enfeksiyonlu hastalardan en sık izole edilen etkenler Gram-negatif patojenlerdi. Ortalama klinik yanıt alma zamanı, komplike olmayan yaşlı hastalarda gençlere göre anlamlı olarak yüksekti.

Anahtar sözcükler: Selülit; Diyabetik ayak; Yaşlı hastalar; Çapraz enfeksiyon; Risk faktörleri

INTRODUCTION

Skin and soft tissue infections (SSTIs) are among the most common infections, and are characterized by induration, erythema, warmth, and pain. These infections range from mild and self-limiting to life-threatening necrotizing fasciitis. These cases may be complicated by deep soft tissue involvement; severe conditions such as ulcers, burns, or major abscesses requiring significant surgical intervention; and co-morbid host factors such as diabetes mellitus (DM), obesity, and immunodeficiency (1). Elderly patients exhibit changes in skin consistency and are more likely to have underlying skin disorders and co-morbid factors, and are therefore have a high risk of SSTIs. Healthcare-associated (HCA) SSTIs such as pressure ulcers and surgical site infections are more common in elderly populations (2). Although community-acquired (CA) SSTIs are generally diagnosed and treated easily, complicated SSTIs (CSSTIs) can cause serious morbidity and even mortality, especially in the elderly and immunosuppressed patients. This study investigated differences in clinical features, types of SSTIs, isolated the causative microorganisms, and complicated risk factors between young and older patients. Currently, the microbial spectra of SSTIs in older patients and those with HCA infections are largely unknown. Although short-duration treatment regimens are generally suggested for CA-SSTIs, to our knowledge, no study has clearly investigated the time-to-clinical response to the antibiotic therapy in the older patients with complicated SSTI and in those with HCA-SSTI. In this study, we also investigated the times to clinical response in these two groups.

MATERIALS AND METHOD

Hospital setting and study design

Bulent Ecevit University Teaching and Research Hospital is a 600-bed tertiary care hospital in Zonguldak, Turkey. The hospital contains all major departments, including those associated with medical and surgical subspecialties, as well as medical and surgical intensive care units. This retrospective study enrolled 206 patients with CA- and HCA-SSTIs who were aged ≥18 years and had been hospitalized between January 2005 and December 2012. The patients were hospitalized in the Department of Infectious Diseases and Clinical Microbiology or another department that consulted with an Infectious Diseases (ID) specialist. Patients were monitored by the ID team during daily rounds. The study protocol was approved by the Ethics Committee of Bulent Ecevit University Teaching and Research Hospital, and written informed consent was obtained from the patients' legal representatives.

Data collection

This study included all patients with CA- and HCA-SSTIs who were hospitalized during the study period and for whom an ID consultation was requested. A form was used to collect the following data: name, age, sex, hospital ward, type of SSTI, antibiotic use before the consultation, empirical antibiotic treatment, clinical features of the SSTI (e.g., complicated or non-complicated), co-morbid factors, results of a complete blood count analysis (e.g., total white blood cell count, hemoglobin level, platelet count), sedimentation rate, C-reactive protein level, biochemical parameters (serum sodium, potassium, urea, creatine, and glucose levels), presence of fever, and signs of SSTI (e.g., induration, erythema, warmth, and tenderness). For cases with clinically suspected SSTI, samples were taken from the suspected infection sites. Also blood cultures were taken from all of the study patients. If an abscess or a bullous lesion was present, microbiological samples were obtained from aspirated exudates, bullous liquid and deep tissues after debridement and cleansing of superficial tissue. Swabs of pus or deep tissue samples were obtained from the open wounds. When an ulcer was present, deep swab and tissue samples were cultured. Gram stain, deep swab, tissue and blood culture results were evaluated together for the final decision of antibiotic regimen. Only blood cultures were taken from the patients with non-complicated SSTIs such as simple, nonpurulent, nonbullous selulitis. *Staphylococcus epidermidis* is generally

considered as a part of skin flora. In this study it was thought as a causative microorganism when it grew from an abscess material, deep tissue sample or ≥2 blood cultures from the patients with SSTIs. Patients were excluded from the study if they had been treated with intravenous antibiotics for >24 h prior to enrollment, were expected to undergo amputation or complete resection of the infected site, and had any diagnosis of nosocomial SSTI.

Definitions

Skin and soft tissue infections are defined as infections characterized by induration, erythema, warmth, and pain or tenderness (3). Complicated skin and soft tissue infections are defined as infections involving deep soft tissue or requiring significant surgical intervention, or those in patients with a significant underlying condition such as DM, obesity, immunodeficiency, or venous or arterial insufficiency (1). A HCA-SSTI was defined as any SSTI in a patient who had been recently hospitalized (i.e., within the previous 30 days), had used antibiotics in the 30 days prior to admission, had been transferred from a nursing home, or required dialysis (4, 5). A CA-SSTI was defined as an episode that developed in an outpatient setting or within 48 h after hospital admission in patients who did not fit the criteria for a HCA-SSTI (5). The empirical antibiotic treatment choice was made according to the pathogens suspected to be responsible for the SSTI.

Appropriate antimicrobial treatment was defined as the use of antibiotics with in vitro activity against the isolated pathogens or the presence of a clinically proven response when administered at an adequate dosage and time interval. Antimicrobial treatment was defined as inappropriate when the prescribed agent was not effective against the infecting microorganism(s) isolated from the infection sites or blood; if clinical deterioration, such as a lack of response, recurrence or worsening of fever, worsening of the infection site, increased purulence, erythema, induration, or local warmth, was observed within 72 hours of the initiation of treatment; or if the patients exhibited ≥2 systemic inflammatory reaction symptoms such as hypotension, tachycardia, a body temperature of <35°C or >38°C, and confusion or reduced

consciousness. Broadening of antibiotic treatment was considered if no clinical or microbiological response was observed, the patient's clinical status worsened, and/or the isolated causative bacteria was resistant to the initial antibiotic therapy according to in vitro antibiotic susceptibility testing. The following criteria were considered indicative of a clinical response: 1) resolution of fever or hypothermia, with a body temperature between 36°C and 38°C; 2) disappearance of the induration, erythema, warmth and tenderness, and/or pain; and 3) the absence of purulence and exudation in the infection site (6,7).

The treatment duration was 10–14 days for patients with non-complicated SSTI and ≥21 days for patients with CSSTI. Surgeons were also consulted for drainage and debridement in cases involving complicating factors such as necrotizing infection, abscesses, arthritis, and osteomyelitis.

Prior antibiotic use was defined as treatment for at least 24 h within 30 days prior to the beginning of the SSTI. Previous hospitalization was defined as hospitalization within the previous 30 days. If a suspicion of an abscess or an osteomyelitis was present, magnetic resonance imaging was also used. Isolation and Identification of Microorganisms from Cultures

Isolates were identified using conventional methods; when required, the results were confirmed using semi-automated API systems (bioMérieux, Marcy l'Etoile, France). Antibiotic susceptibility tests were performed according to the Kirby–Bauer disk diffusion method and the guidelines of the Clinical and Laboratory Standards Institute (CLSI) (8).

Statistical analysis

Statistical analyses were performed using SPSS 19.0 software (SPSS Inc., Chicago, IL, USA). The Shapiro–Wilk test was used to determine the distribution of data. Continuous variables are expressed as means±standard deviations, whereas categorical variables are expressed as frequencies and percentages. Continuous variables were compared using the Mann–Whitney U test, and categorical variables were compared using Pearson's chi-square test for two groups. A binary

logistic regression analysis with a forward stepwise method was performed to identify significant risk factors. A p value of <0.05 was considered statistically significant for all tests.

RESULTS

A total of 206 patients with SSTIs were recorded during the study period, including 132 male (64%) and 74 female patients (36%). The mean patient age was 57.17±15.17 years (range: 20–83 years). Sixty-nine patients were aged ≥65 years. Most patients were hospitalized in the Departments of Infectious Diseases and Clinical Microbiology (38.3%), Plastic and Reconstructive Surgery (15.5%), and Orthopedic Surgery (14.1%). Demographic features, co-morbid factors, and clinical characteristics were compared between patients aged <65 years and those aged ≥65 years (Table 1). Of the co-morbid factors, the incidence of DM was significantly higher among older patients. Similarly, leukocytosis was significantly more frequent among patients aged ≥65 years, whereas erythema was significantly more common among younger patients (Table 1).

Table 1. Demographic and clinical variables of patients with SSTIs by age.

Variable	All Patients N=206 n (%)	18–65 years N=137 n (%)	≥65 years N=69 n (%)	p
Sex (male)	132 (64)	88 (64)	44 (64)	1.000
DM	104 (50.5)	57 (41.6)	47 (68.1)	<0.001
Essential hypertension	36 (17.5)	20 (14.6)	16 (23.2)	0.348
CRF	20 (9.7)	11 (8.0)	9 (13.0)	0.316
Malignancy	19 (9.2)	10 (7.3)	9 (13.0)	0.276
COPD	12 (5.8)	5 (3.6)	7 (10.1)	0.110
CHF	6 (2.9)	2 (1.5)	4 (5.8)	0.098
Fever on admission	66 (32.0)	46 (33.6)	20 (29)	0.611
Erythema	110 (53.7)	82 (60.3)	28 (40.6)	0.007
Induration	63 (30.7)	43 (31.6)	20 (29.0)	0.821
Tenderness/pain	35 (17.1)	24 (17.6)	11 (15.9)	0.912
Exudation	27 (13.1)	17 (12.5)	10 (14.5)	0.857
Leukocytosis	86 (41.7)	50 (36.5)	36 (52.2)	0.031
Prior antibiotic use	131 (63.6)	86 (62.8)	45 (65.2)	0.731
Prior hospitalization	93 (45.1)	57 (41.6)	36 (52.2)	0.725
Operation	58 (28.2)	37 (27.0)	21 (30.4)	0.150
Trauma	27 (13.1)	21 (15.3)	6 (8.7)	0.266
Obesity	44 (21.4)	27 (19.7)	17 (24.6)	0.526
Toe-web intertrigo	35 (17.0)	22 (16.1)	13 (18.8)	0.760
Venous insufficiency	38 (18.4)	22 (16.1)	16 (23.2)	0.291
HCA-SSTI	87 (42.2)	52 (38)	35 (50.7)	0.080
CSSTI	117 (56.8)	74 (54)	43 (62.3)	0.256
	median (min–max)	median (min–max)	median (min–max)	
Time to resolution of fever (days)	3 (2–10)	3 (2–10)	3 (2–10)	0.596
Time to clinical response (days)	5 (2–14)	5 (2–14)	7 (3–12)	0.179

SSTI, skin and soft tissue infection; HCA, healthcare-associated; CSSTI, complicated SSTI; DM, diabetes mellitus; CRF, chronic renal failure; COPD, chronic obstructive pulmonary disease; CHF, congestive heart failure.

Table 2. Types of SSTI.

Type	All Patients N=206 n (%)	18–65 years N=137 n (%)	≥65 years N=69 n (%)	p	CA-SSTI patients N=119 n (%)	HCA-SSTI patients N=87 n (%)	P
Cellulitis	94 (45.6)	68 (49.6)	26 (37.7)	0.104	66 (55.5)	28 (32.2)	0.001
Diabetic foot	54 (26.2)	25 (18.2)	29 (42.0)	<0.001	29 (24.4)	25 (28.7)	0.587
Erysipelas	24 (11.7)	15 (10.9)	9 (13.0)	0.832	9 (7.6)	15 (17.2)	0.055
Fournier gangrene	12 (5.8)	9 (6.6)	3 (4.3)	0.754	5 (4.2)	7 (8.0)	0.388
Abscess	8 (3.9)	7 (5.1)	1 (1.4)	0.272	5 (4.2)	3 (3.4)	1.000
Ulcer	4 (1.9)	4 (2.9)	0 (0.0)	0.303	2 (1.7)	2 (2.3)	1.000
Burn	4 (1.9)	4 (2.9)	0 (0.0)	0.303	0 (0.0)	4 (4.6)	0.031
NF	3 (1.5)	2 (1.5)	1 (1.4)	1.000	1 (0.8)	2 (2.3)	0.575
Other	3 (1.5)	3 (2.2)	0 (0.0)	0.552	2 (1.7)	1 (1.1)	1.000

SSTI, skin and soft tissue infection; CA, community-acquired; HCA, healthcare-associated ; NF, necrotizing fasciitis,

Cellulitis and diabetic foot infections were the most frequent SSTI infections in all patients (Table 2). Cellulitis was significantly more common in patients with CA-SSTI (p=0.001), whereas burn infections were more common in patients with HCA-SSTI (p=0.031). Patients aged ≥65 years were significantly more likely to have a diabetic foot infection, compared to younger patients (p=0.001).

Pathogenic microorganism(s) were isolated from 96 (46.6%) of the 206 patients (19 cases were polymicrobial). Causative microorganism isolation rate from blood cultures was 4.9%. Gram negative bacteria isolation rate was higher in patients aged ≥65 years (25/31, 80.6%), than the patients aged <65 years (35/65, 53.8%) (p<0.001).

In patients aged <65 years, methicillin-sensitive *Staphylococcus aureus* (MSSA)/*epidermidis* (MSSE) (21/65, 32.3%) and *Escherichia coli* (18/65, 27.6%) were the most common pathogens

responsible for SSTIs. In patients aged ≥65 years, *E. coli* (11/31, 35.5%) and *Pseudomonas aeruginosa* (8/31, 25.8%) were the most frequently isolated pathogens. Among patients with complications, *P. aeruginosa* was the most commonly isolated pathogen (25/83, 30.1%). MSSA was the most frequently isolated pathogen from patients with CA-SSTI (18/40, 45.0%), whereas *P. aeruginosa* was most frequently from patients with HCA-SSTI (19/56, 33.9%). Methicillin resistance was detected in only one of 22 *S. epidermidis/aureus* isolates (4.5%), and three of nine *E. coli* and *K. pneumoniae* isolates (33.3%) from patients with CA-SSTI produced extended-spectrum beta-lactamase (ESBL). In patients with HCA-SSTI, approximately half of the *S. aureus* and *S. epidermidis* isolates were methicillin-resistant (8/15, 53.3%). Patients with HCA-SSTI were more likely to produce ESBL (9/21, 42.8%) than were patients with CA-SSTI. Table 3 compares patients with CSSTI and non-complicated SSTI in terms of

the study variables. Furthermore the differences in variables between young and older patients with CSSTI and non-complicated SSTI are shown in this table. Of the evaluated co-morbid factors, DM was significantly more common in patients with CSSTI (p<0.001). Malignancy was significantly more common in non-complicated patients (p=0.002), and erythema (p<0.001) and induration (p=0.001) were more frequently seen in this population. By contrast, patients with CSSTI were significantly more likely to exhibit leukocytosis (p=0.005), exudation (p<0.001) prior antibiotic use (p<0.001), prior hospitalization (p<0.001), toe-web intertrigo (p=0.013), and venous insufficiency (p<0.001) or to have undergone surgery (p<0.001). Furthermore, the time- to -resolution of fever (p< 0.001) and time-to -clinical response (p=0.016) were significantly longer in patients with CSSTI. Patients with CSSTI were also significantly more likely to have HCA-SSTI (p<0.001). DM was significantly a more common co-morbid factor in both patients with complicated SSTI (p=0.025) and those with non-complicated SSTI patients (p=0.030) aged ≥65 years. Among co-morbid factors, chronic renal failure was also significantly more common in older patients with non-complicated SSTIs (p=0.013). Erythema was significantly a more common sign in non-complicated SSTI aged <65 years (p=0.024). Time- to -clinical response was significantly found to be longer in older patients with non-complicated SSTI (p=0.007).

Table 4 presents a comparison of patients with CA-SSTI and HCA-SSTI in terms of co-morbid factors and some clinical features. This table also presents differences in variables between young and the older patients with CA-SSTI and HCA- SSTI. Prior antibiotic use (p< 0.001), prior hospitalization (p<0.001), and operation (p<0.001) were significantly more common among patients with HCA-SSTI, and these patients were also more likely to have CSSTI (p<0.001). However, patients with CA-SSTI and HCA-SSTIs did not differ significantly in terms of the time to resolution of fever and time to clinical response. Erythema (p<0.001) and induration (p=0.032) were more common in patients with CA-SSTI. Exudation was significantly more common in patients with HCA-SSTI (p=0.006). DM was found to be significantly more common in older patients with both CA (p=0.019) and HCA-SSTI (p=0.014). Erythema was a more common sign in young patients with HCA-SSTI (p=0.047).

Risk factors for CSSTI are shown in Table 5. Male sex (p=0.000), venous insufficiency (p=0.028), DM (p=0.001) prior hospitalization (p=0.005) and operation (p=0.019) were identified as risk factors for CSSTI in patients aged <65 years, whereas venous insufficiency (p=0.008) and prior hospitalization (p=0.001) were identified as risk factors for CSSTI in patients aged ≥65 years. Inappropriate antibiotic use was identified in 34 patients. Complicated cellulitis and diabetic foot infections were the most common SSTIs in these patients. The most commonly reported reasons for switching antibiotic treatment regimens were the resistance of causative bacteria (18/34, 52.9%) and lack of a clinical response (15/34, 44.1%). Half of these patients had HCA-SSTI. Twenty-three of were aged <65 years, and 11 were aged ≥65 years old.

Table 3. The differences in variables between young and older patients with complicated SSTI and non-complicated SSTI.

