Demographics of patients with heart failure who were over 80 years old and were admitted to the cardiology clinics in Turkey

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Abstract

Objective: Heart failure (HF) has a high prevalence and mortality rate in elderly patients; however, there are few studies that have focused on patients older than 80 years. The aim of this study is to describe and compare the age-specific demographics and clinical features of Turkish elderly patients with HF who were admitted to cardiology clinics.

Methods: The Epidemiology of Cardiovascular Disease in Elderly Turkish population (ELDER-TURK) study was conducted in 73 centers in Turkey, and it recruited a total of 5694 patients aged 65 years or older. In this study, the clinical profile of the patients who were aged 80 years or older and those between 65 and 79 years with HF were described and compared based on the ejection fraction (EF)-related classification: HFrEF and HFpEF (is considered as EF: ≥50%).

Results: A total of 1098 patients (male, 47.5%; mean age, 83.5±3.1 years) aged ≥80 years and 4596 patients (male, 50.2 %; mean age, 71.1±4.31 years) aged 65-79 years were enrolled in this study. The prevalence of HF was 39.8% for patients who were ≥80 years and 27.1% for patients 65–79 years old. For patients aged ≥80 years with HF, the prevalence rate was 67% for hypertension (HT), 25.6% for diabetes mellitus (DM), 54.3% for coronary artery disease (CAD), and 42.3% for atrial fibrilation. Female proportion was lower in the HFrEF group (p=0.019). The prevalence of HT and DM was higher in the HFpEF group (p<0.01), whereas CAD had a higher prevalence in the HFrEF group (p=0.02). Among patients aged 65–79 years, 43.9% (548) had HFpEF, and 56.1% (700) had HFrEF. In this group of patients aged 65-79 years with HFrEF, the prevalence of DM was significantly higher than in patients aged ≥80 years with HFrEF (p<0.01).

Conclusion: HF is common in elderly Turkish population, and its frequency increases significantly with age. Females, diabetics, and hypertensives are more likely to have HFpEF, whereas CAD patients are more likely to have HFrEF. *(Anatol J Cardiol 2019; 21: 196-205)*

Keywords: epidemiology, heart failure, elder patients

Introduction

Heart failure (HF) is a leading cause of cardiovascular mortality and morbidity, and it is associated with high costs that are burdening health care systems (1). Approximately 6.5 million adults suffer from HF in the United States (2). According to data from the Heart Failure Prevalence and Predictors in Turkey (HAPPY) study, the estimated prevalence of HF is 2.9% in Turkey, which means that 2.000.424 Turkish adults have HF (3). This huge population needs age-specific prudent care to decrease the burden of the disease in Turkey.

The incidence and prevalence of HF gradually increase with advanced age. The number of elderly patients is also increasing in our population. Nearly 8.6% of total population is aged ≥85 years in Turkey (4). Furthermore, as the population gets older, the prevalence of HF continues to increase (5). This is due to progressive aging of the population, as well as the improvements in the HF survival over the years. In addition to its high prevalence, the disease also has a poor prognosis and high mortality rate in elderly patients. The 5-year mortality rate for 80-year-olds with HF is as high as 54.4% (2). Although HF has a markedly high mortality rate and prevalence in the elderly, few studies have focused on patients with HF who are older than 80 years. In large

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clinical trials, this growing population is underrepresented or excluded. However, patients aged ≥80 years show a different clinical profile when compared with younger patients. Patients aged ≥80 years with HF have a complex comorbidity and a high number of cardiovascular risk factors, which have a significant impact on the prognosis of the disease (6). Moreover, the effective treatment of chronic cardiovascular disorders, such as coronary artery disease (CAD), hypertension (HT), and diabetes mellitus (DM), may prevent the progression of HF.

