ORIGINAL ARTICLE

The prevalence of cardiovascular diseases, risk factors, and cardiovascular drug therapy in very elderly Turkish patients admitted to cardiology clinics: A subgroup analysis of the ELDER-TURK study

Kardiyoloji kliniklerine başvuran çok ileri yaş Türk hastalarının kardiyovasküler hastalık prevelansı, risk faktörleri ve kardiyovasküler ilaç kullanımları: ELDER-TURK çalışmasının bir altgrup analizi

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ABSTRACT

Objective: The aim of this study was to determine the baseline clinical characteristics and the cardiovascular drug usage of patients aged ≥80 years who were admitted to cardiology clinics and to compare the cardiovascular disease and risk factors with patients aged 65-79 years who participated in the Epidemiology of Cardiovascular Disease in Elderly Turkish Population (ELDER-TURK) study.

Methods: The ELDER-TURK study included 5694 patients aged over 65 years who were followed up at cardiology clinics between March 2015 and December 2015. The prevalence of cardiovascular diseases and the risk factors of 1098 patients aged ≥80 years (Group II) were compared with 4596 patients aged 65–79 years (Group I).

Results: The mean age of Group I was 71.1±4.31 years (male: 50.2%) and the mean age of Group II was 83.5±3.12 years (male: 47.5%). The prevalence rate was 71.3% for hypertension, 24.6% for diabetes mellitus (DM), 44.7% for coronary artery disease (CAD), 35.9% for atrial fibrillation (AF), and 15.5% for renal failure. A statistical difference in the prevalence of comorbid conditions and cardiovascular disease risk factors, such as DM, CAD, renal failure, and AF was seen in the very elderly group ($p<0.001$, $p=0.002$, $p<0.001$, $p<0.001$, respectively). In all, 28.7% of the very elderly were using a beta-blocker, 10.1% an angiotensin system inhibitor, 28.4% an angiotensin receptor blocker, and 32.7% a mineralocorticoid receptor antagonist.

Conclusion: Valuable data about the prevalence of cardiovascular and comorbid diseases and medication usage among Turkey`s very elderly patients who were admitted to cardiology clinics was gathered and analyzed.

ÖZET

Amaç: Bu çalışmanın amacı, kardiyoloji kliniklerine başvuran 80 yaş üstü hastaların kardiyovasküler ilaç kullanımı ve temel klinik özelliklerini belirlemek ve ELDER-TURK (Epidemiology of Cardiovascular Disease in Elderly Turkish Population) çalışmasına katılan 65-79 yaş arası hastaların risk faktörleri ve kardiyovasküler hastalıklarını karşılaştırmaktır.

Yöntemler: ELDER-TURK çalışmasına Mart 2015 ve Aralık 2015 tarihleri arasında kardiyoloji kliniklerine takip olan 65 yaş üstü 5694 hasta alındı. Kardiyoloji kliniklerinde takip edilen 80 yaş ve üstü olan 1098 hastanın (Grup II) kardiyovasküler hastalık prevalansı ve risk faktörü 65–79 yaş arasındaki 4596 hasta grubu (Grup I) ile karşılaştırıldı.

Bulgular: Grup I'in ortalama yaşı 71.1±4.31 (%50.2 erkek), Grup II'nin ortalama yaşı 83.5±3.12 idi (%47.5 erkek). Hipertansiyon prevelansı %71.3, diabetes mellitus prevelansı %24.6, koroner arter hastalığı prevelansı %44.7, atriyal fibrillasyon prevelansı %35.9 ve böbrek yetersizliği prevelansı %15.5 olarak saptandı. Çok ileri yaş hasta grubunda diabetes mellitus, koroner arter hastalığı, böbrek yetersizliği ve atriyal fibrilasyon gibi kardiyovasküler hastalık risk faktörleri ve komorbid hastalık prevelansında istatistiksel farklılıklar saptandı (sırasıyla, $p<0.001$, $p=0.002$, $p<0.001$, $p<0.001$). İleri yaş hastaların %28.7'si beta bloker, %10.1'i anjiotensin inhibitörü, %28.4'ü anjiotensin reseptör blokeri, %32.7 mineralokortikoid reseptör antagonisti kullanmaktaydı.