Variable	Complicated SSTI				Non-complicated				p (for all patients of CSSTI and non-complicated SSTI)
	All N=117 n (%)	<65 N=74 n (%)	≥65 N=43 n (%)	P	All N=89 n (%)	<65 N=63 n (%)	≥65 N=26 n (%)	p	
Sex (male)	86 (73.5)	56 (75.7)	30 (69.8)	0.631	46 (51.7)	32 (50.8)	14 (53.8)	0.977	0.001
DM	73 (62.4)	40 (54.1)	33 (76.7)	0.025	31 (34.8)	17 (27.0)	14 (53.8)	0.030	<0.001
Essential hypertension	20 (17.1)	12 (16.2)	8 (18.6)	0.939	16 (17.9)	8 (12.7)	8 (30.8)	0.067	1.000
CRF	9 (7.7)	7 (9.5)	2 (4.7)	0.482	11 (12.4)	4 (6.3)	7 (26.9)	0.013	0.377
Malignancy	4 (3.4)	1 (1.4)	3 (7.0)	0.140	15 (16.9)	9 (14.3)	6 (23.1)	0.357	0.002
COPD	9 (7.7)	3 (4.1)	6 (14.0)	0.073	3 (3.4)	2 (3.2)	1 (3.8)	1.000	0.312
CHF	2 (1.7)	1 (1.4)	1 (2.3)	1.000	4 (4.5)	1 (1.6)	3 (11.5)	0.073	0.406
Obesity	27 (23.1)	16 (21.6)	11 (25.6)	0.793	17 (19.1)	11 (17.5)	6 (23.1)	0.562	0.604
Toe-web intertrigo	27 (23.1)	17 (23.0)	10 (23.0)	1.000	8 (9.0)	5 (7.9)	3 (11.5)	0.687	0.013
Venous insufficiency	33 (28.2)	19 (25.7)	14 (32.6)	0.559	5 (5.6)	3 (4.8)	2 (7.7)	0.627	<0.001
Fever on admission	42 (35.9)	28 (37.8)	14 (32.6)	0.708	24 (27.0)	18 (28.6)	6 (23.1)	0.788	0.174
Erythema	26 (22.2)	20 (27.4)	6 (14.0)	0.148	84 (94.4)	62 (98.4)	22 (84.6)	0.024	<0.001
Induration	24 (20.5)	15 (20.5)	9 (20.9)	1.000	39 (43.8)	28 (44.4)	11 (42.3)	1.000	0.001
Tenderness/pain	18 (15.4)	13 (17.8)	5 (11.6)	0.534	17 (19.1)	11 (17.5)	6 (23.1)	0.562	0.726
Exudation	26 (22.2)	17 (23.3)	9 (20.9)	0.949	1 (1.1)	0 (0.0)	1 (3.8)	0.292	<0.001
Ulcer	4 (3.4)	3 (4.1)	1 (2.3)	1.000	0 (0.0)	-	-		0.071
Bullous skin lesion	2 (1.7)	1 (1.4)	1 (2.3)	1.000	0 (0.0)	-	-		0.260
Leukocytosis	78 (66.7)	52 (70.3)	26 (60.5)	0.378	42 (47.2)	35 (55.6)	7 (26.9)	0.026	0.005
Prior antibiotic use	88 (75.2)	56 (75.7)	32 (74.4)	1.000	43 (48.3)	30 (47.6)	13 (50.0)	1.000	<0.001
Prior hospitalization	72 (61.5)	43 (58.1)	29 (67.4)	0.422	21 (23.6)	14 (22.2)	7 (26.9)	0.841	<0.001
Operation	45 (38.5)	28 (37.8)	17 (39.5)	1.000	13 (14.6)	9 (14.3)	4 (15.4)	1.000	<0.001
Trauma	14 (12)	10 (13.5)	4 (9.3)	0.703	13 (14.7)	11 (17.5)	2 (7.7)	0.331	0.728
HCA-SSTI	63 (53.8)	36 (48.6)	27 (62.8)	0.198	24 (27.0)	16 (25.4)	8 (30.8)	0.797	<0.001
			median (min–max)				median (min–max)		
Time to resolution of fever (days)	3 (2–10)	8 3-12	6 3-10	0.074	2 (2–8)	2 (2-6)	2 (2-8)	0.687	<0.001
Time to clinical response (days)	6.5 (3–12)	4 (2-10)	3 (2-10)	0.254	5 (2–14)	5 (2-14)	7 (3-12)	0.007	0.016

SSTI, skin and soft tissue infection; HCA, healthcare-associated; DM, diabetes mellitus; CRF, chronic renal failure; COPD, chronic obstructive pulmonary disease; CHF, congestive heart failure.

Table 4. The differences in variables between young and older patients with CA-SSTI and HCA-SSTI.

Variable	CA-SSTI N=119 n (%)	CA-SSTI <65 N=85 n %	CA-SSTI ≥65 N=34 n %	p	HCA-SSTI N=87 n %	HCA-SSTI <65 N=52 n %	HCA-SSTI ≥65 N=35 n %	p	p (for all patients of CA-SSTI and HCA-SSTI)
Sex (male)	75 (63.0)	54 (63.5)	21 (61.8)	1.000	57 (65.5)	34 (65.4)	23 (65.7)	1.000	0.713
DM	62 (52.1)	38 (44.7)	24 (70.6)	0.019	42 (48.3)	19 (36.5)	23 (65.7)	0.014	0.588
Essential hypertension	22 (18.5)	13 (15.3)	9 (26.5)	0.247	14 (16.1)	7 (13.5)	7 (20.0)	0.606	0.794
CRF	10 (8.4)	5 (5.9)	5 (14.7)	0.146	10 (11.5)	6 (11.5)	4 (11.4)	1.000	0.616
Malignancy	10 (8.4)	6 (7.1)	4 (11.8)	0.469	9 (10.3)	4 (7.7)	5 (14.3)	0.475	0.817
COPD	4 (3.4)	3 (3.5)	1 (2.9)	1.000	8 (9.2)	2 (3.8)	6 17.1	0.056	0.143
CHF	3 (2.5)	1 (1.2)	2 (5.9)	0.196	3 (3.4)	1 (1.9)	2 (5.7)	0.562	0.690
Obesity	24 (20.2)	15 (17.6)	9 (26.5)	0.406	20 (23.0)	12 (23.1)	8 (22.9)	1.000	0.752
Toe-web intertrigo	16 (13.4)	13 (15.3)	3 (8.8)	0.553	19 (21.8)	9 (17.3)	10 (28.6)	0.326	0.163
Venous insufficiency	26 (21.8)	15 (17.6)	11 (32.4)	0.131	12 (13.8)	7 (13.5)	5 (14.3)	1.000	0.197
Fever on admission	37 (31.6)	27 (31.8)	10 (29.4)	0.975	29 (33.3)	19 (36.5)	10 (28.6)	0.588	0.134
Erythema	78 (65.5)	58 (69.0)	20 (58.8)	0.396	32 (36.8)	24 (46.2)	8 (22.9)	0.047	<0.001
Induration	43 (36.1)	30 (35.7)	13 (38.2)	0.963	20 (23.0)	13 (25.0)	7 (20.0)	0.777	0.032
Tenderness /pain	20 (16.8)	13 (15.5)	7 (20.6)	0.690	15 (17.2)	11 21.2	4 11.4	0.374	1.000
Exudation	8 (6.7)	8 (9.5)	0 (0.0)	0.103	19 (21.8)	9 (17.3)	10 (28.6)	0.326	0.006
Ulcer	2 (1.6)	2 (2.4)	0 (0.0)	1.000	2 (2.3)	1 (1.9)	1 (2.9)	1.000	1.000
Bullous skin lesion	2 (1.6)	1 (1.2)	1 (2.9)	0.495	0 (0.0)	0 (0.0)	0 (0.0)	-	0.265
Leukocytosis	71 (59.7)	55 (64.7)	16 (47.1)	0.117	49 (56.3)	32 (61.5)	17 (48.6)	0.329	0.631
Prior antibiotic use	49 (41.2)	37 (43.5)	12 (35.3)	0.536	82 (94.3)	49 94.2	33 94.4	1.000	<0.001
Prior hospitalization	20 (16.8)	15 (17.6)	5 (14.7)	0.907	73 (83.9)	42 (80.8)	31 (88.6)	0.501	<0.001
Operation	17 (14.3)	14 (16.5)	3 (8.8)	0.389	41 (47.1)	23 (44.2)	18 (51.4)	0.660	<0.001
Trauma	17 (14.3)	15 (17.6)	2 (5.9)	0.146	10 (11.5)	6 (11.5)	4 (11.4)	1.000	0.706
CSSTI	54 (45.4)	38 (44.7)	16 (47.1)	0.977	63 (72.4)	36 (69.2)	27 (77.1)	0.572	<0.001
			median (min–max)				median (min–max)		
Time to resolution of fever (days)	3 (2–8)	3 (2-8)	2 (2-8)	0.590	3 (2–10)	3 (2-10)	4 (2-10)	0.675	0.096
Time to clinical response (days)	5 (2–14)	5 (2-14)	7 (4-12)	0.265	5 (3–10)	6 (3-10)	7 (3-10)	0.467	0.836

SSTI, skin and soft tissue infection; CA, community-acquired; HCA, healthcare-associated; CSSTI, complicated SSTI; DM, diabetes mellitus; CRF, chronic renal failure; COPD, chronic obstructive pulmonary disease; CHF, congestive heart failure.

Table 5. Age related risk factors for CSSTI.

Risk factor	OR	95% CI	p
For patients aged ≥65 years			
Venous insufficiency	10.160	1.823–56.641	0.008
Prior hospitalization	8.273	2.505–27.329	0.001
For all patients			
DM	2.952	1.541–5.656	0.001
Prior hospitalization	5.730	2.934–11.190	<0.001
Venous insufficiency	6.526	2.253–18.898	0.001
For patients aged <65			
Sex (male)	5.199	2.062-13.109	0.000
Venous insufficiency	6.066	1.210-30.408	0.028
DM	4.930	1.980-12.400	0.001
Prior hospitalization	3.972	1.524-10.348	0.005
Operation	3.908	1.251-12.198	0.019

SSTI, skin and soft tissue infection; CSSTI, complicated SSTI; OR, odds ratio; CI, confidence interval; DM, diabetes mellitus

DISCUSSION

SSTIs are common both in the general population and among older patients. The latter are particularly at risk of developing SSTIs because of changes in skin consistency, co-morbid conditions that affect immunity, skin disorders such as edema, and trauma (2, 9).

A previous report identified cellulitis as a frequent occurrence in long-term care facilities, where it affected 1–9% of residents (10). In our study, cellulitis was the most common SSTI among all patients, whereas diabetic foot infection was more common in older patients. In our study, DM was the most common comorbid disease in patients with CSSTIs and in older patients among all sub-groups of SSTIs such as complicated, non-complicated, community acquired and healthcare-associated. The authors of a previously reported study also found DM to be the most common of the active co-morbid factors

at the time of enrollment in each complicated infection type. That study also reported peripheral vascular disease, renal insufficiency, chronic renal failure, immunosuppression, and advanced age as risk factors (11). By contrast, we did not identify advanced age as a risk factor for CSSTI. However, we identified venous insufficiency and prior hospitalization as risk factors for complications in all patients and in older patients.

In older patients, cellulitis often presented with atypical symptoms. Systemic symptoms, such as fever, tachycardia, hypotension, and leukocytosis occur infrequently. Some conditions associated with skin fragility, such as edema and skin tears, are known to predispose a patient to cellulitis (2). In our study, erythema, a main clinical sign of SSTI, was significantly more common among young patients with non-complicated SSTI. However, we observed that an elevated leucocyte count was more common

in the older group. Exudation was a more common clinical sign in patients with CSSTIs, and these patients also had a longer time- to -clinical response and time- to -resolution of fever. These results were independent of age. Although an antibiotic therapy duration of approximately 5 days was recently recommended (12), in our study, the median time- to -clinical response was approximately 7 days in patients with CSSTIs. Also this time was significantly longer in older patients with non-complicated SSTI than the younger patients. Therefore, our treatment duration was longer that recommended in the current guideline.

Per the literature, the main etiological agents of SSTIs are Gram-positive organisms such as *S. aureus* and beta-hemolytic streptococci (13). Current IDSA guideline described positive blood culture rates of only 2%–4% and positive punch biopsy culture 20%-30% in patients with CA-SSTIs. Furthermore, blood, aspirate and other biopsy material cultures are no longer routinely recommended for simple, nonpurulent CA-SSTIs because of low isolation of causative microorganism rates (12). In another domestic guideline recently reported by the Korean authors, routine blood, aspiration, or punch biopsy culture was recommended only in immunosuppressive patients, similar to that reported in the IDSA guideline (14) In our study, causative microorganisms were isolated from 47% of included patients; in other words, our bacteria isolation rate was higher than that reported previously (12). We attribute this high rate to the facts that patients with CSSTI comprised 57% of our study population and that most cultures were grown from deep swab and tissue samples. Our study population was hospitalized before the reporting date of these guidelines, so the patients' blood cultures were taken routinely even from patients with simple cellulitis. Our causative microorganism isolation rate from blood cultures was 4.9%, similar to that reported previously (12). In a recently published study of 158 elderly patients

with cellulitis, positive bacterial cultures were grown from the superficial samples of 15% of the patients, and *S. aureus* was the most commonly isolated pathogen (15). Similarly, in our study, Gram-positive microorganisms were most frequently isolated from patients with CA-SSTI and those aged <65 years. By contrast, Gram-negative pathogen isolation rate was significantly higher in older patients. Although DM was significantly more common in older patients, it was not found as a significant risk factor for CSSTI for this population. So we think this high isolation rate may be due to the advanced age. In patients with HCA-SSTI, approximately half of the staphylococcal strains were methicillin-resistant, and ESBL production by gram-negative bacteria was more frequently observed. Accordingly, we think that initial antibiotic regimens administered to older patients and those with HCA-SSTI should target Gram-negative pathogens. Additionally, the high frequency of resistant pathogens was unsurprising, as many patients had a history of prior antibiotic use. The identification of a resistant organism should prompt a change in the initial antibiotic regimen. We believe that culture and antibiotic sensitivity tests should be performed for older patients and those with HCA-SSTIs. Penicillinase-resistant penicillin was suggested for the patients in whom the clinical findings could not accurately distinguish between streptococcal and staphylococcal infection. The initial regimen was suggested in combination with clindamycin, linezolid, or vancomycin if MRSA is suspected as a causative agent (13). Generally, SSTIs are considered as complicated if they require surgical procedures or involve deeper subcutaneous tissues. In our study, more than half of the patients had CSSTI, and more than half these cases were HCA. The treatment of a CSSTI may be challenging because of the complex spectrum of causative microorganisms. A previous report noted that the prevalence of antibiotic-resistant microorganisms had increased among CSSTI cases (11). In our study, Gram-negative pathogens were more common among patients

with CSSTIs. Although infection management depends on many factors, including the local prevalence, previous antibiotic use, and previous hospitalization, we recommend that patients with CSSTI receive an initial treatment regimen that targets Gram-negative microorganisms, especially *P. aeruginosa*.

Although it was suggested that empirical initial antibiotic therapy for elderly patients should target Gram-positive agents, we also suggest Gram-negative pathogens, and even *P. aeruginosa*, should be targeted in this group, as well as in patients with CSSTIs and HCA-SSTIs (9).

Previous studies have defined many risk factors for SSTIs, including obesity, venous or lymph stasis, tinea pedis, recent trauma, and underlying skin disorders (9, 16); however, overweight and lymphedema were identified as the prominent risk factors (16). In our study, we compared the risk factors for complications between young and older patients with SSTI. In young patients, male sex, DM, operation, venous insufficiency, and prior hospitalization were identified as significant risk factors for CSSTI, whereas the latter two remained risk factors for CSSTI in patients aged ≥65 years. Although toe-web intertrigo, which is mostly caused

by fungal infection, was also reported as a major risk factor, we did not identify this condition as a risk factor for complications in age related sub-groups of patients with SSTI.

In conclusion, DM was the most common co-morbid factor in older patients with SSTI in each sub-group. We did not find advanced age as a risk factor for CSSTI, but found that risk factors for complicated SSTI may differ by age. Time- to-resolution of fever and time- to- clinical response were significantly longer in patients with CSSTI and time- to- clinical response was longer in older patients with non-complicated SSTI. Furthermore isolation rate of Gram-negative bacteria is more common among in older patients. Although current guidelines and reviews suggest providing coverage for beta-hemolytic streptococcal and methicillin-sensitive staphylococcal strains when treating CA-SSTIs, we should not overlook the likelihood that Gram-negative pathogens are the etiologic agents of SSTIs, especially in elderly patients.

Conflict of interest

The authors have no potential conflicts of interest.

REFERENCES

1. White B, Seaton RA. Complicated skin and soft tissue infections: literature review of evidence for and experience with daptomycin. Infect Drug Resist 2011;4:115-27. (PMID:21753891).

2. Compton GA. Bacterial skin and soft tissue infections in older adults. Clin Geriatr Med 2013;29(2):443-59. (PMID:23571039).

3. Eron LJ, Lipsky BA, Low DE, Nathwani D, Tice AD, Volturo GA. Managing skin and soft tissue infections: expert panel recommendations on key decision points. J Antimicrob Chemother 2003;52(Suppl 1):i3-i17. (PMID:14662806).