Traditionally, HF has been defined as failure of the contractile function of the left ventricle. However, it is recognized that the HF symptoms can occur in the presence of normal or near-normal EF, which is defined as HF with preserved ejection fraction (HFpEF). HFpEF and HFrEF have different clinical characteristics and prognostic factors. Patients with HFpEF are more often female and are more likely to have HT but less likely to have CAD. A recent meta-analysis suggests that patients with HFpEF may have a lower mortality rate than those with HFrEF (7). Altough all these differences are well known to affect the prognosis and the clinical outcome of elderly patients with HF, there is not much evidence, especially considering those issues related to specific characteristics of the elderly with HFrEF and HFpEF. Further studies are required to determine specific clinical characteristics of patients aged ≥80 years with HFrEF and HFpEF to produce a contemporary management strategy. The objective of this study is to determine clinical characteristics and major comorbidities of Turkish patients aged ≥80 years with HFrEF and HFpEF, and to compare them with patients aged 65-79 years.

Methods

Study design

In this study, we used data of 5694 patients aged ≥65 years who were recruited from the ELDER–TURK study, which was conducted in 73 volunteering hospital cardiology clinics participating in 12 EUROSTAT NUTS1 regions of Turkey (Fig. 1, Table 1). The design and details of this study have been reported before (8-10).

In this population-based study, patients aged ≥65 years who were admitted to outpatient cardiology clinics and inpatient wards of state, university, private, and training and research hospitals between March 2015 and December 2015 were included after signing the informed consent for data sharing. In this study, elderly patients from the ELDER–TURK population with known HF (n=1681, 29.5%) were evaluated. As there is no specific classification cutoffs for elderly patients, in this study, participants aged ≥80 years were defined as being of an advanced age. The participants with HF were divided into two groups patients aged 65-79 years (n=1248) and patients aged ≥80 years (n=433). Cardiovascular diseases, risk factors, comorbidities, demographic characteristics, and the laboratory findings were analyzed and compared.

The study was approved by the Local Ethics Committee and was conducted according to the principles of the Declaration of Helsinki (as revised in Brasil, 2013).

The diagnosis of HF was established if the following HF symptoms were found: dyspnea, paroxysmal nocturnal dyspnea, and signs of pulmonary and/or peripheral congestion (11). Left ventricular (LV) function was determined by two-dimensional transthorasic echocardiography, which was performed by a physician in all subjects participating in the study. Patients with HF signs and symptoms and a normal or mildly reduced LV systolic function (LVEF >50%) with relevant structural heart disease (left atrial enlargement, LV hypertrophy) and/or diastolic dysfunction were classified as having HFpEF. Patients with HF symptoms and a reduced LV systolic function (LVEF ≤50%) were classified as having HFrEF (12).

Cardiovascular diseases, risk factors, and comorbidities were recorded according to the self-reported history or hospital medical records.

The diagnosis of HF was established by the local investigators by combining information about history, clinical data, medications, and echocardiography. To be eligible for inclusion in the studies, patients were required to have a history of shortness of breath on minimal exertion or at rest [New York Heart Association (NYHA) Class III or IV], within the last month and had to be in NYHA Class II–IV at the time of randomization. Patients were also required to have been treated with a diuretic. The diagnosis of HF was established by the local investigators by combining information about history, clinical data, medications, and echocardiography. To be eligible for inclusion in the studies, patients were required to have a history of shortness of breath on minimal exertion or at rest (NYHA Class III or IV), within the last month and had to be in NYHA Class II–IV at the time of randomization. Patients were also required to have been treated with a diuretic.

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Figure 1. Twelve NUTS regions of Turkey

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Table 1. List of participating centers and NUTS1 regions

			Percentage (%) of total patient population	Percentage (%) of total Turkish population
1) İstanbul	Pendik State Hospital	398		
	Şişli Etfal Training and Research Hospital	231		
	Kartal KoşuyoluYüksek İhtisas 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 İhtisas 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 Özal 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) Eagean Region	Ege University Faculty of Medicine	366		
	Muğla Sıtkı Koçman University Faculty of Medicine	142		
	Muğla Yücelen 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		

Table 1. Cont.

			Percentage (%) of total patient population	Percentage (%) of total Turkish population
	İzmir Tepecik Training and Research Hospital	38		
	Manisa Demirci State Hospital	24		
	İzmir Military Hospital	120		
	Afyon State Hospital	114		
	Bolvadin State Hospital	40		
	Afyon Kocatepe University Faculty of Medicine	8		
Total		1358	23.84	17.63
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		

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Table 1. Cont.