Sonuç: Kardiyoloji kliniklerinde takipli çok ileri yaş Türk hastaları ile ilgili, kardiyovasküler hastalık prevelansı, komorbid hastalıklar ve ilaç kullanımları açısından değerli bir veri tabanı toplandı ve incelendi.

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Abbreviations:

AF	*Atrial fibrillation*
CAD	*Coronary artery disease*
DM	*Diabetes mellitus*
ELDER-TURK	*Epidemiology of Cardiovascular Disease in Elderly Turkish Population Study*
GFR	*Glomerular filtration rate*

The proportion of the very elderly population has been gradually increasing in Turkey and all over the world in recent decades. In 2014, the proportion of the Turkish elderly population (aged over 65 years) was 8% (6,192,962 inhabitants) of the total population, whereas, the very elderly (aged ≥80 years) accounted for 21.2% of the total elderly population. This proportion is estimated to increase 32.2% and will make up nearly 1.5% of the national population in 2030.[1]

The major cause of death in the very elderly is cardiovascular disease. In 2016, the rate of death from circulatory system diseases was 46.8% in Turkey, higher than the rate in Europe, which was 42%.[1,2] Despite the steady increase in the number of the very elderly and the proportion of very elderly patients with cardiovascular diseases, there are few data about the prevalence of cardiovascular diseases, the risk factors, and pharmacological therapy among this special age group in Turkey.

Aging is associated with altered pharmacokinetics and pharmacodynamics that can cause adverse drug reactions in very elderly patients with multiple comorbidities and polypharmacy. Additionally, the presence of multiple comorbidities and the frailty of this age group complicate the treatment strategies of common diseases, such as hypertension and coronary artery disease (CAD). Thus, the types of cardiovascular drugs used in daily practice should be evaluated in this special group.

As the evidence for cardiovascular drugs recommended in the guidelines is mostly obtained from patients aged less than 80 years, and because several guidelines disregard the difference in the clinical profile of this special group, clinical judgement is usually required to determine the treatment strategy in the very elderly. Evaluation of the clinical differences and risk factors of very elderly patients from relatively younger elderly individuals may help to increase awareness of secondary prevention and associated comorbidities, as well as to decrease the burden of cardiovascular diseases in this special group.[3]

The aim of this study was to compose a database of cardiovascular risk factors, concomitant diseases, and details of drug usage among the very elderly who were followed up at cardiology clinics in Turkey.

METHODS

Study design

The Epidemiology of Cardiovascular Disease in Elderly Turkish Population Study (ELDER-TURK) study was a national, multicenter, cross-sectional, and non-interventional study conducted in 73 participating hospital cardiology clinics in 12 Eurostat Nomenclature of territorial units for statistics (NUTS 1) regions of Turkey (Fig. 1, Table 1).[4,5] The list of participating centers and provinces is presented in Table 2. The study was conducted in outpatient cardiology clinics and inpatient wards of state, university, private, and training and research hospitals.

Data privacy and security was provided through an electronic case report form. During the trial, patient data were registered on the electronic forms, and each center used their own password and was able to see only their own patients' data. For better data input quality, automated data entry control was provided through an audit trail and was consistent with the Code of Federal Regulations, part 11.

A total of 5694 patients aged 65 years or older who were admitted to cardiology clinics between March 2015 and December 2015 were included in the study after signing informed consent for data sharing. In this research, individuals aged ≥80 years are referred to as very elderly, while those between 65–79 years of age are considered elderly. The participants were divided into 2 groups: Group I comprised patients aged 65–79 years and Group II patients were aged ≥80

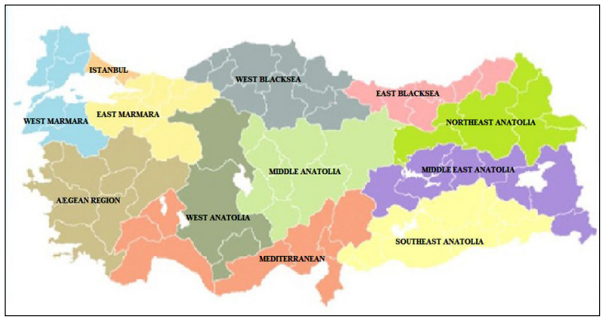

Figure 1. The statistical regions of Turkey.