4. Zilberberg M, Micek ST, Kollef MH, Shelbaya A, Shorr AF. Risk factors for mixed complicated skin and skin structure infections to help tailor appropriate empiric therapy. Surg Infect (Larchmt) 2012;13:377-82. (PMID:23216526).

5. Kofteridis DP, Valachis A, Koutsounaki E, et al. Skin and soft tissue infections in patients with solid tumours. Scientific World Journal 2012 Feb 1; 2012:804518. (PMID:22448140). [Internet] Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3289964/pdf/TSWJ2012-804518.pdf. Accessed: 1. 2. 2012. DOI:10.1100/2012/804518.

6. Kothe H, Bauer T, Marre R, Suttorp N, Welte T, Dalhoff K. Competence network for community-acquired pneumonia study group. Outcome of community-acquired pneumonia: influence of age, residence status and antimicrobial treatment. Eur Respir J 2008;32:139-46. (PMID:18287129).

7. Gordon NC, Wareham DW. A review of clinical and outcomes following treatment of infections involving multidrug-resistant Acinetobacter baumannii with tigecycline. J Antimicrob Chemother 2009;63(4):775-80. (PMID:19158109).

8. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing; twenty-second informational supplement. CLSI document M100-S22. Wayne, PA: Clinical and Laboratory Standards Institute 2012;32(3):44-120.

9. Anderson DJ, Kaye KS. Skin and soft tissue infections in older adults. Clin Geriatr Med 2007;23(3):595-613. (PMID:17631236).

10. Nicolle LE. Infection control in long-term care facilities. Clin Infect Dis 2000;3(3):752-6. (PMID:11017825).

11. Lipsky BA, Moran GJ, Napolitano LM, Vo L, Nicholson S, Kim M. A prospective, multicenter, observational study of complicated skin and soft tissue infections in hospitalized patients: clinical characteristics, medical treatment, and outcomes. BMC Infect Dis 2012;(12):227. (PMID:23009247).

12. Stevens DL, Bisno AL, Chambers HF, et al. Infectious Diseases Society of America. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clin Infect Dis 2014;59(2):147-59. (PMID:24973422).

13. Stevens DL, Bryant AE. Impetigo, Erysipelas and Cellulitis, In: Ferretti JJ, Stevens DL, Fischetti VA, (Eds). *Streptococcus pyogenes*: Basic Biology to Clinical Manifestations [Internet]. Oklahoma City (OK): University of Oklahoma Health Sciences Center 2016, pp 1-18. Available from: https://www.ncbi.nlm.nih.gov/books/NBK333408/pdf/Bookshelf_NBK333408.pdf. Accessed: 10. 2. 2016.

14. Kwak YG, Choi SH, Kim T, et al. Clinical guidelines for the antibiotic treatment for community-acquired skin and soft tissue infection. Infect Chemother 2017;49(4):301-25. (PMID:29299899)

15. Mzabi A, Marrakchi W, Alaya Z, et al. Cellulitis in aged persons: a neglected infection in the literature. Pan Afr Med J 2017;30(27):160. (PMID:28904688).

16. Dupuy A, Benchikhi H, Roujeau JC, et al. Risk factors for erysipelas of the leg (cellulitis): case-control study. BMJ 1999;318(7198):1591-4. (PMID:10364117).

■ Dilek ÜNAL[1]
■ İpek ÖZYAYLALI[2]
■ İsmail Hakan KULAÇOĞLU[3]

CORRESPONDANCE

Dilek ÜNAL
Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Turkey

Phone: 03125962553
e-mail: dilek.yazicioglu@hotmail.com

[1] Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Anesthesiology and Reanimation, Ankara, Turkey
[2] Haymana State Hospital, General Surgery, Ankara, Turkey
[3] Ankara Hernia Center, General Surgery, Ankara, Turkey

RESEARCH

SAFETY OF OUTPATIENT HERNIORRHAPHY IN THE GERIATRIC PATIENT: A RETROSPECTIVE COMPARATIVE STUDY

ABSTRACT

Materials and Method: A retrospective medical record review of geriatric patients aged ≥65 years (Group G, n=185) who had undergone outpatient inguinal hernia repair under local infiltration anesthesia (LIA) and sedation was conducted. Their data were compared with those of a group of nongeriatric patients aged 18–64 years (Group C, n=185). Patient selection, anesthetic and surgical care, and discharge criteria were protocol-based. Safety was evaluated in terms of incidence of adverse events, discharge delay, unanticipated admission and readmission and time to discharge.

Results: Results for the Groups G and C were age 73.2±7.1 vs. 43.9±12.3 years, number of high-risk patients with American Society of Anesthesiologists classification (ASA) III (n=55 [30%] vs. 5 [3%]), ASA IV (n=4 [2%] vs. 1 [0.5%]), minimal sedation was used in 158 vs. 163 patients, midazolam dose 2.7±1.1 vs. 4.6±1.7 mg, fentanyl dose 63.4±28.6 vs. 88.1±32.4 µg, lidocaine dose 246.6±59.9 vs. 198.6±69.8 mg, and bupivacaine dose 39±9.5 vs. 47.7±10.7 mg, respectively. Times to discharge were 102±19 min and 91.2±22.5 min in Groups G and C, respectively. Groups were similar regarding the rate of intraoperative and postoperative adverse events, except for ecchymosis (n=2 in Group G vs. n=10 in Group C) and the rates of discharge delay, unanticipated admission, and readmission.

Conclusion: Outpatient inguinal herniorrhaphy under LIA and sedation in geriatric patients is as safe as in the nongeriatric patients, provided that protocol-based preoperative evaluation and discharge criteria and appropriate anesthetic management and surgical techniques are followed.

Keywords: Geriatrics; Outpatient; General Surgery; Herniorrhaphy

ARAŞTIRMA

GERİATRİK HASTALARDA GÜNÜBİRLİK KASIK FITIĞI ONARIMININ GÜVENLİĞİNİN ARAŞTIRILMASI: GERİYE DÖNÜK KONTROLLÜ ARAŞTIRMA

ÖZ

Giriş: Geriatrik hastalarda günübirlik kasık fıtığı onarımının güvenliğinin araştırılması amaçlanmıştır.

Gereç ve Yöntem: Lokal anestezi ve sedasyon altında günübirlik kasık fıtığı onarımı yapılan yaşları ≥65 yıl (Grup G, n=185) olan hasta kayıtları geriye dönük olarak incelendi ve veriler, yaşları 18-64 yıl (Grup K, n=185) olan hastaların verileri ile karşılaştırıldı. Hasta seçimi, anestezi ve cerrahi bakım ve taburculuk belirli protokollere göre yapıldı. Sonuç ölçütleri, istenmeyen olayların görülme sıklığı, taburculuk süresi, taburculuk gecikmesi ve planlanmamış hastane yatışı ile yeniden hastaneye başvuru sıklığıdır.

Bulgular: Geriatri ve Kontrol gruplarının sonuçları sırasıyla, yaş: 73.2±7,1 ve 43.9±12.3 yıl; yüksek riskli hasta sayısı Amerikan Anestezistler Derneği sınıflaması (ASA) III (n=55 [%30] ve 5 [%3]), ASA IV (n=4 [%2] ve 1 [%0.5]); minimal sedasyon kullanılan hasta sayısı 158 ve 163; midazolam dozu 2.7±1.1 ve 4.6±1.7 mg; fentanil dozu 63,4±28,6 ve 88.1±32.4 µg; lidokain dozu 246.6±59,9 ve 198,6±69,8 mg ve bupivakain dozu 39±9.5 ve 47.7±10,7 mg'dır. Taburculuk süresi Grup G ve K'da sırasıyla 102±19 ve 91.2±22.5 dk'dır. Gruplarda ekimoz oluşma sıklığı (Grup G'de n=2, Grup K'da. n=10) dışında intraoperatif ve postoperatif istenmeyen olayların gelişme sıklığı ve taburculuk gecikmesi, planlanmayan hastane yatışı ve yeniden hastaneye başvuru sıklığı bakımından fark yoktur.

Sonuç: Geriatrik hasta grubunda, lokal anestezi ve sedasyon altında yapılan günübirlik kasık fıtığı onarımı, protokol bazlı preoperatif değerlendirme ve taburculuk kuralları ve uygun anestezik ve cerrahi bakım uygulanmak koşulu ile genç hastalardaki kadar güvenlidir.

Anahtar sözcükler: Geriatri; Günübirlik; Genel Cerrahi; Kasık fıtığı onarımı

INTRODUCTION

Inguinal hernia is a common problem, and its prevalence increases with age. The number of elderly patients who require surgical intervention is increasing accordingly. There is an ongoing debate on the surgical treatment of asymptomatic or mildly symptomatic hernias in elderly patients. It has been shown that watchful waiting may be safe, whereas it has also been stated that the improvement of quality of life in elderly patients with minimally symptomatic inguinal hernia represents an indication for elective herniorrhapy (1-3). It has been shown that elective inguinal hernia repair carries a mortality rate in the elderly patients similar to that in the general population (4, 5). In addition, emergency inguinal hernia surgery is associated with remarkably higher morbidity and mortality rates than elective repairs (6, 7). Planned herniorrhaphy under local anesthesia seems more acceptable today even for patients older than 80 years (8).

Inguinal hernia repair is an outpatient surgery eligible procedure. The main advantages of outpatient care are decreased health costs and milder patient stress. The success of safe outpatient anesthesia depends on appropriate patient selection (3). Time to discharge as well as return hospital visits and readmission rates are measures of quality for outpatient procedures (8,9). Several studies have been aimed at determining the frequency of return hospital visits and readmission, as well as associated adverse events, after outpatient surgery to describe the predictors (8,10,11). The higher incidence of comorbid diseases and concurrent use of medications and physiological changes in the geriatric patient population may increase the risk of anesthesia and surgery (12,13). However, to date, the anesthesia and surgical risks in the outpatient geriatric population are not well defined. In this study, we aimed to investigate the time to discharge, frequency of return hospital visits and readmission, and associated adverse events after outpatient inguinal herniorrhaphy in the elderly patients and to report on the safety of

the procedure under local infiltration anesthesia (LIA) and sedation.

MATERIALS AND METHOD

Ankara Hernia Center is an outpatient surgery service. Service is specific to hernia repair and a standardized anesthesia and surgical protocol is used for all patients. All data are prospectively documented in separate sheets for each patient. A retrospective data analysis was conducted to compare a group of patients aged 65 years and older (Group G, n=185) with a random sample of patients aged 16–64 years as the control group (Group C, n=185). The participants underwent elective outpatient inguinal herniorrhaphy under LIA and intravenous sedation in the period 2005–2010. Ethical approval and informed patient consents were obtained.

The outpatient patient selection criteria were stable medical condition and body mass index ≤30 kg/m^2). The patients were first evaluated by the surgeon with a standardized questionnaire for preexisting diseases, concurrent medications, and patients who needed early preanesthetic evaluation were identified. Routine preoperative testing included complete blood count, glucose, blood urea nitrogen, prothrombin time, activated prothrombin time, international normalized ratio, electrocardiography, and chest radiography. Echocardiography, stress testing, and cardiology or pulmonology expert consultations and drug cessation were planned if needed and it was assured that the patients continued to take all their medications except for acetylsalicylic acid and clopidogrel.

Anesthesia protocol

A history was elicited during preanesthetic evaluation; all systems were reviewed; a physical examination was performed; and laboratory studies were checked. Particular attention was directed to the airway and cardiovascular systems, and patients

were asked about exercise tolerance, unstable angina, and exacerbation of chronic bronchitis. Patients with the complaints of significant respiratory disease, unstable ischemic cardiac or cerebrovascular disease, myocardial infarction in the past 6 months, and drug-eluting stents in the past 9 months were considered not appropriate for outpatient surgery.

Premedication was not administered; intravenous prophylactic ondansetron 4 mg was provided for all patients at moderate or high risk for postoperative nausea and vomiting (PONV) (14). All patients except those having renal insufficiency received low-molecular-weight heparin (LMWH; enoxaparin sodium 20 mg) subcutaneously.

During surgery, heart rate (HR), blood pressure, peripheral oxygen saturation (SpO_2), and respiratory rate (RR) were monitored. An intravenous Ringer's lactate solution infusion was initiated at 10 mL kg^{-1}. All patients received oxygen 2 L min^{-1} via a nasal cannula. Initial sedation was employed with midazolam 2 mg followed by 1 µg kg^{-1} fentanyl. Propofol, midazolam, and fentanyl were used with incremental boluses as needed, and the total doses were documented. The patient's response to verbal stimuli was used as the primary sedation target. The level of sedation was recorded (minimal sedation, moderate sedation and analgesia, and deep sedation).

Respiratory depression was defined as SpO_2 ≤94% and RR ≤8 breaths min^{-1}. Maneuvers needed to manipulate airway patency were recorded. Hypertension (≥20% increase in mean arterial pressure (MAP) in comparison with baseline values) was treated with nitroglycerin or esmolol; hypotension (≥20% decrease in MAP in comparison with baseline values) was treated with a fluid bolus and/or ephedrine 5 mg; bradycardia (HR <50 beats min^{-1}) was treated with atropine 0.5 mg; and tachycardia (≥20% increase in HR in comparison with baseline values) was treated with esmolol.

Bupivacaine 0.5% and lidocaine 2% were used for LIA. Bupivacaine and lidocaine were diluted 1:1 with saline, and epinephrine was not used. Maximum bupivacaine (2 mg kg^{-1}) and lidocaine (3 mg kg^{-1}) doses were determined for each patient for LIA. The bupivacaine dose was decreased 20% in patients with a history of heart condition. Total doses of local anesthetics were recorded at the end of the procedure.

The surgeon applied LIA by using the step-by-step infiltration (15). This technique commences with intradermal, subdermal injections of the local anesthetic solution. Subcutaneous tissues are gradually infiltrated as dissection deepens. A bolus dose of 6–8 mL of the local anesthetic solution is given under the external oblique aponeurosis before it is incised, and additional small doses are given at the root of the spermatic cord, the pubic corner, and the internal oblique aponeurosis lateral to the internal inguinal ring.

At the end of the procedure, patients were transferred to the postanesthesia care unit (PACU). Postoperative pain was evaluated using a 0- to 10-cm visual analogue scale (VAS) (0=no pain, 10=maximum pain). Postoperative pain management consisted of naproxen sodium 5–6 mg kg^{-1} every 12 h or acetaminophen 500 mg every 4 to 6 h, when the patient was able to consume oral fluids.

Patients were discharged from the center when their Modified Post Anesthetic Discharge Scoring System (MPADSS) score was ≥9, and they were tolerating oral intake (16). The discharge time (time elapsed from the time the patient entered the PACU to the time to discharge from the hernia center) was recorded, and discharge time >120 min was considered discharge delay. Patients were contacted by telephone the day after surgery, and control visits were scheduled 1 week and 1 month later at the center. The patients were questioned for cognitive dysfunction (both hypoactive and hyperactive symptoms) and unplanned hospital visits or admissions, including other hospitals, during these contacts.

Statistical analysis was performed with PASW Statistics for Windows version 18 software (SPSS Inc., Chicago, IL, USA). Discrete categorical data are presented as number of occurrences (*n*), frequencies (%), and medians; continuous data are given as mean (SD). Student's *t* test, Pearson's χ^2 test and Fisher's exact test were used as appropriate. A *p* value of 0.05 was considered significant. Groups were compared regarding patient characteristics, anesthetic technique, type (17) and size of hernia, duration of surgery, time to discharge, discharge delay, intraoperative and postoperative adverse events, and the rate of unanticipated admission and readmission.

RESULTS

Data from 370 patients (358 men and 12 women) were analyzed (Table 1). One patient from each group was considered non-eligible for outpatient surgery because of uncontrolled heart failure (Group G) and aortic stenosis (group C).

The most common comorbid diseases were hypertension, coronary artery disease, chronic obstructive lung disease, and diabetes. In Group G, three patients had end-stage renal failure and were receiving hemodialysis, two had compensated heart failure, one had pulmonary hypertension, one had an implanted pacemaker, and three had Parkinson's disease. Three patients in Group G were on warfarin therapy, one for a history of deep venous thrombosis and two for existing atrial fibrillation. Warfarin was discontinued before surgery, and bridged with LMWH. Echocardiography was needed in four patients (2.1%) in Group G and one (0.5%) in Group C. Pulmonary function tests were needed in six patients (3.2%) in Group G.

The duration of surgery was similar between groups. All patients were able to complete the procedure with the planned anesthetic technique. The majority of the patients were calm and responding to verbal commands throughout the procedure. Groups were significantly different with respect to local anesthetic consumption (Table 2). Anesthesia-related adverse events were minor, and none of them involved the airway or respiration. The hemodynamic parameters were within 20% of initial values, except in 10 patients in whom hypertension and hypotension were observed (in two and three patients, respectively, in both groups). Nitroglycerin (0.1 μg kg^{-1} h^{-1}) or esmolol (0.5–0.1 μg kg^{-1} h^{-1}) infusions were used in the hypertensive patients, and the hypotensive patients received additional intravenous fluid. The mean total fluid administered was 1000±250 mL.

Mean VAS pain scores were 0 upon arrival at the PACU and in most patients at discharge in both the groups. One patient in Group G and two in Group C had VAS scores >3 in the early postoperative period.