			Percentage (%) of total patient population	Percentage (%) of total Turkish population
	Gaziantep 25 Aralık 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

The diagnosis of HF was established by the local investigators by combining information about history, clinical data, medications, and echocardiography. To be eligible for inclusion in the studies, patients were required to have a history of shortness of breath on minimal exertion or at rest (NYHA Class III or IV), within the last month and had to be in NYHA Class II–IV at the time of randomization. Patients were also required to have been treated with a diuretic.

Patients were defined as hypertensive if they were using antihypertensive medications or if they had high blood pressure on examination (systolic >140 mm Hg or diastolic >90 mm Hg) (13). Patients who were newly diagnosed as diabetic or who were already using an oral hypoglycemic agent or insulin were reported as diabetic. The glomerular filtration rate (GFR) was calculated using the Modification of Diet in Renal Disease formula. Chronic renal failure (CRF) was defined as an estimated GFR <60 mL/min for at least 3 months (14). Smoking status was recorded as positive if the patients were an active smoker. Patients were considered as having CAD in the presence of previous myocardial infarction, stable or unstable CAD, a history of myocardial revascularization, and coronary artery by-pass graft operation (15).

Statistical analysis

All statistical analyses were performed using the SPSS program, version 21 (Chicago, IL, USA) for Windows XP. Data summary was planned to be shared by tables. Continuous variables were expressed as the mean±standard deviation. The chi-square test was used for categorical variables and was expressed as the number of cases and percentages (%). Mean differences between groups were compared by Student's t-test, whereas the Mann–Whitney U test was applied for comparisons of the not normally distributed data. Values for $p<0.05$ were considered to indicate statistical significance.

Results

Among 1089 patients aged ≥80 years (male, 47.5%; mean age, 83.5±3.1 years), 39.8% (433) had HF. The prevalence of CAD and peripheral artery disease (PAD), DM, and atrial fibrilation (AF) were higher in patients aged ≥80 years with HF when compared to those without HF (54.3% vs. 32.3%, 45.5% vs. 14.3%, 25.6% vs. 23%, 42.3% vs. 31.7%, respectively, all $p<0.01$) whereas the prevalence of HT was higher in patients aged ≥80 years without HF (74.2% vs. 67%, $p<0.01$). Approximately 9.9% of those patients with HF were smoking (Table 2). The prevalence of comorbidities in very elderly with HF were 25.4% for chronic obstructive pulmonary disease (COPD), 26.8% for anemia, and 19.9% for CRF. There was no age or gender difference between those with HF and without HF. The mean heart rate was significantly higher in patients with HF (76.4±14.3 vs. 80.5±18.5 $p<0.01$). Laboratory values and demographic characteristics are given in Table 2. Nearly half of those patients with HF had HFrEF (50.1%, 217), and 49.9% (216) had HFpEF. The proportion of females was significantly higher in those with HFpEF (55.1%, 119) ($p=0.019$). The mean age was similar between the groups (83.8±3.2 vs. 83.7±3.3, $p=0.457$). When compared with patients aged ≥80 years with HFrEF, the prevalence of HT and DM were higher in those with HFpEF (75.9% vs. 58.1%, 29.2% vs. 22.1%, respectively, all $p<0.01$). Whereas, the prevalence of CAD was significantly higher in patients aged ≥80 years with HFrEF (62.7% vs. 45.8%, $p=0.02$) (Table 3).

Among 4596 of patients aged 65-79 years (male, 50.2%; mean age, 71.1±4.31 years), 27.1% (1248) had HF. In those patients, the prevalence of HFrEF and HFpEF were 56.1% (700) and 43.9% (548), respectively. In the HFrEF group, DM had a higher frequency in patients aged 65–79 years when compared with patients aged ≥80 years (5.3% vs. 24.1%, $p<0.01$). Tables 3 and 4 represent

Table 2. Comparison of demographics and prevalence of comorbid conditions and cardiovascular risk factors between the patients aged ≥80 years, with and without HF