Table 1. The participating centers and statistical regions

	n	% of total patient population	% of total Turkish population
1) Istanbul			
Pendik State Hospital	398		
Şişli Etfal Training and Research Hospital	231		
Kartal KoşuyoluYüksek Ihtisas Training and Research Hospital	208		
Okmeydanı Training and Research Hospital	94		
İstanbul University, Cardiology Institute	83		
GATA Haydarpaşa	77		
İstinye State Hospital	75		
Türkiye Hospital / Memorial Hospital	43		
Surp Pirgiç Ermeni Training and Research Hospital	17		
Medipol University Faculty of Medicine	5		
Mehmet Akif Ersoy Training and Research Hospital	40		
Total	1271	22.32	16.5
2) West Anatolia			
Mevlana University Faculty of Medicine	104		
Selçuk University Faculty of Medicine	31		
Başkent University Faculty of Medicine	41		
Gazi University Faculty of Medicine	15		
GATA Ankara	41		
TürkiyeYüksek Ihtisas Training and Research Hospital	428		
Hacettepe University Faculty of Medicine	87		
Ankara University Faculty of Medicine	40		
Keçiören Training and research hospital	43		
Yenimahalle Training and Research Hospital	234		
Ereğli State Hospital	1		
Turgut Ozal University Faculty of Medicine	4		
Total	1069	18.77	13.88
3) East Marmara			
Sakarya Training and Research Hospital	9		
Total	9	0.15	0.11
4) Aegean Region			
Ege University Faculty of Medicine	366		
Muğla Sıtkı Koçman University Faculty of Medicine	142		
MuğlaYücelen Private Hospital	127		
Menemen State Hospital	74		
Manisa State Hospital	61		
Gazi Emir State Hospital	44		
Aksaz Military Hospital	40		
Denizli State Hospital	40		
Denizli Server Gazi State Hospital	40		
Kemalpaşa State Hospital	40		
Kent Hospital	40		
Izmir Tepecik Training and Research Hospital	38		
Manisa Demirci State Hospital	24		
Izmir Military Hospital	120		
Afyon State Hospital	114		
Bolvadin State Hospital	40		
Afyon Kocatepe University Faculty of Medicine	8		
Total	1358	23.84	17.63

Table 1. The participating centers and statistical regions (cont.)

	n	% of total patient population	% of total Turkish population
5) West Marmara			
Edirne State Hospital	7		
Tekirdağ State Hospital	60		
Namık Kemal University Faculty of Medicine	46		
Total	113	1.98	1.46
6) Mediterranean			
Antalya Atatürk State Hospital	137		
Tarsus State Hospital	126		
Akdeniz University Faculty of Medicine	120		
Mustafa Kemal Univercity Training and Research Hospital	65		
Necip Fazıl State Hospital	57		
Antalya Training and Research Hospital	55		
Antakya Defne Private Hospital	40		
Isparta State Hospital	19		
Süleyman Demirel University Faculty of Medicine	1		
Antalya OFM Private Hospital	2		
Mersin University Faculty of Medicine	8		
Osmaniye State Hospital	8		
Total	638	11.2	8.28
7) West Black Sea			
Samsun Training and Research Hospital	15		
Hitit University Faculty of Medicine	153		
Sinop State Hospital	3		
Osmangazi University Faculty of Medicine	10		
Total	181	3.17	2.35
8) Middle Anatolia			
Ahi Evren Thorasic and Cardiovascular Training and Research Hospital	12		
Ahi Evran University Training and Research Hospital	219		
Aksaray State Hospital	62		
Total	293	5.14	3.8
9) East Black Sea			
Rize Kaçkar State Hospital	340		
Total	340	5.97	4.41
10) Southeast Anatolia			
Mardin State Hospital	91		
Siirt State Hospital	43		
Gaziantep University Faculty of Medicine	11		
Gaziantep 25 Aralik State Hospital	7		
Total	152	2.66	1.97
11) Middle East Anatolia			
Bingöl State Hospital	88		
Total	88	1.54	1.14
12) Northeast Anatolia			
Kars State Hospital	2		
Bayburt State Hospital	53		
Erzurum Training and Research Hospital	64		
Kafkas University Faculty of Medicine	63		
Total	182	3.19	2.36