The mean time to discharge was longer in Group G, discharge delay was detected in 11 and 16 patients in Groups G and C, respectively (p<0.001, p=0.644). The reasons for discharge delay were transient femoral palsy (n=1 in both groups), dizziness (n=6 in Group G vs. n=8 in Group C), nausea (n=1 in both groups), hypotension (n=5 in Group G vs. n=8 in Group C), and hypertension (n=1 in both groups). Groups were similar regarding return-hospital visit and admission rates.

The most commonly observed complications after discharge were ecchymosis and edema formation in both groups (Table 3). Cognitive dysfunction, pulmonary embolism/myocardial infarction were not observed in either of the study groups. The overall 30-day postoperative morbidity was 1.08% in patients aged 65 years and older and 0.8% in patients younger than 65 years.

Correlation analysis and multiple linear regression analysis were performed, and no apparent difference among the patient characteristics, type of sedation, and occurrence of surgical or nonsurgical adverse events was observed (Table 4).

Table 1. Patient characteristics, duration of surgery, discharge time, discharge delay compared between groups.

			Group G n=185	Group C n=185	p
Age		yr	73.2±7.1	43.9±12.3	<0.001
Gender	Male	n	179	179	1.000
	Female		6	6	
BMI		kgm^2	26.2±3.3	26.3±3.7	0.773
Weight		kg	73.0±11.9	78.6±11.9	<0.001
ASA	I	n	36 (19.5%)	133 (71%)	<0.001
	II		98 (53%)	41 (22%)	
	III		55 (30%)	5 (3%)	
	IV		4 (2%)	1 (0.5%)	
Hypertension		n	86	12	<0.001
Coronary artery disease		n	36	8	<0.001
Diabetes		n	14	-	<0.001
Chronic obstructive lung disease		n	16	4	0.008
Benign prostate hypertrophia		n	5	0	0.026
Acetylsalicylic acid		n	46	13	<0.001
Clopidogrel		n	7	0	0.026
Duration of surgery		min	70.1±23.4	69.4±23.3	0.625
Discharge time		min	102±19	91.2±22.5	<0.001
Discharge delay		n	11	16	0.645
		min	189.2±55.4	187.9±43.3	

Values are in mean±standard deviation and numbers of occurrences. BMI: body mass index, ASA: American Society of Anesthesiologists status. Groups were different with respect to patient age, weight, ASA status, co morbid diseases and discharge time.

Table 2. Anesthesia related data compared between groups.

		Group G n=185	Group C n=185	p
Level of sedation n	-Minimal sedation	158 (85%)	163 (88%)	
	-Moderate sedation analgesia	6 (3.2%)	12 (6.4%)	
	-Deep sedation	3 (1.6%)	7 (3.7%)	0.57
	-Monitorized anesthesia care	3 (1.6%)	-	
Midazolam mg		2.7±1.1	4.6±1.7	<0.001
Fentanyl µg		63.4±28.6	88,1±32.4	<0.001
Propofol mg		74.6±61.9	11.7±79.4	0.082
Lidocain mg		246.6±59.9	198.6±69.8	<0.001
Bupivacain mg		39±9.5	47.7±10.7	<0.001
Bupivacaine 0.25% + Lidocaine1% total volume ml		40 (20-60)	38 (20-80)	<0.001
Intraoperative Adverse event	Hypotension	2 (1%)	2 (1%)	1.000
	Hypertension	3 (1.6%)	3 (1.6%)	1.000
Early postoperative Adverse event	Nausea	1 (0.5%)	1(0.5%)	1.000
	Dizziness	6 (3.2%)	8 (4.2%)	0.785
	Hypertension	1(0.5%)	1(0.5%)	1.000
	Hypotension	5 (2.7%)	8 (4.2%)	0.572
	Pain	1(0.5%)	2 (1%)	1.000
	Femoral palsy	1(0.5%)	1(0.5%)	1.000
Return hospital visit n		-	1(0.5%)	1.000
Admission(due to social reasons) n		2 (2.7%)	4 (2.1%)	0.685
Readmission n		-	-	

Values are in mean±standard deviation and numbers of occurrences and median (minimum-maximum).
Groups were different with respect to midazolam, fentanyl, lidocaine and bupivacaine doses.

Table 3. Hernia characteristics, postoperative adverse events compared between groups.

Hernia		Group G n=185	Group C n= 185	p
Side n	left	82 (47.7%)	70 (38.9%)	0.112
	right	89 (51.7%)	110 (61.1%)	
Primer/ Recurrent n		157 (92%)/ 15(8%)	168 (90%)/ 13(10%)	0.736
Direct / Indirect n		88 (47.5%)/ 70 (37%)	101(54%) / 69(37%)	0.496
Size n	Small	15	35	0.114
	Medium	72	77	
	Large	45	49	
	Massive	13	12	
Type n	1	2	18	0.019
	2	47	52	
	3	30	26	
	4	53	51	
	5	8	11	
	6	18	15	
Sac content n	Omentum	73	14	<0.001
	Intestine	26	77	
Postoperative Adverse event n	Ecchymosis	10	2	0.031
	Edema	2	8	1.000
	Seroma	4	1	0.113
	Pain	1	-	0.486
	Dyspepsia	2	1	0.614
	Wound infection	-	2	0.499
	Hydrosel	1	-	0.486
	Enduration	-	1	1.000
	Plebitis-arm	-	1	1.000
	Hematoma	-	2	0.121
	Superficial fat necrosis	-	1	1.000
Hernia recurrence n		2		

Values are in numbers of occurrences. Groups were different with respect to the type of hernia (17), sac content and the incidence of ecchymosis.

Table 4. Multiple linear regression and correlation analysis for the total drug doses, patient- hernia characteristics, duration of surgery, discharge time; adverse events.

		Midazolam	Fentayl	Lidocaine	Buivacaine
Age	*Control*	High dose B=0.842, p=0.036			
	Geriatric			High dose B=34.56, p=0.000	Low dose B=8.55, p=0.000
Weight		High dose B=0.037 p=0.012			
Adverse event *Intraoperative* hypertension		B=-0.037, P=0.014		High dose B=28.191, p=0.001	
Duration of surgery				High dose r=0.246 p<0.001	
Discharge time				High dose B=0.079, p=0.005	
Sac content					
	Intestine	High dose p=0.000	High dose p=0.000	High dose p=0.000	High dose p=0.079
Type of hernia					
	Type 1			Low dose p<0.001	
Size of hernia	*Massive*	High dose p=0.023	High dose p=0.009		
	Small			Low dose p=0.006	

r=correlation; B=multiple linear regression.

DISCUSSION

The safety of elective inguinal herniorrhapy in hospitalized elderly patients was previously demonstrated (4). The present study was carried out on an outpatient basis, and the results showed that inguinal herniorrhaphy under LIA and sedation in the elderly patients is safe in the.

The rates of return-to-hospital visits after outpatient surgery range from 0.1% to 5.9% in diverse age groups and surgical procedures (8-11,14,18). The safety of outpatient procedures was studied in a case mix group of 57,709 patients; the main reasons for readmission were hematoma, infection, and thromboembolic events (19). Gastroenterology and gynecology are the surgical specialties with the highest risk for return-hospital visits, and female sex is also a risk factor, whereas age is not (5). Another study of outpatient surgery demonstrated that pain and infection were the most common reasons for

return-hospital visits, followed by fatigue and PONV, and the most common reasons for readmission were bleeding and infection (18). This study included 3532 outpatient surgery procedures. Among them, 373 (5.6%) were inguinal herriorrhapy, and local anesthesia was used in 33%, return hospital visits or readmission rates for herniorrhapy were not reported (18).

Postoperative morbidity was investigated in 229,033 elective herniorrhaphies. The overall incidence of readmission, length of stay exceeding 2 days, and postoperative death within 30 days was 7.1% (20). The rate of surgical complications was 3.5%, and the rate of nonsurgical complications was 3.4% in these cases. The complication rate increased with age (4.5% in patients aged ≥65 years vs. 2.7% in patients aged <65 years), and complications were more frequent after regional anesthesia. The most frequently observed surgical complications were hematoma, wound infection, pain, and seroma, and the most frequent medical complications were pneumonia, thrombosis, and myocardial infarction. Morbidity was the lowest with LIA. This study included in-hospital both open and laparoscopic herniorrhaphies (20).

In the present study, adverse events were minor and rare. The most frequently observed adverse events were hypotension and hypertension intraoperatively and hypotension and dizziness in the early postoperative period. Serious adverse events such as myocardial infarction or pulmonary embolism were not observed. There was no unanticipated overnight stay for medical reasons, and only one patient in Group C needed to return to the center.

We consider that meticulous preoperative patient evaluation and management are the key factors of these outcomes. The anesthesiologist must evaluate every patient before surgery; however, an evaluation several days before surgery is necessary only for patients with American Society of Anesthesiologists physical status classification (ASA) III and IV. Our patient selection criteria were in accordance with the current recommendations of the guidelines of the American Heart Association and the American College of Cardiology (21). As expected, the number of high-risk patients was higher in Group G. ASA III and IV are not *per se* contraindications for outpatient surgery (18). There was one patient with an implanted cardiac pacemaker. This patient's cardiologist and the manufacturer of the device were contacted. The device was evaluated before surgery and was reprogrammed to an asynchronous pacing mode; the rate-adaptive function was disabled; a bipolar electrocautery system was used. We suggest that a wider range of routine screening tests is unnecessary for outpatient inguinal herniorrhaphy and that further testing should be based on the symptoms and physical examination. The need for expert consultation is rare. We consider that patient selection should be based on the specific medical condition of each patient rather than on the presence of comorbidities and ASA physical status classification.

Our results show a statistical difference between study groups regarding discharge time. We consider this 11-min difference clinically insignificant. Pain is the most common reason for discharge delay and unplanned admission after surgery. LIA provides better pain relief after inguinal herniorrhaphy than spinal anesthesia and general anesthesia (18,19,22). In our center, LIA and sedation is used as the main method. Most of our patients were pain-free in the early postoperative period, and this fact might have contributed to early discharge time. Along with effective pain control, early mobilization and oral intake may have contributed to the fact that our patients did not experience cognitive dysfunction.

We used prophylaxis for PONV only in patients at risk (14). The use of volatile agents, nitrous oxide, neostigmine, and opioids is considered an anesthesia-related risk factor for PONV, for which our patients were provided only fentanyl. It appears that fentanyl up to 100 µg does not

increase PONV incidence in patients undergoing outpatient repairs.

We consider discharge according to protocol important for low adverse event and readmission rate. A MPADSS score ≥9 was used for discharge, because inguinal herniorrhaphy is a high-risk surgery for urinary retention. It was assured that the patients were able to walk without assistance and were able to consume oral food in order to prevent falls and malnutrition.

Our results indicate some differences between the groups that need interpretation regarding the doses of drugs. We decreased the bupivacaine doses in patients with a history of heart condition, and surgical anesthesia was provided by relatively increasing the lidocaine dose; this may have created bias between the study groups. The presence of a massive hernia may have increased the difficulty and duration of surgery, resulting in the patients requiring more lidocaine and midazolam, and consequently discharge time was longer in patients who had massive hernias. The higher midazolam doses in Group C can be explained by the difference in the mean weight of the groups. The

higher fentanyl use in patients with the intestinal loop as the sac content indicates that these patients may feel more pain during the manipulation of the peritoneum.

The elderly patients are a rapidly growing group, and more geriatric patients with co morbidities will present for outpatient surgery in the future. Discharge delay as well as unplanned hospital visits or admissions can cause significant financial burden for outpatient surgical centers; thus, an evaluation of predictors of these outcomes should have an important impact on daily practice (9).

In conclusion, this study demonstrates that outpatient inguinal herniorrhaphy under LIA and sedation in the geriatric age group is as safe and feasible as in the nongeriatric patient population. It also shows that the rates of discharge delay or unanticipated admission and return hospital visits are very low, provided that meticulous preoperative evaluation, appropriate anesthetic management, and appropriate surgical techniques are used and that patients are discharged according to a discharge protocol.

REFERENCES

1. INCA Trialists Collaboration. Operation compared with watchful waiting in elderly male inguinal hernia patients: a review and data analysis. J Am Coll Surg 2011;212(2):251-9. (PMID:21183367).

2. Patti R, Aiello P, Caruso AM, Cudia B, Di Vita G. The improvement of quality of life a indication for elective surgery in elderly patients with minimally symptomatic inguinal hernia. Ann Ital Chir 2014;85(2):136-42. (PMID:24901813).

3. Aktimur R, Çetinkünar S, Yıldırım K, et al. Comparison of the outcomes of wachfull waiting and surgery in 80 years of age and older comorbid and minimally symptomatic inguinal hernia patients. Turkish Journal of Geriatrics 2014;17(4):338-44.

4. Kulacoglu HI, Polat A, Moran M, Gök R, Coşkun F. Elective inguinal hernia repair in the elderly. TurkishJournal of Geriatrics 2000;3(2):64-8.

5. Wu JJ, Baldwin BC, Goldwater E, Counihan TC. Should we perform elective inguinal hernia repair in the elderly? Hernia 2017;21(1):51-7. (PMID:27438793).

6. Kulah B, Duzgun AP, Moran M, Kulacoglu IH, Ozmen MM, Coskun F. Emergency hernia repairs in elderly patients. Am J Surg 2001;182(5):455-9. (PMID:11754850).

7. Işıl RG, Yazıcı P, Demir U, et al. Approach to inguinal hernia in high-risk geriatric patients: Should it be elective or emergent? Turkish Journal of Trauma and Emergency Surgery 2017;23(2):122-7. (PMID:28467578).

8. Engbaek J, Bartholdy J, Hjortso NC. Return hospital visits and morbidity within 60 days after day surgery: a retrospective study of 18,736 day surgical procedures. Acta Anaesthesiol Scand 2006;50(8):911–9. (PMID:16923084).

9. Coley KC, Williams BA, DaPos SV, Chen C, Smith RB. Retrospective evaluation of unanticipated admissions and readmissions after same day surgery and associated costs. J Clin Anesth 2002;14(5):349-53. (PMID:12208439).

10. Twersky R, Fishman D, Homel P. What happens after discharge? Return hospital visits after ambulatory surgery. Anesth Analg 1997;84(2):319–24. (PMID:9024021).

11. Garcea G, Majid I, Pattenden CJ, Sutton CD, Neal CP, Berry DP. Predictive factors for unanticipated admission following day case surgery. J Eval Clin Pract 2008;14(1):175–7. (PMID:18211667).

12. Pelavski AD, De Miguel M, Alcaraz Garcia-Tejedor G, et al. Mortality, Geriatric, and Nongeriatric Surgical Risk Factors Among the Eldest Old: A Prospective Observational Study. Anesth Analg 2017;125(4):1329-1336. (PMID:28786844).

13. Rana MV, Bonasera LK, Bordelon GJ. Pharmacologic Considerations of Anesthetic Agents in Geriatric Patients. Anesthesiol Clin 2017;35(2):259-271. (PMID:28526147).

14. Gupta A. Evidence-based medicine in day surgery. Curr Opin Anaesthesiol 2007;20(6):520-5. (PMID:17989543).

15. Amid PK, Shulman AG. Local anesthesia for inguinal hernia repair step-by-step procedure. Lichtenstein IL. Ann Surg 1994;220(6):735-7. (PMID:7986138).

16. Palumbo P, Tellan G, Perotti B, Pacilè MA, Vietri F, Illuminati G. Modified PADSS (Post Anaesthetic Discharge Scoring System) for monitoring outpatients discharge. Ann Ital Chir 2013;84(6):661-5. (PMID:23165318).

17. Mattila K, Hynynen M; Intensium Consortium Study Group. Day surgery in Finland: a prospective cohort study of 14 day-surgery units. Acta Anaesthesiol Scand 2009;53(4):455-63. (PMID:19239413).

18. Majholm B, Engbæk J, Bartholdy J, et al. Is day surgery safe? A Danish multicentre study of morbidity after 57,709 day surgery procedures. Acta Anaesthesiol Scand 2012;56(3):323-31. (PMID:22335277).

19. Bay-Nielsen M, Kehlet H. Anaesthesia and post-operative morbidity after elective groin hernia repair: a nation-wide study. Acta Anaesthesiol Scand 2008;52(2):169-74. (PMID:17999709).

20. Fleisher LA, Kirsten E, Fleischmann AD, et al. 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology 2014;64(22):e77-137. (PMID:25091544).

21. Yazicioglu D, Akkaya T, Kulacoglu H. Addition of lidocaine to bupivacaine for spinal anaesthesia compared with bupivacaine spinal anaesthesia and local infiltration anaesthesia. Acta Anaesthesiol Scand 2013; 57:1313-20. (PMID:239805580).

22. Ahonen J. Day surgery and thromboembolic complications: time for structured assessment and prophylaxis. Curr Opin Anaesthesiol 2007;20(6):535–9. (PMID:17989546).