Parameter	HF (–) (n=656)	HF (+) (n=433)	*P* value
Female	357 (54.4%)	214 (49.4%)	0.106
Male	299 (45.6%)	219(50.6%)	0.120
Smoking	49 (13.4%)	43 (9.9%)	0.149
HT	487 (74.2%)	290 (67%)	0.009
DM	157 (23%)	111 (25.6%)	<0.001
CAD	212 (32.3%)	235 (54.3%)	<0.001
PAD	94 (14.3%)	197 (45.5%)	<0.001
COPD	116 (17.7%)	110 (25.4%)	0.581
AF	208 (31.7%)	183 (42.3%)	0.003
Pacemaker	21 (3.2%)	30 (6.9%)	0.005
CRF	83 (12.6%)	86 (19.7%)	0.457
Anemia	123 (18.7%)	116 (26.8%)	0.001
Age	83.4±3.0	83.7±3.3	0.111
Heart rate (betas/min)	76.4±14.3	80.5±18.5	<0.001
SBP (mm Hg)	131.1±17.0	127.4±18.5	0.043
DBP (mm Hg)	76.7±10.8	75.5±12.1	0.097
Hb (g/dL)	12.4±1.7	12.0±1.8	0.340
TC (mg/dL)	193 (164-220)	180 (148-207)	0.174
LDL (mg/dL)	118 (93-142)	106 (84-135)	0.245
Kreatinin (mg/dL)	0.9 (0.8-1.1)	1 (0.8-1.3)	0.001
eGFR (mL/min)	70 (55.4-83.4)	63.6 (48.7-79.5)	0.245

AF - atrial fibrilation; CAD - coronary artery disease; COPD - chronic obstructive pulmonary disease; CRF - chronic renal failure; DBP - diastolic blood pressure; DM - diabetes mellitus; eGFR - estimated glomerular filtration rate; Hb - hemoglobin; HF - heart failure; HT - hypertension; LDL - low-density lipoprotein; PAD - peripheral artery disease; SBP - systolic blood pressure; TC - total cholesterol

Table 3. Demographics of patients aged ≥80 years, with HFrEF and HFpEF

Parameter	HFrEF (n=217)	HFpEF (n=216)	*P* value
Female	95 (43.8%)	119 (55.1%)	0.019
Male	122 (56.2%)	97 (44.9%)	0.024
Smoking	27 (12.4%)	16 (7.4%)	0.078
HT	126 (58.1%)	164 (75.9%)	<0.001
DM	48 (22.1%)	63 (29.2%)	0.003
CAD	136 (62.7%)	99 (45.8%)	0.002
PAD	96 (44.2%)	101 (46.8%)	0.350
COPD	52 (24%)	58 (26.8%)	0.247
AF	88 (40.5%)	95 (44%)	0.356
Pacemaker	21 (9.7%)	9 (4.2%)	0.025
CRF	48 (22.1%)	38 (17.6%)	0.350
Anemia	57 (26.3%)	59 (27.3%)	0.254
Age	83.8±3.2	83.7±3.3	0.457

AF - atrial fibrilation; CAD - coronary artery disease; COPD - chronic obstructive pulmonary disease; CRF - chronic renal failure; DM - diabtes mellitus; HFrEF - HF with reduced ejection fraction; HFpEF - HF with preserved ejection fraction; HT - hypertension; LDL - low-density lipoprotein; PAD - peripheral artery disease

comparison based on EF-related classification between patients with HF aged ≥80 years and patients with HF aged 65–79 years.

Discussion

In this multi-centered, epidemiologic study, a large number of elderly patients with HF who were admitted to cardiology clinics were recruited. Significant epidemiologic data on cardiovascular disease and risk factors among Turkish elderly patients with HF were obtained. We observed significant differences between patients with HF aged 65–79 years and ≥80 years.

The age-specific prevalence of HF among patients aged 75–84 years was 22% in the CARLA study (German), 13% in the ROTTERDAM study (The Netherlands), and 8.4% in the Olmsted county study (USA) (5, 16, 17). In patients aged ≥80 years, the prevalence of HF is 14.1% for males and 13.4% for females in the United States (2). In southwestern Europe, the prevalence of HF for patients aged ≥80 years is 16.14% (18). In those community-based epidemiological surveys, the prevalence of HF for the elderly population was lower than our finding in cardiology clinics in Turkey.