Table 2. The list of participating centers and provinces of the ELDER-TURK study

Province		Frequency	Percent	Valid percent	Cumulative percent
Ankara	TürkiyeYüksek Ihtisas Training and Research Hospital	428	7.5	7.5	7.5
Istanbul	Pendik State Hospital	398	7.0	7.0	14.5
İzmir	Ege University Faculty of Medicine	366	6.4	6.4	20.9
Rize	Rize Kaçkar State Hospital	340	6.0	6.0	26.9
Ankara	Yenimahalle Training and Research Hospital	234	4.1	4.1	31.0
İstanbul	Şişli Etfal Training and Research Hospital	231	4.1	4.1	35.1
Kırşehir	Ahi Evran University Training and Research Hospital	219	3.8	3.8	38.9
İstanbul	Kartal KoşuyoluYüksek Ihtisas Training and Research Hospital	208	3.7	3.7	42.6
Çorum	Hitit University Faculty of Medicine	153	2.7	2.7	45.3
Muğla	Muğla Sıtkı Koçman University Faculty of Medicine	142	2.5	2.5	47.8
Antalya	Antalya Atatürk State Hospital	137	2.4	2.4	50.2
Muğla	MuğlaYücelen Private Hospital	127	2.2	2.2	52.4
Tarsus	Tarsus State Hospital	126	2.2	2.2	54.6
Antalya	Akdeniz University Faculty of Medicine	120	2.1	2.1	56.7
İzmir	Izmir Military Hospital	120	2.1	2.1	58.8
Afyon	Afyon State Hospital	114	2.0	2.0	60.8
Konya	Mevlana University Faculty of Medicine	104	1.8	1.8	62.6
İstanbul	Okmeydanı Training and Research Hospital	94	1.7	1.7	64.3
Mardin	Mardin State Hospital	91	1.6	1.6	65.9
Bingöl	Bingöl State Hospital	88	1.5	1.5	67.4
Ankara	Hacettepe University Faculty of Medicine	87	1.5	1.5	69.0
İstanbul	İstanbul University Cardiology Institute	83	1.5	1.5	70.4
İstanbul	GATA Hayarpaşa	77	1.4	1.4	71.8
İstanbul	Istinye State Hospital	75	1.3	1.3	73.1
İzmir	Menemen State Hospital	74	1.3	1.3	74.4
Hatay	Mustafa Kemal Univercity Training and Research Hospital	65	1.1	1.1	75.5
Erzurum	Erzurum Training and Research Hospital	64	1.1	1.1	76.7
Kars	Kafkas University Faculty of Medicine	63	1.1	1.1	77.8
Aksaray	Aksaray State Hospital	62	1.1	1.1	78.9
Manisa	Manisa State Hospital	61	1.1	1.1	79.9
Tekirdağ	Tekirdağ State Hospital	60	1.1	1.1	81.0
Maraş	Necip Fazıl State Hospital	57	1.0	1.0	82.0
Antalya	Antalya Training and Research Hospital	55	1.0	1.0	82.9
Bayburt	Bayburt State Hospital	53	.9	.9	83.9
Tekirdağ	Namık Kemal University Faculty of Medicine	46	.8	.8	84.7
İzmir	Gazi Emir State Hospital	44	.8	.8	85.5
Ankara	Keçiören Training and research hospital	43	.8	.8	86.2
Siirt	Siirt State Hospital	43	.8	.8	87.0
İstanbul	Türkiye Hospital / Memorial Hospital	43	.8	.8	87.7
Ankara	Başkent University Faculty of Medicine	41	.7	.7	88.4
Ankara	GATA Ankara	41	.7	.7	89.2

Table 2. The list of participating centers and provinces of the ELDER-TURK study (cont.)