- Adem ÇÖBDEN[1]
- İsmet Yalkın ÇAMURCU[2]
- Hanifi ÜÇPUNAR[3]
- Hakan SOFU[4]
- Serda DUMAN[5]

CORRESPONDANCE

İsmet Yalkın ÇAMURCU
Erzincan University, Faculty of Medicine,
Department of Orthopaedics and Traumatology
Erzincan, Turkey

Phone: 0533 4802310
e-mail: yalkin.camurcu@gmail.com

1 Sivas Numune Hospital, Department of
   Orthopaedics and Traumatology,
   Sivas, Turkey
2 Erzincan University, Faculty of Medicine,
   Department of Orthopaedics and Traumatology
   Erzincan, Turkey
3 Erzincan University, Faculty of Medicine,
   Department of Orthopaedics and
   Traumatology, Erzincan, Turkey
4 Erzincan University, Faculty of Medicine,
   Department of Orthopaedics and Traumatology
5 Diyarbakır Selahaddin Eyyubi State
   Hospital, Department of Orthopaedics and
   Traumatology, Diyarbakır, Turkey

RESEARCH

EVALUATION OF RISK FACTORS FOR OSTEOPOROSIS AND OSTEOPENIA IN MALE PATIENTS AGED OVER 60 YEARS OF AGE

ABSTRACT

Introduction: Osteoporosis in men is often underdiagnosed and neglected compared to postmenopausal women. Major risk factors should be determined to prevent this disease, which has potential risk of mortality and morbidity for elder men. This study's purpose was to determine the risk factors for osteoporosis and osteopenia in male patients aged >60 years.

Materials and Method: Between January 2015 and June 2017, male patients aged >60 years admitted to our centers who underwent dual energy x-ray absorptiometry (DXA) were included in this retrospective study. Patients' age, body mass index, site of residence (village/city), smoking status, and systemic diseases were examined through our records. Patients were divided into control, osteopenia, and osteoporosis groups according to DXA measurements. Serum vitamin D measurements also were evaluated. Multivariate analysis was performed to determine major risk factors for osteoporosis and osteopenia.

Results: Compared with the control group, patients in the group categorized as having osteoporosis or osteopenia had a significantly lower body mass index and more commonly resided in the city (p<0.001 and p<0.005, respectively). Serum vitamin D levels were significantly lower in the osteoporosis and osteopenia groups than in the control group (p=0.001). According to multivariate analysis, insufficient or deficient serum vitamin D levels were determined to be a major risk factor for osteoporosis and osteopenia (p=0.001).

Conclusion: According to our results, men aged >60 years with deficient serum vitamin D levels (<20 ng/mL) were six times more likely to have osteopenia and 80 times more likely to have osteoporosis.

Keywords: Osteoporosis; Bone diseases, Metabolic; Bone density; Risk factors; Vitamin D

ARAŞTIRMA

ALTMIŞ YAŞ ÜZERİ ERKEK HASTALARDA OSTEOPOROZ VE OSTEOPENİ RİSK FAKTÖRLERİNİN DEĞERLENDİRİLMESİ

ÖZ

Giriş: Erkeklerde osteoporoz postmenopozal kadınlara kıyasla çoğunlukla az tanı alır ve ihmal edilir. Yaşlı erkeklerde potansiyel mortalite ve morbidite riski taşıyan bu hastalığı önlemek için başlıca risk faktörleri belirlenmelidir. Bu çalışmanın amacı, 60 yaş üzerindeki erkek hastalarda osteoporoz ve osteopeni için risk faktörlerini belirlemektir.

Gereç ve Yöntem: Ocak 2015- Haziran 2017 tarihleri arasında merkezlerimize başvuran ve Dual Enerji X-ray Absorptiometri (DXA) ölçümleri yapılan 60 yaş üzeri erkek hastalar bu retrospektif çalışmaya dahil edildi. Hastaların yaşı, beden kütle indeksi (BKİ), yerleşim yeri (köy-şehir), sigara içme durumu ve sistemik hastalıkları kayıtlarımızdan incelendi. Hastalar DXA ölçümlerine göre kontrol, osteopeni ve osteoporoz olarak 3 gruba ayrıldı. Hastaların serum vitamin D ölçümleri de değerlendirildi. Osteoporoz ve osteopeni için temel risk faktörlerini belirlemek için çok değişkenli analiz uygulandı.

Bulgular: Kontrol grubuyla karşılaştırıldığında, osteoporoz veya osteopeni grubundaki hastalarda VKİ anlamlı derecede düşüktü ve bunlar daha çok şehirde yerleşikti (sırasıyla p<0.001 ve 0.005). Serum vitamin D seviyeleri osteoporoz ve osteopeni gruplarında kontrol grubuna göre anlamlı düşüktü (p=0.001). Çok değişkenli analize göre, yetersiz veya eksik serum vitamin D seviyeleri osteoporoz ve osteopeni için temel risk faktörleri olarak belirlendi (p=0.001).

Sonuç: Sonuçlarımıza göre, serum vitamin D düzeyleri yetersiz olan 60 yaşın üzerindeki erkeklerde (<20 ng / mL) osteopeni tanısı olasılığının 6 kat, osteoporoz tanısı olasılığının 80 kat fazla olduğu görülmüştür.

Anahtar sözcükler: Osteoporoz; Kemik hastalıkları; metabolik; Kemik dansite; Risk faktörleri; Vitamin D

INTRODUCTION

Osteoporosis is the most common metabolic bone disease, characterized by decreased bone mass and microarchitectural deterioration of the bone tissue, with consequent increases in bone fragility and fracture susceptibility (1,2). The prevalence of osteoporosis in male patients aged >60 years was reported at 13%, which increases to 70% at age ≥80 years (3-5). Of the 9.0 million new osteoporotic fractures that occurred worldwide in 2000, 39% occurred in men, and 45% of these fractures occurred in the areas frequently affected by osteoporosis (6).

Various risk factors for osteoporosis have been reported, including race, heredity, age, gender, family history, low bone mineral density (BMD), vitamin D deficiency, smoking, low physical activity, and body mass profile (7). Investigators attempt to decrease the number of male patients with osteoporosis using the appropriate strategies and early intervention for preventable factors. Although, there are numerous studies about male osteoporosis exist in the literature; some studies reported that osteoporosis in elder men is still underdiagnosed and neglected (8-11).

Dual energy X-ray absorbtiometry (DXA) is recommended for osteoporosis in men aged 70 years and older but supportive data is limited (12,13). Male osteoporosis is becoming an increasingly common condition with subsequent mortality and mortality (14). Healthcare providers should consider annual screening for osteoporosis in men as equal as routine prostate and colorectal screening. In addition to that, independent major risk factors should be determined for elder men to prevent this disease, which has potential risk of mortality and morbidity. Therefore, the aim of this study was to determine the main risk factors for osteoporosis in male patients aged >60 years.

MATERIALS AND METHOD

This multicenter retrospective study was conducted with the approval of the institutional ethical review board (University Clinical Researches Ethical Review Board, ID=42914) and performed in accordance with the Declaration of Helsinki. To obtain a standardized data evaluation, this study was performed at two centers using the same manufacturer's DXA devices and located in the same areas of sun exposure. Male patients aged >60 years who were admitted to the two centers from January 2015 to June 2017 and underwent DXA and laboratory tests were reviewed from our electronic medical records. Patients with known history of metabolic bone diseases, taking any form of medication for osteoporosis or osteopenia, under follow-up at the endocrinology department due to secondary osteoporosis or osteomalacia were excluded. After exclusions, the data of 460 patients were evaluated in this study.

Patients' age, gender, body mass index (BMI), site of residence (village or city), smoking status, and systemic diseases were reviewed from our electronic medical records. Patients' BMIs were classified according to World Health Organization classification as underweight (<18.5 kg/m^2), normal (18.5–24.5 kg/m^2), overweight (25–29.9 kg/m^2), class-I obesity (30–34.9 kg/m^2), class-II obesity (35–39.9 kg/m^2), and class-III extreme obesity (>40 kg/m^2). Systemic comorbid diseases were hypertension, hyperlipidemia, cardiovascular system disease (coronary artery disease and congestive heart failure), respiratory system disease (asthma, chronic obstructive lung disease), diabetes mellitus, gastrointestinal system disease (peptic ulcus, irritable bowel syndrome, celiac disease), neurological system disease (cerebrovascular disease, Parkinson

disease, epilepsy, Alzheimer disease, depression), and rheumatological disease (rheumatoid arthritis, ankylosing spondylitis).

All subjects underwent measurement of BMD (kg/cm^2) using the same DXA devices (*STRATOS dR*, DMS, Maugio, France) at the anteroposterior lumbar spine (L1-L4) and at the femoral neck as per standard protocol stated by the manufacturer. Patients' were primarily divided into one of three groups according to T scores established by World Health Organization classification as control (>−1), osteopenia (−1 to −2.5), and osteoporosis (<−2.5). Serum levels of vitamin D [25(OH) D] were measured by radio-immune-assay (RIA) method by using the same kits in both two centers. Serum vitamin D levels classified as adequate (>30 ng/mL), insufficient (21–29 ng/mL), or very deficient (<20 ng/mL). Serum calcium (Ca) and phosphor (P) levels were also reviewed for all patients, which were analyzed by calorimetric method. The normal laboratory ranges for serum Ca was 8.8-10.6 mg/dl and for serum P was 2.3-5 mg/dl. Those with impaired serum Ca and P values were routinely consulted to endocrinology department and excluded from the study to keep apart osteomalacia and secondary osteoporosis as mentioned above.

Statistical analysis was performed using SPSS 20.0 (*SPSS Inc.*, IBM, NY, USA). Numeric variables were given as means and standard deviation; categorical variables were given as frequency and percentage. The comparison of the three study groups was performed using One-way analysis of variance (ANOVA) for means, and with Chi-square test for frequencies.

Bonferroni or Tamhane's t^2 tests were used for comparison between groups. P values of <0.05 were considered statistically significant. Finally, multivariate regression analysis was performed to determine the main risk factors for osteoporosis and osteopenia.

RESULTS

The demographics of the three study groups as well as of systemic comorbid diseases, serum vitamin D levels, and BMD values are shown in *Table 1*. No significant difference was observed among the three groups in terms of age, smoking status, and systemic comorbid diseases. The osteoporosis and osteopenia groups had significantly lower BMI values than the control group (p=<0.001 and p=<0.001, respectively). In addition, patients diagnosed with osteoporosis and osteopenia were significantly more likely to be living in a city than patients in the control group (p=0.005). Serum vitamin D levels, BMD values, and t scores were significantly lower in patients in the osteoporosis and osteopenia groups than in patients in the control group, as expected.

According to multivariate regression analysis, insufficient and deficient serum vitamin D levels were determined as the main risk factors for osteoporosis and osteopenia in male patients aged >60 years (Table 2). According to our results, males aged >60 years with deficient serum vitamin D levels (<20 ng/mL) were six times more likely to have osteopenia and 80 times more likely to have osteoporosis.

Table 1. Demographics and clinical characteristics of study groups.

	Normal (n=179)	Osteopenia (n=201)	Osteoporosis (n=80)	p
Age (years)	67.0±8.5	68.8±9.7	68.7±9.2	0.154
BMI (kg/m²)	29.6±4.3	27.9±4.2	26.5±5.1	**<0.001**
BMI (WHO Classification)				**<0.001**
Underweight	1 (0.5%)	2 (1%)	7 (8.7%)	
Normal	35 (19.6%)	66 (32.9%)	32 (40%)	
Overweight	69 (38.5%)	78 (38.8%)	24 (30%)	
Class I	40 (22.4%)	28(13.9%)	9 (11.2%)	
Class III	31 (17.3%)	24 (11.9%)	6 (7.5%)	
Class III	3 (1.7%)	3 (1.5%)	2 (2.6%)	
Site of Residence				**0.005**
City	95 (53%)	127 (63.2%)	59 (73.7%)	
Village	84 (47%)	74 (36.8%)	21 (26.3%)	
Smoking Status				0.363
None	137 (76.5%)	153 (76.1%)	55 (68.7%)	
Smoking	42 (23.5%)	48 (23.9%)	25 (31.3%)	
Systemic Comorbid Disease (+/-)				
Hypertension	88 / 91	106/95	42/38	0.764
Hyperlipidemia	10/169	5/196	1/79	0.126
Cardiovascular disease	19/160	16/185	6/74	0.589
Respiratory system disease	41/138	47/154	25/55	0.309
Diabetes mellitus	18/161	12/189	6/74	0.332
Gastrointestinal system disease	2/177	9/192	4/76	0.115
Neurologic system disease	16/163	17/184	7/73	0.986
Rheumatologic disease	1/178	3/198	0/80	0.405
Serum Vitamin D Level				**<0.001**
Adequate	118	41	5	
Insufficient	42	115	26	
Deficient	19	45	49	
BMD (kg/cm²)	1.08±0.07	0.88±0.05	0.72±0.07	**<0.001**
T score (lumbar)	0.1±1.1	(-)1.4±0.7	(-)2.9±0.6	**<0.001**
T score (femur neck)	(-)0.2±1.0	(-)1.3±0.9	(-)1.9±1.2	**<0.001**

BMD: bone mineral density, BMI: body mass index, WHO: world health organization

Table 2. The major risk factors for osteopenia and osteoporosis according to multivariate regression analysis.

Study Group	Variable	Level	Multivariate regression analysis		
			Odds ratio	(95% Confidence Interval)	p
Osteopenia	Vitamin D	Insufficient		8.1 (4.8-13.6)	**<0.001**
	Vitamin D	Deficient		6.8 (3.5-13.2)	**<0.001**
Osteoporosis	Vitamin D	Insufficient		17.6 (5.7-54.2)	**<0.001**
	Vitamin D	Deficient		80.5 (25.4-254.5)	**<0.001**

DISCUSSION

The most significant finding of our study was that insufficient or deficient serum vitamin D levels are the major risk factors for osteoporosis or osteopenia in male patients aged >60 years. Previous clinical studies widely investigated the risk factors for osteoporosis in men. Cheung et al. evaluated the determinants of BMD in Chinese men and authors reported that age, weight, BMI, cigarette smoking and exercise were significant determinants of total hip BMD. Authors found that body weight was the most important determining factor (15). The positive correlation of low BMI and low BMD for post-menopausal women has also been reported in previous clinical studies (16). Villareal et al. observed that diet-induced weight loss in elderly adults increased bone turnover and decreased hip BMD (17). In another study by Boyanov et al., BMD values for 80 male patients diagnosed with metabolic syndrome were found to be significantly higher than values for a control group (18). Yang et al. also emphasized the importance of diet as determinant of BMD values in their study evaluating 2305 male aged 50 to 79 years (19). Despite having higher BMI values in our country compared to eastern countries such as China and Korea; we also found significantly lower BMI values in osteopenia and osteoporosis groups compared with a control group, similar to results from reported studies. Our results showed

that 80% patients were overweight or obese in the control group; however, 50% patients were overweight or obese in the osteoporosis group.

Smoking is another risk factor, which has been found to correlate with decreased BMD (20,21). Oncken et al. investigated smoking cessation and found a significant increase in femur neck BMD measurements 1 year after cessation of smoking cigarettes (22). According to our results, smoking status did not differ among groups; however, we did not have data about number of cigarette smoked per day and duration of smoking, which may influence the results.

Pagonis et al. reported that osteoporotic fracture patterns in urban patients are more severe, which is explained by decreased activity level and poor quality of life (23). In the same study, the authors stated that people living in rural areas had a later diagnosis of osteoporosis, and had better treatment outcomes (23). Men aged >60 years living in rural areas are more active than their urban counterparts, because of work and environmental conditions (24). Consistent with results from the literature, our findings indicated that 74% male patients diagnosed with osteoporosis lived in the city, while the remaining 26% lived in villages. However, in the control group, half of the patients lived in the city.

Clinical studies about systemic comorbid diseases and drug use revealed that 90% patients with osteoporosis have a chronic disease and one-third of them use a drug that can cause osteoporosis (25). In studies evaluating systemic comorbid diseases related to osteoporosis, hypertension and diabetes were found as most commonly associated with osteoporosis (26). In our study, the most common systemic comorbid disease was found to be hypertension in both groups. Respiratory system disease such as chronic obstructive lung disease and asthma were the second-most common systemic comorbid diseases in both groups. We found no relationship between systemic comorbid diseases and lower BMD values. Our study had no data about the drug use that may also cause secondary osteoporosis. Most studies in the literature investigated male osteoporosis by excluding systemic comorbid diseases. However, we believe that rather than evaluation of healthy elder people, evaluation of elder people with systemic comorbid diseases may give valuable information about the real incidence of disease and may demonstrate the main characteristics of population accurately.

To our knowledge, vitamin D provides an important contribution to skeletal calcium balance by increasing intestinal and renal calcium absorption. It was stated that the shade of clothing, duration of exposure to direct sunlight, and regional climatic characteristics could affect vitamin D levels. A positive correlation also was found between duration of sunshine exposure and vitamin D level (27). However, the prevalence of vitamin D deficiency is high worldwide even in tropical regions (28). Most studies about male osteoporosis have indicated that vitamin D deficiency is a substantial risk factor for the reduction of BMD and the development of osteoporosis. Moreira et al evaluated healthy men in Brazil and authors found a high prevalence of vitamin D deficiency and its relation to increased osteoporosis (28). Khashayar et al reported significant correlation of

vitamin D deficiency and BMD in healthy Iranian men (29). Sundh et al emphasized that serum vitamin D is associated with higher cortical porosity in elderly men (30). Other studies also revealed the importance of vitamin D deficiency in male osteoporosis (12,15,19,31). The provinces where our study was performed are disadvantaged areas in terms of climate characteristics and insufficient sun exposure, when evaluated with regard to vitamin D synthesis. According to multivariate regression analysis, we found insufficient and deficient serum vitamin D levels to be the main predictive factors for the diagnosis of osteopenia and osteoporosis in our study. Our results also are consistent with previous community-based studies. Considering data obtained from our study, clinicians should attempt to prevent osteoporosis and osteopenia by investigating serum vitamin D levels in elderly patients.

The main limitation of our study was its retrospective design, which may strongly influence determining risk factors accurately. However, we evaluated a relatively large homogenous (>60 years old male patients) patient data collected from two centers with a standardized method. In addition, we performed a multivariate regression analysis to determine the major risk factors for osteopenia and osteoporosis with odds ratios. The most important strength of our study was that it is the first study in our country reporting major risk factors for osteoporosis and osteopenia in male patients aged >60 years. In addition, the importance of serum vitamin D level deficiency was also shown in this study.

According to our results, males aged >60 years with deficient serum vitamin D levels (<20 ng/mL) were six times more likely to have osteopenia and 80 times more likely to have osteoporosis. Physicians should take into account the importance of serum vitamin D deficiency in elderly men and its significant relation with osteoporosis which can cause mortality and morbidity.

REFERENCES

1. Warriner AH, Saag KG. Osteoporosis diagnosis and medical treatment. Orthop Clin North Am 2013;44:125-35. (PMID:23544819).

2. Erkin G, Akınbingöl M, Gülsen ED, Aybay C, Özel S. The features of the geriatric patients who have bone mineral dansitometric measurements in our osteoporosis unit. Turkish Journal of Geriatrics 2004;7:84-8.

3. Randell A, Sambrook PN, Nguyen TV, et al. Direct clinical and welfare costs of osteoporotic fractures in elderly men and women. Osteoporos Int 1995;5(6):427-32. (PMID:8695963).

4. Johnell O, Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int 2006;17(12):1726-33. (PMID:16983459).

5. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB. Incidence and mortality of hip fractures in the United States. JAMA 2009;14;302(14):1573-9. (PMID:19826027).

6. Burge R, Dawson-Hughes B, Solomon DH, Wong JB, King A, Tosteson A. Incidence and economic burden of osteoporosis-related fractures in the United States, 2005-2025. J Bone Miner Res 2007;22(3):465-75. (PMID:17144789).

7. Unni S, Yao Y, Milne N, Gunning K, Curtis JR, LaFleur J. An evaluation of clinical risk factors for estimating fracture risk in postmenopausal osteoporosis using an electronic medical record database. Osteoporos Int 2015;26(2):581-7. (PMID:25288442).

8. Haas ML, Moore K. Osteoporosis: an invisible, undertreated, and neglected disease of elderly men. J Elder Abuse Negl 2007;19(1-2):61-73. (PMID:18077270).

9. Goh LH, How CH, Lau TC. Male osteoporosis: clinical approach and management in family practice. Singapore Med J 2014;55(7):353-7. (PMID:25091882).

10. Bleicher K, Naganathan V, Cumming RG, et al. Prevalence and treatment of osteoporosis in older Australian men: findings from the CHAMP study. Med J Aust 2010;193(7):387-91. (PMID: 20919967).

11. Rasheed M, Kaim Khani GM, Rasheed N. Awareness of osteoporosis in men. J Pak Med Assoc 2015;65(11 Suppl 3):S12-6. (PMID: 26878501).

12. Bhat KA, Kakaji M, Awasthi A, et al. High prevalence of osteoporosis and morphometric vertebral fractures in ındian males aged 60 years and above: should age for screening be lowered? J Clin Densitom 2016 Nov 30. pii: S1094-6950(16)30242-6. (PMID:27914693).

13. Khatib J, Stote K, Gosmanov AR. Utility of DXA screening for diagnosis of osteoporosis in US veterans aged 70 years and older. J Investig Med 2017 Oct 2. pii: jim-2017-000557. (PMID:28974557).

14. Tuzun S, Eskiyurt N, Akarirmak U, et al. Incidence of hip fracture and prevalence of osteoporosis in Turkey: the FRACTURK study. Osteoporos Int 2012;23(3):949-55. (PMID:21594756).

15. Cheung EY, Ho AY, Lam KF, Tam S, Kung AW. Determinants of bone mineral density in Chinese men. Osteoporos Int 2005;16(12):1481-6. (PMID:16133639).

16. Fu X, Ma X, Lu H, He W, Wang Z, Zhu S. Associations of fat mass and fat distribution with bone mineral density in pre- and postmenopausal Chinese women. Osteoporos Int 2011;22(1):113-9. (PMID:20306018).

17. Villareal DT, Shah K, Banks MR, Sinacore DR, Klein S. Effect of weight loss and exercise therapy on bone metabolism and mass in obese older adults: a one-year randomized controlled trial. J Clin Endocrinol Metab 2008;93(6):2181-7. (PMID:18364384).

18. Boyanov M, Bakalov D, Boneva Z. Bone mineral density in men with and without the metabolic syndrome. Aging Male 2009;12(2-3):62-5. (PMID:19639517).

19. Yang YJ, Kim J. Factors in relation to bone mineral density in Korean middle-aged and older men: 2008-2010 Korea National Health and Nutrition Examination Survey. Ann Nutr Metab 2014;64(1):50-9. (PMID:24851837).

20. Korkor AB, Eastwood D, Bretzmann C. Effects of gender, alcohol, smoking, and dairy consumption on bone mass in Wisconsin adolescents. WMJ 2009;108(4):181-8. (PMID:19753823).

21. Hollenbach KA, Barrett-Connor E, Edelstein SL, Holbrook T. Cigarette smoking and bone mineral density in older men and women. Am J Public Health 1993;83(9):1265-70. (PMID:8363002).

22. Oncken C, Prestwood K, Kleppinger A, Wang Y, Cooney J, Raisz L. Impact of smoking cessation on bone mineral density in postmenopausal women. J Womens Health (Larchmt) 2006;15(10):1141-50. (PMID:17199455).

23. Pagonis T, Givissis P, Pagonis A, Petsatodis G, Christodoulou A. Osteoporosis onset differences between rural and metropolitan populations: correlation to fracture type, severity, and treatment efficacy. J Bone Miner Metab 2012;30(1):85-92. (PMID:21667356).

24. Nilsson M, Ohlsson C, Odén A, Mellström D, Lorentzon M. Increased physical activity is associated with enhanced development of peak bone mass in men: a five-year longitudinal study. J Bone Miner Res 2012;27(5):1206-14. (PMID:22247082).

25. Chen YT, Miller PD, Barrett-Connor E, Weiss TW, Sajjan SG, Siris ES. An approach for identifying postmenopausal women age 50-64 years at increased short-term risk for osteoporotic fracture. Osteoporos Int 2007;18(9):1287-96. (PMID:17464525).

26. Assantachai P, Angkamat W, Pongpim P, Weattayasuthum C, Komoltri C. Risk factors of osteoporosis in institutionalized older Thai people. Osteoporos Int 2006;17(7):1096-102. (PMID:16544053).

27. Reid IR. Vitamin D Effect on Bone Mineral Density and Fractures. Endocrinol Metab Clin North Am 2017;46(4):935-45. (PMID:29080644).

28. Moreira ML, Neto LV, Madeira M, Lopes RF, Farias MLF. Vitamin D Deficiency and Its Influence on Bone Metabolism and Density in a Brazilian Population of Healthy Men. J Clin Densitom 2018;21(1):91-7. (PMID:28233710).

29. Khashayar P, Aghaei Meybodi HR, Rezai Hemami M, Keshtkar A, Dimai HP, Larijani B. Vitamin D status and its relationship with bone mineral density in a healthy Iranian population. Rev Bras Ortop 2016;51(4):454-8. (PMID:27517026).

30. Sundh D, Mellström D, Ljunggren Ö, et al. Low serum vitamin D is associated with higher cortical porosity in elderly men. J Intern Med 2016;280(5):496-508. (PMID:27196563).

31. Fink HA, Litwack-Harrison S, Taylor BC, et al. Clinical utility of routine laboratory testing to identify possible secondary causes in older men with osteoporosis: the Osteoporotic Fractures in Men (MrOS) Study. Osteoporos Int 2016;27(1):331-8. (PMID:26458388).

- Burcu AKPINAR SÖYLEMEZ[1]
- Özlem KÜÇÜKGÜÇLÜ[1]
- Nil TEKİN[3]
- Merve Aliye AKYOL[1]
- Ahmet Turan IŞIK[2]

CORRESPONDANCE

Burcu AKPINAR SÖYLEMEZ
Dokuz Eylül University, Faculty of Nursing,
Department of Internal Medicine Nursing,
İzmir, Turkey

Phone: 02324124793
Fax: 02324124798
e-mail: burcu.akpinar@deu.edu.tr

[1] Dokuz Eylül University, Faculty of Nursing, Department of Internal Medicine Nursing, İzmir, Turkey
[2] Dokuz Eylül University, Faculty of Medicine, Department of Geriatrics, İzmir, Turkey
[3] Narlıdere Residential and Nursing Home, İzmir, Turkey

RESEARCH

NURSING HOMES NURSES' ATTITUDES TOWARD OLDER PEOPLE AND AFFECTING FACTORS

Abstract

Introduction: The quality of nursing care for older people in nursing homes is closely related to nurses' attitudes toward older people. This study was conducted to determine the attitudes of nurses working in nursing homes and to determine the factors affecting attitudes of nurses.

Materials and Method: A descriptive study design was used. The sample consisted of 83 nurses, accounting for 79% of the research population. Participant Information Form and Kogan's Attitudes Toward Old People scale were used. The study utilized the value, mean, percentage frequency distribution and correlation, independent t test, Mann–Whitney U test, and Kruskal–Wallis test.

Results: Mean total of Kogan's score of the nurses who were working in seven nursing homes at the time of the study reached 144.75 [standard deviation (sd)=16.6]. Mean age of participants was 33.9 (sd=7.6); 88% of the participants were females. The number of participants who received no geriatric education before working and while they were students totaled 91.6% and 72%, respectively. Nearly half of the participants (47%) claimed previous experience of care giving for older people. A statistically significant difference was observed between gender, previous experience of care for older people, and average score in Kogan's scale.

Conclusion: Results showed that the nurses working in nursing homes showed slightly positive attitudes toward older people. Gender and care giving experience were determined as factors that influence attitudes toward older people.

Keywords: Aged; Attitude; Nursing Homes; Nurses

ARAŞTIRMA

HUZUREVİ HEMŞİRELERİNİN YAŞLILARA YÖNELİK TUTUMLARI VE ETKİLEYEN ETMENLER

Öz

Giriş: Huzurevlerindeki hemşirelik bakımının kalitesi, hemşirelerin yaşlılara yönelik tutumları ile yakından ilişkilidir. Bu araştırma, huzurevinde çalışan hemşirelerin tutumlarını belirlemek ve hemşirelerin tutumlarını etkileyen etmenleri belirlemek amacıyla yapılmıştır.

Gereç ve Yöntem: Tanımlayıcı araştırma tasarımı kullanılmıştır. Örneklem sayısı 83 hemşiredir, bu sayı araştırma popülasyonunun %79'unu oluşturmaktadır. Katılımcı Bilgi Formu ve Kogan Yaşlı İnsanlara Karşı Tutum Ölçeği kullanılmıştır. Çalışmada sayı, ortalama, yüzde frekans dağılımı ve korelasyon, iki ortalama arasındaki farkın önemlilik testi (t testi), Mann–Whitney U testi, Kruskal–Wallis testi kullanılmıştır.

Bulgular: Araştırma zamanında yedi huzurevinde çalışan hemşirelerin Kogan puan ortalaması 144.75'dir [standart sapma (ss)=16.6]. Katılımcıların yaş ortalaması 33.9'dur (ss=7.6); katılımcıların %88'i kadındır. Daha önce geriatri eğitimi almamış olan katılımcılar çalışmaya başlamadan önce ve öğrenciyken sırasıyla, %91.6 ve %72'dir. Katılımcıların yaklaşık yarısı (%47) yaşlı bireylere daha önce bakım verme deneyimi olduğunu belirtmiştir. Cinsiyet, yaşlılara daha önce bakım verme deneyimi ve Kogan ölçeğinin ortalama puanı arasında istatistiksel olarak anlamlı bir farklılık gözlemlenmiştir.

Sonuç: Sonuçlar huzurevinde çalışan hemşirelerin yaşlılara yönelik biraz olumlu tutum gösterdiğini ortaya koymuştur. Cinsiyet ve bakım verme tecrübesi yaşlılara yönelik tutumu etkileyen etmenler olarak belirlenmiştir.

Anahtar sözcükler: Yaşlılık; Tutum; Huzurevi; Hemşirelik

INTRODUCTION

The number of older people who live in nursing homes is projected to increase due to population and social changes. In this regard, nursing home services which are provided for older people have increased in Turkey (1). The quality of nursing home services that are provided to older people is closely related to the attitudes of health professionals who provide such care (2,3). The attitude of healthcare professional to older people is one of the key points for providing quality care for older people (4).

Most of the studies that analyzed attitudes toward older people showed results on groups of students who will become health professionals in the future (4-8). In the systematic review which analyzed nurses' attitudes toward older people (6), 17 out of 25 articles provided results on nursing students. However, owing to various reasons, the attitudes of health professionals toward older people change when they graduate and work. These reasons are listed as those related with the institution, those related with individuals, and deficiencies in health and social care services in Turkey (2, 9-11).

A systematic review which analyzed attitudes of nurses and nursing students toward older people showed the inconsistent results of studies (6). This inconsistency is assumed to result from conducting studies in different cultures and with different health professionals and sample sizes. This observation implies the need for studies on attitudes toward older people in different cultures using more specific health professionals and sufficient sample size and desirable design. Studies on nurses' attitudes toward older people focused on nurses working in hospitals (12, 13). In a systematic review, 5 of the 8 articles that analyzed the attitudes of nurses toward older people presented the attitudes of nurses working in acute care units toward older people (6). At most, the health professionals who work with older people comprise nurses who work in nursing homes. However, in Turkey, no study analyzed factors that affect the attitudes of the nurses who work in nursing homes toward older people. For this reason, this study aimed to determine the attitude of nurses working in nursing homes and the related influencing factors.

MATERIALS AND METHOD

Study design and sample

This research was a descriptive study which was conducted in seven nursing homes of the Ministry of Family and Social Policy in İzmir between May and December 2017. The capacity of the seven nursing homes varies between 94 and 966 older people. The number of nurses working in nursing homes varies between 7 and 46. Additionally, four nursing home has at least one doctor. The study included nurses who worked in the seven nursing homes (n=105), who volunteered to participate in the study, and who can be reached during data collection days (n=83). Nurses who participated in the study covered 79% of the research population. On the day of data collection, nurses who did not work, who were on annual and maternity leave, and who were out of town were not reached.

Instruments

Sociodemographic form

The sociodemographic form was prepared by the researchers to obtain data that can affect sociodemographic information and attitudes of nurses in the sample toward older people. The data include age, gender, alma mater, duration of working as nurse, duration of working at the institution, the experience of living with older people, experience of older people care, completing a specific education for older people and their care before the study, possessing a certificate in the field of geriatrics, willingness to work in the field of geriatrics, willingness to work with older people again.

Kogan's Attitudes Toward Old People Scale

Kogan's Attitudes Toward Old People Scale (14) is a tool that has been used to evaluate attitudes toward the older people for more than 50 years. The systematic review by Neville (2015) analyzed 8 different scales used in 42 different studies published between 2008 and 2013 to examine the attitudes of nursing students toward older individuals. Among these scales, Kogan's scale was frequently used for measuring attitudes toward older people (4). Therefore Kogan's original instrument needs to be reviewed, revised and validated to provide reliable and contemporary information reflecting today's undergraduate nurses' attitudes toward older people (4). In this study, first version of Kogan was used.

Kogan's scale is a six-point Likert scale consisting of 34 items. The scale comprises 17 positively and 17 negatively worded items about the older people. The negative statements are reverse-scored to attribute more positive attitudes to higher scores. Minimum and maximum scores obtained from Kogan's scale reached 34 and 238, respectively. High scores indicate a positive attitude toward older people, and low scores indicate the opposite (14). In Kogan's original study, the total-item correlation of the scale was between 0.1 and 0.7 in the Turkish version of the scale, and Cronbach's alpha reliability coefficient was 0.89 (15).

Statistical analysis

Data analysis was performed by the researchers using SPSS 22.0 software. Observed values, average, and percentage frequency distribution were examined. To determine the factors that affect attitudes, correlations according to the characteristics of the independent variables, t test, Mann–Whitney U test, and Kruskal–Wallis test were used. p<0.05 was considered as statistically significant.

Ethical considerations

An approval to conduct the research was obtained from Izmir Provincial Directorate of Family and Social Policies and X University Ethical Committee (2016/33-04). Oral and written information were given to the nurses prior to the study. Written consents were obtained from all participants.

RESULTS

According to results, mean age of participants was 33.9 (sd=7.6), with 88% comprising females, whereas 51% were vocational high school graduates. A total of 72% of the participants received no previous courses in geriatrics, 65% claimed previous experience of living with an older family member, 79.5% worked with older people voluntarily, and 85.5% wanted to work with older people again. The mean working years of nurses reached 12.6 (sd=6.6) (min:1, max:32), and the ratio of nurses with the experience in the care of older people totaled 47% (Table 1).