Province		Frequency	Percent	Valid percent	Cumulative percent
Muğla	Aksaz Military Hospital	40	.7	.7	89.9
Ankara	Ankara University Faculty of Medicine	40	.7	.7	90.6
Hatay	Antakya Defne Private Hospital	40	.7	.7	91.3
Afyon	Bolvadin State Hospital	40	.7	.7	92.0
Denizli	Denizli State Hospital	40	.7	.7	92.7
Denizli	Denizli Server Gazi State Hospital	40	.7	.7	93.4
İzmir	Kemalpaşa State Hospital	40	.7	.7	94.1
İzmir	Kent Hospital	40	.7	.7	94.8
İstanbul	Mehmet Akif Ersoy Training and Research Hospital	40	.7	.7	95.5
İzmir	Izmir Tepecik Training and Research Hospital	38	.7	.7	96.2
Konya	Selçuk University Faculty of Medicine	31	.5	.5	96.7
Manisa	Manisa Demirci State Hospital	24	.4	.4	97.1
Isparta	Isparta State Hospital	19	.3	.3	97.5
İstanbul	Surp Pirgiç Ermeni Training and Research Hospital	17	.3	.3	97.8
Ankara	Gazi University Faculty of Medicine	15	.3	.3	98.0
Samsun	Samsun Training and Research Hospital	15	.3	.3	98.3
Kırşehir	Ahi Evren Thorasic and Cardiovascular Training and Research Hospital	12	.2	.2	98.5
Gaziantep	Gaziantep University Faculty of Medicine	11	.2	.2	98.7
Tokat	Osmangazi University Faculty of Medicine	10	.2	.2	98.9
Sakarya	Sakarya Training and Research Hospital	9	.2	.2	99.0
Afyon	Afyon Kocatepe University Faculty of Medicine	8	.1	.1	99.2
Mersin	Mersin University Faculty of Medicine	8	.1	.1	99.3
Osmaniye	Osmaniye State Hospital	8	.1	.1	99.4
Edirne	Edirne State Hospital	7	.1	.1	99.6
Gaziantep	Gaziantep 25 Aralik State Hospital	7	.1	.1	99.7
İstanbul	Medipol University Faculty of Medicine	5	.1	.1	99.8
Ankara	Turgut Ozal University Faculty of Medicine	4	.1	.1	99.8
Sinop	Sinop State Hospital	3	.1	.1	99.9
Antalya	Antalya OFM Private Hospital	2	.0	.0	99.9
Kars	Kars State Hospital	2	.0	.0	100.0
Konya	Ereğli State Hospital	1	.0	.0	100.0
Isparta	Süleyman Demirel University Faculty of Medicine	1	.0	.0	100.0
	Total	5694	100.0	100.0	

ELDER-TURK: Epidemiology of Cardiovascular Disease in Elderly Turkish Population. Study.

years (Fig. 2). Cardiovascular diseases, risk factors, comorbidities, medications, and laboratory values were investigated and recorded. Comorbidities were categorized according to the international classification of diseases criteria defined by the World Health Organization.

Clinical and demographic characteristics of the patients, such as birth date, sex, weight, height, body mass index, blood pressure, and heart rate and rhythm were recorded. Cardiovascular disease risk factors as described in the Framingham heart study, such as hypertension, diabetes mellitus (DM), hyperlipidemia,

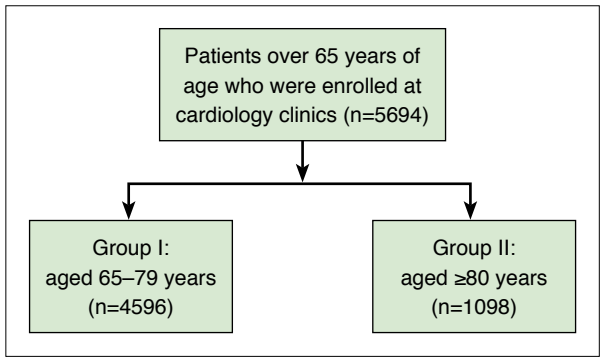

Figure 2. CONsolidated Standards of Reporting Trials 2010 Flow Diagram.

tobacco use, and physical activity level, as well as a history of cardiovascular disease, dysrhythmia, heart failure with preserved or reduced ejection fraction, peripheral artery disease, or valvular disease were also obtained. Comorbid conditions, including cerebrovascular accident; pulmonary, hepatic, renal, or thyroid diseases; musculoskeletal disorders; malignancies; or anemia were also noted. Data on the usage of relevant cardiovascular medication, such as a beta-blocker, an angiotensin-converting enzyme inhibitor, an angiotensin receptor blocker, a diuretic or over the counter medication were also examined and recorded. Details of annual cardiology clinic visits of the participants were obtained from the electronic medical records and self-reported history.