The participants featured a mean score of 144.7 (sd=16.6), a mean positive score of 74.3 (sd=11.0), and a mean negative score of 65.6 (sd=11.5) for the KOGAN Attitudes Toward Old People Scale (Table 2). Independent variables were analyzed in terms of the influencing factors, and results showed that gender and older people care experience variables cause statistically significant differences in terms of the score in KOGAN Attitudes Toward Old People Scale. Mean score of positive attitudes of male nurses was statistically significantly higher than that of female nurses (p=.01). A statistically significant difference was detected between mean KOGAN negative attitude score (p=.02) and mean KOGAN positive attitude score (p=.01); and mean KOGAN total attitude score (p<.01) of the nurses with older people care experience (Table 1). The other independent variables that were analyzed showed no effect on attitudes toward older people (Table 1).

Table 1. Sociodemographic characteristics of nurses who participated in the study (n=83).

Sociodemographic Characteristics	mean	sd
Age (years)	33.9	7.6
Duration of working as nurse (years)	12.6	6.6
Duration of working at the institution (years)	7.5	4.7
Gender	**n**	**%**
Female	73	88.0
Male	10	12.0
Graduated School		
Vocational high school	42	51.0
University	36	43.0
Post-graduate education	5	6.0
Taking a specific education for older people (while student)		
Yes	23	28.0
Experience of living with older people		
Yes	54	65.0
Experience of older people care		
Yes	39	47.0
Having a certificate in the field of geriatric		
Yes	7	8.4
Willingness to start to work with older people		
Yes	66	79.5
Willingness to rechoose working with older people		
Yes	71	85.5

Abbreviations: SD, standard deviation

Table 2. Average scores of nurses in the KOGAN Scale (n=83).

	Min-Max	mean	sd
Positive Score of KOGAN	48–117	74.38	11.06
Negative Score of KOGAN	43–97	65.62	11.59
Total Score of KOGAN	112–206	144.75	16.69

Abbreviations: SD, standard deviation

Table 3. Sociodemographic characteristics and KOGAN mean scores of nurses.

Sociodemographic Characteristics	Positive Attitudes scores of KOGAN mean (sd)	Negative Attitudes scores of KOGAN mean (sd)	Total scores of KOGAN mean (sd)
Gender			
Female	72.90 (9.71)	65.45 (11.36)	143.45 (15.32)
Male	85.20 (14.61)	66.90 (13.83)	154.30 (23.36)
	U=183.500 p=0.010[b]	U=356.000 p=0.900[a]	U=267.000 p=0.170[a]
Graduated School			
High school	75.26 (12.16)	66.16 (11.85)	145.09 (17.86)
University	73.52 (9.99)	66.19 (11.33)	143.33 (16.01)
Post-graduate education	73.20 (10.20)	57.00 (9.69)	152.20 (10.63)
	KWx^2=0.328 p=0.849[a]	KWx^2=3.023 p=0.221[a]	KWx^2=2.073 p=0.355[a]
Taking a specific education for older people (while student)			
Yes	74.04 (8.57)	66.95 (9.31)	143.08 (11.20)
No	74.51 (11.94)	65.11 (12.39)	145.40 (2.37)
	U=672.500 p=0.859[a]	U=618.500 p=0.467[a]	U=660.000 p=0.760[a]
Experience of living with older people			
Yes	74.44 (11.32)	65.46 (11.93)	144.98 (17.43)
No	74.27 (10.77)	65.93 (11.15)	144.34 (15.51)
	U=751.000 p=0.760[a]	U=748.500 p=0.742[a]	U=763.500 p=0.852[a]
Experience of older people care			
Yes	77.46 (10.36)	62.69 (10.01)	150.76 (16.78)
No	71.65 (11.06)	68.22 (12.37)	139.43 (14.85)
	t=2.455 p=0.016[c]	t=−2.221 p=0.02[c]	t=3.264 p=0.002[b]
Having a certificate in the field of geriatric			
Yes	75.42 (9.71)	62.14 (11.23)	149.28 (15.64)
No	74.28 (11.23)	65.94 (11.65)	144.34 (16.82)
	U=236.000 p=0.623[a]	U=209.000 p=0.354[a]	U=212.500 p=0.380[a]
Willingness to work with older people			
Yes	74.36 (11.17)	65.69 (12.05)	144.66 (16.66)
No	74.47 (10.98)	65.35 (9.96)	145.11 (17.32)
	U=546.000 p=0.870[a]	U=542.500 p=0.835[a]	U=529.000 p=0.718[a]
Willingness to work with older people again			
Yes	74.88 (10.57)	65.74 (11.85)	145.14 (16.42)
No	71.45 (14.50)	64.90 (10.89)	142.54 (19.77)
	U=293.500 p=0.187[a]	U=388.500 p=0.978[a]	U=291.500 p=0.178[a]
Age	r=.130 p=.241[a]	r=−.107 p=.337[a]	r=.160 p=.147[a]
Duration of working as nurse (years)	r=.006 p=.960[a]	r=−.089 p=.423[a]	r=.066 p=.555[a]
Duration of working at the institution (years)	r=.082 p=.462[a]	r=−.007 p=.949[a]	r=.060 p=.595[a]

Abbreviations: SD, standard deviation, U value: Mann–Whitney U test, KWx^2 value: Kruskal–Wallis test, t value: independent samples t test, r value: Correlation coefficient, [a]: p > .05, [b]: p<.01, [c]: p<.05

DISCUSSION

Nurses who participated in the current study reported slightly positive attitudes toward older people. This result displayed a Turkish society which considers the older people. Traditionally, people in Turkey consider older people as a source of wisdom and guidance. In general, older people are important, strong, and wise people within the family. Social norms and families play important roles in shaping attitudes. Result of this study coincides with those in literature in Turkey, China, and Sri Lanka (8, 16-18). Notably, results of these studies are rooted in culture. The studies have emphasized that healthcare professionals are influenced by societal attitudes toward the older people (6). Attitudes toward older people are transmitted to people as a cultural heritage in the family life before they enter the nursing profession (19). Willingness to work with older people is closely related to positive attitude (5,6). In the current study, 79.5% of the nurses working in the nursing home stated that they worked in the nursing home voluntarily. For this reason, attitudes of the nurses are assumed to be positively related to their willingness to work with older people.

The vast majority (85.5%) of the nurses who participated reported that they will still want to work with the older people given the opportunity. This condition is thought to be caused by the cultural structure in Turkey. Older people are considered respectable in the society (20). Showing respect to older people is a religious and traditional phenomenon in Turkey. For this reason, respect for the older people in Turkish culture also provides spiritual satisfaction (20). Özmete (2016) reported that according to job satisfaction scale score, 65% of health professionals favor working in the institutional older people care sector (21). High job satisfaction is observed in health professionals working in the institutional older people care field, possibly as a result of the desire to work in the same sector. Literature reported that nurses who have been with older people for a long time show

positive emotions toward other older people (22). For these reasons, nursing home nurses are thought to be willing to work with older people given the opportunity to work again in this field.

When the factors affecting attitudes were analyzed, no statistically significant difference was observed between age and duration of working and score in KOGAN Attitudes Toward Old People Scale of the nurses. This finding is consistent with the results of other studies in literature (3,13). On the other hand, literature, results showed that age affect attitudes toward older people, and more positive attitudes toward old people were observed with increasing age (23).

When gender variable was analyzed, inconsistent results were identified in literature. According to the results of some studies, gender showed no effect on attitudes toward older people (5,13,24). In these results, no significant difference was observed in attitudes according to gender, and this condition was explained with insufficient number of males. Gender was assumed to cause no effect on attitudes owing to the same educational conditions in both genders in the studies conducted with student nurses. Results of other studies reported that women exhibit more positive attitudes toward older people due to their motherhood role and feminine care instincts (9,23). In this study, male nurses showed a more positive attitude toward older people compared with women, and this result is similar to the results of the study of Ünalan Soyuer and Elmalı (2012). They reported that women undertake more difficult physical care and support roles in the care of older people (3). According to this study, the females meet older people care needs, such as hygiene and bathing, compared with men, and this condition leads to tiredness and exclusion of women during providing care for older people. In this study, given that 90% of men claimed experience of living with an older people in the same house, males showed more positive attitudes toward older people compared with females. A total of 61% of the women reported experience of

living with an older people in the same house. At the same time, in this study, the large part of the sample was comprised of women (10 male, 73 female). Therefore, this study is considered inadequate in showing the actual attitudes of male nurses and gender difference may not be generalized. More sophisticated studies should be conducted to clarify the inconsistent results associated with gender.

Although many studies showed that education features a positive effect on attitudes toward older people, this research revealed that the alma mater exerted no effect on attitudes toward aged people. Such result is attributed to the inadequacy of geriatric education at the national-level nursing education curriculum. Among the nurses who participated in this study, 72% stated not receiving any specific course toward older people during their education period, and 91.6% reported not receiving any special education for the older people before they worked as nurses. A number of nurses cannot receive education for older people from their institutions due to the lack of curriculum during their education period. Studies reported that only a few participants take courses about older people care. For these reasons, alma mater, the training undertaken during education period or after starting to work, is assumed to cause no effect on the attitudes toward older people.

A large majority of the nurses who participated in the study stated that they had lived in the same

house with an older people before, and nearly half of the participants experienced care giving to older people. In this study, results showed that the experience of care giving is the most influential variable for attitude to older people. This result is consistent with those found in literature (3). Before working in a nursing home, the nurses who provided care to older people show more positive attitudes toward the other older people. Observing the lives of older individuals in their own families, monitoring their needs and expectations develop tolerance for older people and also affect the positive attitudes toward the older people in the business field. Given their improved experience in care giving, nurses with the opportunity to provide care for older people in clinical practices while finishing school are assumed to be more positively affected with regard to older people.

In conclusion, nurses who participated in the current study reported slightly positive attitudes toward older people. Gender and caregiving experience have been identified as factors that influence attitudes toward older people. Clinical applications toward older people during nursing education are assumed to increase the positive attitudes toward older people. In terms of gender, conducting qualitative studies is suggested to deeply analyze the attitudes toward older people of male and female nurses and to provide more accurate results.

REFERENCES

1. Karakuş B. Ministry of Family and Social Policies, Directorate General of Services for Persons with Disabilities and Elderly People. Institutional care needs for elderly in Turkey. 2015; pp 18.24. [Internet] Available from: http://eyh.aile.g.,ov.tr/data/595de492290eac101cfd1a92/Kurumsal%20Yaşlı%20Bakım%20İhtiyacı%20Tespit%20ve%20Öneriler%20Raporu%202015.pdf. Accessed:12.01.2018. (in Turkish)..

2. Hanson RM. Is elderly care affected by nurse attitudes? A systematic review. Br J Nurs 2014;23(4):225-9. (PMID:24809152).

3. Ünalan D, Soyuer F, Elmalı F. Evaluation of attitude towards the elderly in geriatric centre workers. Kafkas J Med Sci 2012;2(3):115-20. (in Turkish).

4. Neville C. Undergraduate nurse attitudes toward older adults and perceptions of working with older adults: An analysis of measurement instruments. Nurse Educ Today 2015;35(1):183-8. (PMID:25245662).

5. Alkaya Ayaz S, Birimoğlu Okuyan C. Nursing students' attitudes towards the elderly. Journal of Hacettepe University Faculty of Nursing 2017;4(1):43-52. (in Turkish).

6. Liu Y-E, Norman IJ, While AE. Nurses' attitudes towards older people: A systematic review. Int J Nurs Stud 2013;50(9):1271-82. (PMID:23265870).

7. Sözvurmaz S, Mandıracıoğlu A. Health sciences students' ageing anxiety and attitudes towards older people. Turk J Geriatr 2017;20(1):54-60.

8. Turan E, Yanardağ M, Metintas S. Attitudes of students of health sciences towards the older persons. Nurse Educ Today 2016;36:53-7. (PMID:26239278).

9. Adibelli D, Kılıç D. Difficulties experienced by nurses in older patient care and their attitudes toward the older patient. Nurse Educ Today 2013;33(9):1074-8. (PMID:22542986).

10. Alamri BH, Xiao LD. Health professionals' knowledge and attitudes toward older people in primary care in Saudi Arabia. Saudi Med J 2017;38(3):229-36. (PMID:28251216).

11. Yildirim Usta Y, Demir Y, Yönder M, Yildiz A. Nursing students' attitudes toward ageism in Turkey. Arch Gerontol Geriatr 2012;54:90-3.(PMID:21353316).

12. Dikken J, Hoogerduijn JG, Lagerwey MD, Shortridge-Baggett L, Klaassen S, Schuurmans MJ. Measurement of nurses' attitudes and knowledge regarding acute care older patients: Psychometrics of the OPACS-US combined with the KOP-Q. Geriatr Nurs 2017;38(5):393-7.

13. Aydın L, Yönet GH, Bayat E, Günay B. Nurses' attitudes towards elderly people and examining affecting factors. Yıldırım Beyazıt University, Nursing E-Journal 2016;3(1):10-8. (in Turkish).

14. Kogan N. Attitudes toward old people: the development of a scale and an examination of corraletes. J Abnorm Soc Psychol 1961;64:44-54. (PMID:14457779).

15. Küçükgüçlü Ö, Mert H, Akpinar B. Reliability and validity of Turkish version of attitudes toward old people scale. J Clin Nurs 2011;20(21-22):3196-203. (PMID:21518058).

16. Rathnayake S, Athukorala Y, Siop S. Attitudes toward and willingness to work with older people among undergraduate nursing students in a public university in Sri Lanka: A cross sectional study. Nurse Educ Today 2016;36:439-444. (PMID:26507448).

17. Zhang S, Yan-Hui L, Hong-Fu Z, Li-Na M, Peng-Xi L. Determinants of undergraduate nursing students' care willingness towards the elderly in China: Attitudes, gratitude and knowledge. Nurse Educ Today 2016;43:28-33. (PMID:27286941).

18. Darling R, Sendir M, Atav S, Buyukyilmaz F. Undergraduate nursing students and the elderly: An assessment of attitudes in a Turkish university. Gerontol Geriatr Educ 2017;1-12. (PMID:28353413).

19. Lovell M. Caring for the elderly: Changing perceptions and attitudes. J Vasc Nurs 2006;24(1),22-6.

20. Canatan A. Social values and elderly. Journal of Elderly Problems Research 2008;1:62-71. (in Turkish).

21. Özmete E. Psycho-social risk for older care: The evaluation of the professionals who work in the institutional care of reasons of stress, burnout and job satisfaction level. Cumhuriyet University Journal of Economics and Administrative Sciences 2016;17(1):243-264. (in Turkish).

22. Gallagher S, Bennett K, Halford J. A comparison of acute and long-term health care personnel's attitudes toward older adults. Int J Nurs Pract 2006;12(5):273-9. (PMID:16942515).

23. Hweidi IM, Al-Hassan MA. Jordanian nurses' attitudes toward older patients in acute care settings. Int Nurs Rev 2005;52(3):225-232. (PMID:16033450).

24. Doherty M, Mitchell EA, O'Neill S. Attitudes of healthcare workers towards older people in a rural population: A survey using the Kogan Scale. Nurs Res Pract 2011;1-7. (PMID:21994823).

■ Tansel MUTLU[1]
■ Uygar DAŞAR[1]

CORRESPONDANCE

Uygar DAŞAR
Karabük University, Faculty of Medicine,
Department of Orthopaedics and Traumatology,
Karabük, Turkey

Phone: 05056803048
e-mail: udasar@yahoo.com

[1] Karabük University, Faculty of Medicine, Department of Orthopaedics and Traumatology, Karabük, Turkey

RESEARCH

HIP FRACTURE SURGERY IN PATIENTS OLDER THAN 90 YEARS: EVALUATION OF FACTORS THAT AFFECT 30-DAY MORTALITY IN A PARTICULARLY RISKY GROUP

Abstract

Introduction: To date, hip fracture-related mortality studies are generally conducted on patients over 65 years of age. In our study, we predicted that factors affecting hip injury-related mortality may differ from the current literature and aimed to determine these factors in patients over 90 years of age who were hospitalized due to hip fracture.

Materials and Method: The data of 118 patients who were operated for hip fracture at Karabük University Training and Research Hospital between 2011 and 2014 were retrospectively reviewed. Each patient's age, sex, preoperative period, American Society of Anesthesiologists (ASA) score, type of anesthesia, comorbid diseases, blood transfusion requirements, fracture type, and mortality time were recorded.

Results: The age difference between patients who died (death group) and survivors (survivor group) was statistically significant (p=0.004). The ejection fraction (EF) values of patients who died within the first 30 days after surgery were significantly lower (p=0.012) than those of the survivor group, and more comorbid diseases were seen in the death group (p=0.014). In addition, the median ASA score of the death group was higher than that of the survivor group (p=0.006).

Conclusions: The 30-day mortality rate in our study was 27.9%, which is significantly higher compared with previous studies. To cope with high mortality rates in elderly patients with hip fracture, the patients' general medical conditions should be assessed in detail before surgical intervention and medical problems should be stabilized as early as possible.

Keywords: Mortality; Hip Fractures; Arthroplasty, Replacement, Hip

ARAŞTIRMA

DOKSAN YAŞIN ÜSTÜNDEKİ HASTALARDA KALÇA KIRIĞI CERRAHİSİ: RİSKLİ BİR GRUPTA 30 GÜNLÜK MORTALİTEYİ ETKİLEYEN FAKTÖRLERİN BELİRLENMESİ

Öz

Giriş: Günümüzde kalça kırıkları ile ilişkili mortalite çalışmaları genellikle 65 yaş üstü hastalar üzerinde yapılmaktadır. Çalışmada, 90 yaş üstü kalça kırığı ile hospitalize olan hastalarda bu faktörlerin literatürle farklılıklar göstereceği öngörüldü ve bu faktörlerin belirlenmesi amaçlandı.

Gereç ve Yöntem: Karabük Üniversitesi Eğitim ve Araştırma Hastanesi'nde 2011 ile 2014 arasında kalça kırığı sebebiyle opere edilen 118 hastanın kayıtları retrospektif olarak incelendi. Her bir hastanın yaşı, cinsiyeti, ameliyat öncesi dönemi, Amerikan Anestezi Birliği puanı, anestezi tipi, komorbid hastalıkları, kan transfüzyon ihtiyacı, kırık tipi ve mortalite zamanı kaydedildi.

Bulgular: Ölen hastalar ile hayatta kalan hastalar arasındaki yaş farkı istatistiksel olarak anlamlıydı (p=0.004). Ameliyat sonrası ilk 30 günde ölen hastaların ejeksiyon fraksiyonları hayatta kalan hastalara göre daha düşüktü (p=0.012) ve komorbid hastalıklar daha çoktu (p=0.014). Ayrıca, ölen grupta median ASA skoru hayatta kalan gruba göre daha yüksekti (p=0.006).

Sonuçlar: Çalışmada otuz günlük mortalite oranı daha önceki çalışmalardaki oranlardan yüksek olarak %27.9'dur. Kalça kırığı olan yaşlılardaki yüksek mortalite oranları ile baş edebilmek için hastaların müdahale öncesi genel sağlık durumları ayrıntılı olarak değerlendirilmeli ve tıbbi problemler en hızlı şekilde stabilize edilmelidir.

Anahtar sözcükler: Mortalite; Kalça kırıkları; Replasman artroplasti, Kalça

INTRODUCTION

The geriatric population is growing worldwide because of an increase in expected lifetime. Hip fractures seen in the geriatric population have become a major health concern due to a decline in bone mass with age (1). Hip fracture is the leading cause of injury-related mortality in the elderly (2). Many studies conducted in the past five decades have reported that 1-year mortality rates vary between 15% and 30% (3,4). The highest mortality occurs in the first 6 months, and then the rate declines (5). An essential factor that affects mortality after hip fracture is other problems, besides the fracture, and the patient's general health status (6). Although many factors that increase the risk of death have been identified, there is no consensus on these factors (7). Some of these factors are age, gender, a high American Society of Anesthesiologists (ASA) score, low preoperative walking capacity, low daily activity level, mental status impairment, a low body mass index, anemia, malnutrition, and serum creatinine elevation (8,9). Identifying factors that increase the risk of death helps clinicians take precautions before and after surgery and to intervene when necessary.

It is known that the risk of mortality increases with age. To date, hip fracture-related mortality studies are generally conducted on patients over 65 years of age. In our study, we predicted that factors affecting hip injury-related mortality may differ from the current literature and aimed to determine these factors in patients over 90 years of age who were hospitalized due to hip fracture.

MATERIALS AND METHOD

The study was planned as a retrospective evaluation of elderly patients (>90 years) who were admitted to Karabük University Training and Research Hospital with hip fractures from 2011 to 2014. Inclusion criteria were as follows: 1) being over 90 years of age, 2) being admitted to hospital due to hip fracture, 3) accepting to participate in the study, 4) being clinically operable and accepting surgery. Exclusion criteria were: 1) presence of osteomyelitis or any type of malignant neoplasm/tumor, 2) having previously undergone arthroplasty, 3) being inoperable due to any cause, 4) having a more critical injury which would require treatment priority at time of admittance.

A total of 182 patients who were older than 90 years applied to our center with hip fracture during the study period. Among these, 43 patients did not consent to surgery because of a high risk of death and 21 patients died during the preoperative period. Thus, in total, 64 patients were excluded. The data of the remaining 118 patients who were operated for hip fracture were retrospectively reviewed.

Surgical approach and method was determined according to the type of fracture and the clinical and physiological state of the patient. Each patient's age, sex, preoperative period, ASA score, type of anesthesia (general, spinal, and sciatica), comorbid diseases (diabetes, hypertension, heart failure, renal insufficiency, coronary artery disease, chronic obstructive pulmonary disease [COPD]), blood transfusion requirements, type of fracture, and mortality time were recorded.

The patients were classified preoperatively according to the ASA's six-category physical status classification system. These categories are (i) ASA I: a normal healthy patient; (ii) ASA II: a patient with a mild systemic disease; (iii) ASA III: a patient with a severe systemic disease; (iv) ASA IV: a patient with a severe systemic disease that is a constant threat to life; (v) ASA V: a moribund patient who is not expected to survive with or without the operation; and (vi) ASA VI: a patient who is declared brain-dead and whose organs are being removed for donor purposes (10).

Statistical analysis

All analyses were performed using SPSS Statistics V20.0. The Shapiro–Wilk test was used to test for normality. Continuous variables were given as mean±standard deviation for normally distributed data and median (minimum–maximum) for non-normally distributed data. Comparisons between groups were made with the Mann–Whitney U test.

Analysis of categorical variables was made with the Chi-square test. A p value below 0.05 was accepted as statistically significant.

RESULTS

We included 118 patients (32 women, 86 men) over 90 years of age in our study; mean age was 94.19±4.18 years. Thirty-three (27.9%) of these patients died within 30 days. Therefore, the 30-day mortality rate was 27.9%.

Median age among those who died (death group) was 94 years (90–112 years) and that of the survivors (survivor group) was 92 years (90–109 years). The age difference between the death group and the survivor group was statistically significant (p=0.004). There was no significant difference between men and women in terms of 30-day mortality (p=0.344). The ejection fraction (EF) values of patients who died in the first 30 days after surgery were significantly lower (p=0.012) than those in the survivor group, and more comorbid diseases were seen in the death group (p=0.014). In addition, the median ASA score of the death group was higher than that of the survivor group (p=0.006). The causes of death according to medical records were as follows: 12 due to respiratory failure, 7 due to heart failure, 9 due to pulmonary infections in the ICU, 2 due to acute renal failure, and 3 were reported as spontaneous cardiopulmonary arrest.

No statistically significant difference was found between the two groups in terms of the types of anesthesia used (p=0.326), duration of surgery (p=0.481), and fracture localization (p=0.538) in the study. The patients' demographics and characteristics regarding postoperative life status are presented in Table 1 and patients' characteristics regarding operation and anesthesia are presented in Table 2.

<<Please insert Table 1 and 2 here.>>

Table 1. Patients' demographics and characteristics regarding postoperative life status.

	Survivors (n=85)	Exitus in first 30 days (n=33)	p
Age	92 (90–109)	95 (90–112)	0.004
Gender			
Male	21 (24.7%)	11 (33.3%)	0.344
Female	64 (75.3%)	22 (66.7%)	
White blood cell count (×1000)	9.20 (3.24–21.43)	8.50 (3.90–17.00)	0.300
Red cell distribution width	14.20 (10.50–22.60)	13.70 (10.40–17.60)	0.061
Hemoglobin (mg/dL)	10.95 (7.95–14.10)	10.35 (8.10–12.50)	0.228
Length of stay in hospital (day)	12 (2–43)	10 (2–36)	0.272
Ejection fraction (%)	60 (40–70)	60 (35–65)	0.012
Blood Tx (unit)	2 (0–8)	1 (0–6)	0.361
Comorbidities	36 (42.4%)	23 (69.7%)	0.014
Diabetes Mellitus	12(14.1%)	5(15.1%)	0.885
Chronic Kidney Failure	-	5(15.1%)	NA

Data are given as median (minimum–maximum) or frequency (percentage), NA: not available

Table 2. Patients' characteristics regarding operation and anesthesia.

	Survivors (n=85)	Exitus in first 30 days (n=33)	p
Anesthesia type			
Spinal	58 (68.2%)	18 (54.5%)	
Sciatic nerve block	5 (5.9 %)	3 (9.1%)	0.376
General	22 (25.9%)	12 (36.4%)	
ASA score	3 (1–5)	4 (1–5)	0.006
Duration of surgery (minutes)	36.8 (30-62)	38.3 (30-49)	0.313
Surgery timing			
Before 24 hours	13 (15.3%)	7 (21.2%)	
24–48 hours	31 (36.5%)	14 (42.4%)	0.481
After 48 hours	41 (48.2%)	12 (36.4%)	
Infection after surgery	5 (7.8%)	3 (17.6%)	0.355
Fracture location			
Femoral neck	33 (38.8%)	12 (36.4%)	
Trochanteric	45 (52.9%)	20 (60.6%)	0.538
Subtrochanteric	7 (8.2%)	1 (3.0%)	

Data are given as median (minimum–maximum) or frequency (percentage)

DISCUSSION

The increase in life expectancy has made the chronic disease burden heavier. This burden has become a leading health concern in today's world. In the elderly, protection and avoidance functions are weakened because of diminished physical abilities, systemic diseases, loss of sight and hearing, and debilitated reflexes. Therefore, simple trauma exposure rates are increasing in the elderly, which in turn leads to an increase in fracture risk due to a reduction in bone density (11).

Hip fractures are common skeletal system injuries in the elderly and are accompanied by high mortality and morbidity rates. The 30-day mortality rate is a good indication of hospital care for patients with hip fractures. In the literature, the 30-day mortality rate varies widely. William et al. reported a 30-day mortality rate of 8.2% in their study which was conducted on individuals over 65 years of age. They emphasized that independent risk factors are associated with 30-day mortality (12). Kirkland et al. reported a 30-day mortality rate of 8% and that being aged above 90 years was associated with increased mortality (13). Carretta et al. found a 30-day mortality rate of 3.5% (14), whereas in another study, it was reported as 9.6%, which increased to 33% in the 1-year period (15).

In our study, the 30-day mortality rate was 27.9%. In addition, the mean age of the death group was statistically higher than the survivors'. The fact that the patients who comprised our study group were over 90 years old may explain the high mortality rate compared with the literature. Many studies in

this area have shown that age is an independent risk factor for increased mortality.

Many individuals with hip fractures have multiple chronic conditions, which affect mortality (16). The comorbid diseases found in this study were diabetes, hypertension, heart failure, renal insufficiency, coronary artery disease, and COPD. Patients with at least one of these comorbid diseases had a higher 30-day mortality rate compared with the others. In addition, mortality was significantly higher in patients with a low EF. A meta-analysis investigated the causes of delaying and unstabilizing surgery, and the most common ones were identified as cardiac problems, infections, diabetes, and electrolyte abnormalities (17). Roche et al. reported that after adjusting for age and sex, 2.5-fold greater 30-day mortality was observed in patients with three or more comorbidities (15). Similar results have been reported in other studies (18,19).

The ASA classification is used before surgery to assess how systemic diseases affect the patient's general condition. It is known that mortality increases as accompanying diseases increase. In parallel, with advancing age, the ASA score also increases (20). The ASA score is used as a marker of long-term mortality (21). Hamlet et al.'s study on the relationship between surgery and ASA scores indicated that the ASA score itself is a good indicator of mortality (22). In our study, the ASA score of the death group was significantly higher (similar to the literature) than the survivors'. This suggests that ASA scoring is a useful system for determining postoperative mortality risk.

The use of regional anesthesia in hip fracture surgery may reduce the patient's length of stay in the hospital and thus reduce mortality. However, Neuman et al. reported that this method does not affect mortality, even though there is a significant decrease in the duration of hospitalization after surgery using regional anesthesia (23). Similarly, in our study, there was no significant relationship between the type of anesthesia used for surgery and mortality. In addition, surgery duration and fracture localization did not affect mortality.

This was a retrospective study which brings the usual limitations seen in retrospective studies. another limitation is the fact that we did not perform further analyses according to cause of death. Finally, we may include the relatively low number of subtrochanteric fracture cases as a limitation. To our knowledge, this is the first study which aimed to identify factors affecting 30-day mortality in hip fracture patients older than 90 years.

In conclusion, the results of our study did not differ from the literature, except for the 30-day mortality rate, which in our study was 27.9%, significantly higher compared with previous studies. This difference was due to the fact that age limit in our study was 90 years, whereas previous studies usually set this limit to 65 years (which is considered the limit of aging). ASA scores, age, the EF, and the presence of accompanying chronic diseases were found to be factors associated with 30-day mortality. To cope with the high mortality rates of hip fractures in the elderly, each patient's general medical condition should be assessed in detail before surgical intervention and any medical problems should be stabilized as early as possible. In addition, further studies should be undertaken to better understand the underlying causes of increased mortality.

REFERENCES

1. Cooper C, Campion G, Melton LJ. Hip fractures in the elderly: a world-wide projection. Osteoporos Int 1992;2:285-9. (PMID:1421796).

2. Panula J, Pihlajamaki H, Mattila VM, et al. Mortality and cause of death in hip fracture patients aged 65 or older: a population-based study. BMC Musculoskelet Disord 2011;12:105. (PMID:21599967).

3. Johnston AT, Barnsdal L, Smith R, Duncan K, Hutchison JD. Change in long-term mortality associated with fractures of the hip: evidence from the Scottish hip fracture audit. J Bone Joint Surg Br 2010, 92: 989-93. (PMID:20595120).

4. Paksima N, Koval KJ, Aharanoff G, et al. Predictors of mortality after hip fracture: a 10-year prospective study. Bull NYU Hosp Jt Dis 2008;66:111-7. (PMID:18537780).

5.   Kannegaard PN, der MS V, Eiken P, Abrahamsen B. Excess mortality in men compared with women following a hip fracture. National analysis of comedications, comorbidity and survival. Age Ageing 2010;39:203-9. (PMID:20075035).

6.   Vidan M, Serra JA, Moreno C, Riquelme G, Ortiz J. Efficacy of a comprehensive geriatric intervention in older patients hospitalized for hip fracture: a randomized, controlled trial. J Am Geriatr Soc 2005;53:1476-82. (PMID:16137275).

7.   Kanis JA, Oden A, Johnell O, De Laet C, Jonsson B, Oglesby AK. The components of excess mortality after hip fracture. Bone 2003;32:468-73. (PMID:12753862).

8.   Hu F, Jiang C, Shen J, et al. Preoperative predictors for mortality following hip fracture surgery: a systematic review and meta-analysis. Injury 2012;43:676-85. (PMID:21683355).

9.   Bhaskar D, Parker MJ. Haematological indices as surrogate markers of factors affecting mortality after hip fracture. Injury 2011;42: 178-82. (PMID:20850741).

10. Katayama Y, and K Matumoto. New classification of physical status. Anesthesiology 1963;24:111.

11. Wehren LE, Magaziner J. Hip fracture: risk factors and outcomes. Curr Osteoporos Rep 2003;1:78-85. (PMID:16036069).

12. Williams N, Hardy BM, Tarrant S, et al. Changes in hip fracture incidence, mortality and length of stay over the last decade in an Australian major trauma centre. Arch Osteoporos 2013;8(1–2):150. (PMID:24052133).

13. Kirkland LL, Kashiwagi DT, Burton MC, et al. The Charlson Comorbidity Index Score as a predictor of 30-day mortality after hip fracture surgery. Am J Med Qual 2011;26(6):461-7. (PMID:21450939).

14. Carretta E, Bochicchio V, Rucci P, et al. Hip fracture: effectiveness of early surgery to prevent 30-day mortality. Int Orthop 2011;35(3):419-24. (PMID:20373098).

15. Roche JJ, Wenn RT, Sahota,O, et al. Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study. BMJ 2005;331:1374. (PMID:16299013).

16. Zuckerman JD. Hip fracture. N Engl J Med 1996;334:1519-25. (PMID:8618608).

17. Van de Ree CL, De Jongh MA, Peeters CM, de Munter L, Roukema JA, Gosens T. Hip fractures in elderly people: surgery or no surgery? A systematic review and meta-analysis. Geriatric Orthopaedic Surgery & Rehabilitation 2017;8(3):173-80. (PMID:28835875).

18. Nettleman MD, Alsip J, Schrader M, Schulte M. Predictors of mortality after acute hip fracture. J Gen Intern Med 1996;11:765-7. (PMID:9016427).

19. Kim BH, Lee S, Yoo B, et al. Risk factors associated with outcomes of hip fracture surgery in elderly patients. Korean J Anesthesiol 2015;68(6): 561-7. (PMID:26634079).

20. Cohen MM, Duncan PG, Tate RB. Does anesthesia contribute to operative mortality? JAMA 1988;260:2859-63. (PMID:3184350).

21. Michel JP, Klopfenstein C, Hoffmeye, P, Stern R, Grab B. Hip fracture surgery: is the pre-operative American Society of Anesthesiologists (ASA) score a predictor of functional outcome? Aging Clin Exp Res 2002,14:389-94. (PMID:12602574).

22. Hamlet WP, Lieberman JR, Freedman E, Dorey FJ, Fletcher A, Johnson EE. Influence of health status and the timing of surgery on mortality in hip fracture patients. Am J Orthop 1997;26:621-7. (PMID:9316725).

23. Neuman MD, Rosenbaum PR, Ludwig JM, Zubizarreta JR, Silber JH. Anesthesia technique, mortality, and length of stay after hip fracture surgery. JAMA 2014;311(24): 2508–17. (PMID:25058085).