Patients were considered to have coronary artery disease in the presence of angina pectoris, previous myocardial infarction, history of myocardial revascularization, or accompanying electrocardiogram abnormalities, according to Minnesota codes.[6,7]

Patients were recorded as hypertensive if they were using antihypertensive medication or if they had high blood pressure of systolic >140 mm Hg or diastolic >90 mm Hg measured in the sitting position after a10-minute rest, on both arms, and which was repeated twice.[8] Blood pressure was measured both in the sitting and standing position to evaluate orthostatic hypotension. Participants were defined as diabetic if they were using an oral hypoglycemic agent or insulin, or if the fasting blood glucose was higher than 126 mg/dL.[9] Glomerular filtration rate (GFR) was calculated using the Modification of Diet in Renal Disease formula, including age, sex, race and serum creatine level. Chronic renal failure was defined as an estimated GFR <60 mL/minute for at least 3 months.[10] Smoking status was registered as a smoker if the patient was an active smoker or had quit smoking within the last year, or as a non-smoker.

Approval for the study was obtained from the local ethics committee and the principles of the Declaration of Helsinki were observed (as revised in Brasil, 2013).

Statistical analysis

All statistical analyses were performed using the SPSS program, version 16.0 (SPSS Inc., Chicago, IL, USA) for Windows XP. The data were summarized in tables. Whether or not the distribution of continuous variables was normal was determined using the Kolmogorov-Smirnov test. Continuous variables were presented as median (minimum-maximum) or mean±SD. Frequency data were presented as the number of cases and percentages (%). The mean differences between groups were compared using Student's t-test, whereas the Mann-Whitney U test was applied for comparisons of non-normally distributed data. Values of $p<0.05$ were considered to indicate statistical significance.

RESULTS

Clinical characteristics

Group I consisted of 4596 patients with a mean age of 71.1±4.31 years, and there were 1098 (19.3%) octogenarians (Group II) with a mean age of 83.5±3.12 years. Gender distribution was similar between the 2 groups (men represented 50.2% of Group I and 47.5% of Group II).

The baseline characteristics and laboratory values of both groups are given in Table 3. The prevalence of DM and CAD was higher among the Group I patients compared with the very-elderly patients (30% vs. 24.6%; $p<0.001$ and 50.2% vs. 44.7%; $p=0.001$ respectively). The hypertension prevalence was not statistically different between the groups. The prevalence of renal failure and atrial fibrillation (AF) was significantly higher in Group II compared with Group I patients (15.5% vs. 10.5%, and 35.9% vs 25.1%; $p<0.001$ for both). The resting heart rate of Group II was significantly higher than that seen in Group I.

Table 3. Comparison of demographic details and the prevalence of comorbid conditions and cardiovascular risk factors between the study groups

Parameter	Group I: 65–79 years old 4596 (81%)	Group II: ≥80 years old 1098 (19.3%)	*p*
Male, n (%)	2311 (50.2%)	522 (47.5%)	0.101*
Age (years), Mean±SD	71.15±4.31	83.5±3.12	<0.001*
Hypertension, n (%)	3372 (73.3%)	783 (71.3%)	0.165*
Diabetes mellitus, n (%)	1368 (30%)	271 (24.6%)	<0.001*
COPD, n (%)	471 (10.3%)	142 (12.9%)	0.003*
Coronary artery disease, n (%)	2175 (50.2%)	450 (44.7%)	0.001*
Renal Failure, n (%)	483 (10.5%)	169 (15.5%)	<0.001*
Atrial fibrillation, n (%)	1155 (25.1%)	394 (35.9%)	<0.001*
Smoking, n (%)	551 (9.8%)	93 (1.7%)	<0.001*
Systolic blood pressure (mm Hg)	130.7 (60–220)	129.6 (70–200)	0.328**
Diastolic blood pressure (mm Hg)	77.3 (34–130)	76.2 (34–130)	0.190**
Heart rate (beats/min)	76.3 (32–170)	78.1 (40–155)	0.005**
Fasting blood glucose (mg/dL)	118	112	0.003**
Total cholesteol (mg/dL)	190	187	0.06**
Triglyceride (mg/dL)	136	126	<0.001**
Low density lipoprotein (mg/dL)	116	110	0.06**
Serum creatin (mg/dL)	1.3	1.1	<0.001**
eGFR (ml/min)	70.5	60.2	<0.001**
Hemoglobin (g/dL)	13	12	<0.001**

*Student T test; **Mann-Whitney U test. COPD: Chronic obstructive pulmonary disease; eGFR: Estimated glomerular filtration rate.

In the laboratory values, the median level of the fasting blood glucose, triglyceride, serum creatine, estimated glomerular filtration rate, and hemoglobin were statistically significantly lower than in Group 1, as represented in Table 2 (all p<0.001).

Nearly 16% (917) of all elderly patients had heart failure with a reduced ejection fraction: 19.7% (n=217) of Group II and 15.2% (n=700) of Group I.

The most commonly prescribed cardiovascular drug among the very elderly patients was a diuretic (32.3%), followed by a beta-blocker (28.7%). Conversely, digoxin and ivabradine were the least commonly prescribed drugs. Angiotensin receptor blockers were a more frequently used drug (28.4%) than angiotensin-converting enzyme inhibitors (10.1%).

The rate of yearly visits to outpatient wards was significantly different in very elderly patients (p=0.004). The annual outpatient ward admission rate was significantly lower in very elderly patients (4.94±3 vs 4.85±2.8; p=0.004).

DISCUSSION

This research was a large cross-sectional study of a subgroup of the ELDER-TURK study: 1098 very elderly patients who were followed up at cardiology clinics. Significant epidemiological differences in the prevalence of cardiovascular disease, risk factors, and drug use among very elderly Turkish patients were observed when compared with elderly patients.

In 2014, the American Heart Association published a scientific statement addressing risk reduction and secondary preventive interventions for atherosclerotic cardiovascular disease in patients aged ≥75 years.[11] Secondary preventive interventions in older patients with atherosclerotic cardiovascular disease improve quality of life, reduce recurrent events, and improve survival.[12,13] The necessity for secondary prevention and risk reduction in very elderly patients mandates national epidemiological studies to understand the burden of cardiovascular disease in this special group.

Age-related physiological changes, such as endothelial inflammation, dysfunction, arterial stiffness, and fibrosis lead to increases in the incidence and prevalence of CAD with advanced age. However, very elderly patients often have a sedentary lifestyle and may not have exertional symptoms, which may contribute to unrecognized and clinically silent myocardial infarctions.[11,14] In our study group, the very elderly patients had a significantly lower prevalence of CAD than seen in Group I. This supports the tenuous diagnosis of myocardial infarction and CAD due to atypical or nonspecific symptoms in very elderly patients. Furthermore, memory problems and cognitive impairment in the very elderly can lead to difficulty in obtaining a reliable history, which may also be an aggravating factor for the lower prevalence of CAD in this age group. In 2016, updated American heart disease and stroke statistics indicated that 32.2% of men and 18.8% of women in the aged ≥80 years group had coronary heart disease.[15] In 2007–2008, Onat et al.[16] reported a prevalence of CAD of 29.5% in male adults and 26.2% in female adults aged ≥75 years in Turkey. In our trial, 44.7% of the very elderly had CAD.

Hypertension is the most frequent, modifiable cardiovascular disease risk factor of the very elderly. The PatenT (Prevalence, awareness, treatment and control of hypertension in Turkey) study reported that more than 70% of people over the age 80 years were hypertensive.[17] In the BELFRAIL study, the frequency of hypertension was reported to be 70.1% in a population aged ≥ 80 years in Belgium, which was similar to the rate observed in our study.[18] Ozkara et al.[19] reported in a cross-sectional survey in the Ankara district of Turkey that the prevalence of hypertension was nearly 80% of patients aged ≥80 years, which was higher than our finding. The 2016 updated European Society of Cardiology preventive guidelines recommend beginning treatment if the initial systolic blood pressure is >160 mm Hg and targeting a reduction to below 140–150 mm Hg, provided that the patient is in good physical and mental health.[20] Still, there is a gap in the treatment of the very elderly, thus, antihypertensive treatments should be initiated carefully and monitored closely in the frail elderly. In 2011, the American College of Cardiology Foundation/American Heart Association documented expert consensus and some studies, and reported that the very elderly with a diastolic blood pressure lower than 70–75 mm Hg have a greater incidence of cardiovascular events due to reductions in coronary blood flows and recommended avoiding a systolic blood pressure <130 mm Hg and a diastolic blood pressure <65 mm Hg.[20] The diastolic blood pressure of the very elderly in our study was close to the recommendations and expert consensus. However, the mean systolic blood pressure was lower than the recommendations, which indicates that there is the need for a less aggressive treatment in cardiology clinics, according to the 2011 expert consensus. Studies have shown that blood pressure progressively rises until late-middle age and progressively declines with advanced age.[21,22] In our study, the mean blood pressure was slightly lower than that seen in Group I, which is consistent with a progressive decline of blood pressure in the elderly.

The prevalence of DM increases with age, and glycemic control is crucial to reduce the occurrence of secondary cardiovascular events in the very elderly. Older individuals with diabetes have increased morbidity and mortality compared with those without diabetes.[23] In the TURDEP trial (Turkish diabetes epidemiology study), the prevalence of DM was reported to be 7.2% in the general population of Turkey, which was lower than our finding of 24.6%.[24] In our study group, we observed a lower prevalence of DM in the very elderly compared with Group I. A possible explanation for this observation could be the reduced likelihood of survival until the age of 80 years in patients with diabetes, and this could underestimate the prevalence of DM in the very elderly.

AF is the most common arrhythmia in patients aged over 65 years.[25] In the ATRIA study (The AnTicoagulation and Risk Factors In Atrial Fibrillation), the prevalence of AF was reported to be 9% in a population aged ≥ 80 years in the USA. It is estimated that in 2050, nearly 53% of patients with AF will be 80 years of age or older.[26] It is crucial to understand the burden of disease and define specific treatment strategies in the very elderly, as the prevalence of AF is gradually increasing with age. In our study, nearly one-third of the very elderly admitted to cardiology clinics had AF and this was markedly higher than in Group I.

Renal failure is one of the comorbidities that disproportionately affect the very elderly and increases cardiovascular disease risk.[27] In our study population, the kidney function of Group II was significantly worse than that observed in Group I. The high rate of renal failure in the very elderly makes them suscepti-

ble to drug side effects. Therefore, drugs that are eliminated from the kidneys should be used cautiously in the very elderly. Otherwise, any adverse effects to the drugs encountered could be more severe and life threatening. The most frequently reported adverse drug reactions were caused by cardiovascular agents, especially by furosemide.[28] However, the data for cardiovascular drug use among the very elderly are scarce. The studies are limited to patients aged below 80 years. So, clinical judgement becomes important to avoid side effects from over-medication. In our study, diuretics were used by nearly one-third of the very elderly and were the most commonly prescribed cardiovascular drugs (32.7%, n=359). Diuretics should be prescribed cautiously for very elderly patients in cardiology clinics given that they are the most frequent cause of adverse drug reactions. We observed no significant difference in the drug use between the very elderly and the elderly.

Drug adherence is also a problem for the very elderly, due to fewer referrals or a reduced admission frequency at cardiology clinics. In our study, the annual outpatient ward admission rate was significantly lower compared with Group I, which may also lead to lower adherence to drugs among the very elderly.

Our study has several strengths. We assembled a large population of very elderly patients who followed up at cardiology clinics. This is the first large study to examine cardiovascular disease and risk factors of the very elderly in Turkey. A broader range of the age-specific prevalence of cardiovascular disease and risk factors in the very elderly was demonstrated. Although these data require confirmation with new studies, they point out modifiable factors for the reduction of cardiovascular disease and risk factors exclusively in the very elderly population. Our study statistically represents 12 territorial units of Turkey, which is one of the strengths of the research. On the other hand, we included only the very elderly only who were followed up at cardiology clinics; the very elderly who are taken care of at home were not included, which means our study is not representative of the general very elderly population of Turkey.

Selection bias is also a limitation of our study. The very elderly who are followed up at outpatient wards tend to be less frail and have better functioning, which is thought to be a factor for selection bias and may underestimate the prevalence of cardiovascular disease and risk factors. In addition, some comorbidities lead to a reduced survival rate, most patients dying till the ages of 80s. This could contribute to an underdiagnosis of the prevalence of CAD and risk factors, such as DM. Natural selection of the cardiac diseases and comorbidities is one of the limitation factors of our study. Our results do not represent the general population of Turkey, and this could also have affected the result.

Conclusion

We emphasize that patients older than 80 years of age should be treated differently than patients aged 65-79. The cardiovascular diseases and risk factors were different in the 2 groups. Therefore, specific guidelines and treatment options are needed for this special group. Unfortunately, score risks are limited to the age range of 40–65 years, and there are no specific guidelines for the treatment of cardiovascular diseases in very elderly patients. The cardiovascular disease morbidities and mortalities are high among this special population and specific needs and gaps should be determined for disease prevention and control activities. There is also an obvious need to increase awareness and add programs for disease prevention and the control of risk factors.

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