The prevalence of HFrEF progressively increases with advanced age and grows by 12%–14% in the population aged ≥80 years (19). We observed that nearly half of the very elderly patients with HF had HFrEF in cardiology clinics, which was similar to the other large studies, such as the Framingham and Olmsted county study. In accordance with those large studies, among very elderly patients with HF, CAD was the most contributing factor to HF and was followed by HT (5, 20, 21). CAD is also a strong predictor of all-cause mortality in the elderly (20, 21). In our study, CAD had a higher prevalence in patients aged ≥80 years with HF compared to those without HF.

In the TAKTIK study, the prevalence of CAD for patients hospitalized for acute HF in Turkey was 61% (22). However, our finding was close to results of the EFHS II study (23). In the EFHS II study, the prevalence of CAD in patients aged ≥80 years with HF was 51%, which is similar to our result. This observed difference between the studies might be due to the age distribution of study populations. The prevalence of cardiovascular comorbidities depends on age, but the relationship is not linear. All cardiovascular comorbidities gradually increase until the age of 80 years and then decrease (24, 25). In the EHFS II study, the mean age was similar to the one in our study; however, the mean age was lower in the TAKTIK study (62±13). As a consequence, the prevalence of CAD seems to be higher in the TAKTIK study. Nevertheless, the ELDER–TURK study includes both outpatient cardiology clinics and inpatient wards, which might have an impact on these reported different results.

As CAD is a predominantly caused by HF and has a higher prevalence in very elderly with HF, prevention of the onset of CAD is the key to reducing the burden of HF in cardiology clinics in Turkey. In our study, most of cardiovascular disease risk factors and comorbidities such as CAD, DM, PAD, AF, and anemia were higher in very elderly patients with HF, as shown in Table 3.

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Table 4. Comparison of clinical characteristics of very elderly and the youngers with HFpEF and HFrEF

Parameter	Group I: 65-79 years with HFpEF 548 (43.9%)	Group II: ≥80 years with HFpEF 216 (49.9%)	*P* value	Group I: 65-79 years with HFrEF 700 (56.1%)	Group II: ≥80 years with HFrEF 217 (50.1%)	*P* value
HT (%)	426 (77.7%)	164 (75.9%)	0.591	455 (65%)	126 (58.1%)	0.064
DM (%)	180 (32.8%)	63 (29.2%)	0.321	220 (31.4%)	48 (22.1%)	0.009
CAD (%)	296 (54%)	99 (45.8%)	0.731	493 (70.4%)	136 (62.7%)	0.088
CRF (%)	75 (13.7%)	38 (17.6%)	0.156	155 (22.1%)	48 (22.1%)	0.979
COPD (%)	89 (16.2%)	35 (16.2%)	0.260	117 (16.7%)	36 (16.6%)	0.653
AF (%)	204 (37.2%)	95 (44%)	0.469	282 (40.3%)	88 (40.5%)	0.607

AF - atrial fibrilation; CAD - coronary artery disease; COPD - chronic obstructive pulmonary disease; CRF - chronic renal failure; DM - diabtes mellitus; HFrEF - HF with reduced ejection fraction; HFpEF - HF with preserved ejection fraction; HT - hypertension

In contrast to EHFS II, the prevalence of HT in patients aged ≥80 years with HF was not statistically different than the patients aged 65–79 years with HF. In our study, the mean systolic blood pressure (SBP) was lower in very elderly patients with HF compared to those without HF, which means very elderly patients with HF were more hypotensive. This means those patients should be monitored more closely in cardiology clinics, and aggressive antihypersensive treatment should be avoided in those patients.

In very elderly with HFpEF, the proportion of females was higher, which was similar to large studies such as MAGGIC, HAPPY, PREFER, and CHARM (3, 7, 26, 27). In the CARLA study, single strongest determinant for HFpEF was HT, and this result was similar to our study; HT had a higher prevalence in very elderly patients with HFpEF compared to those with HFrEF. On the other hand, in accordance with the OPTIMIZE-HF, registry the frequency of DM was higher in patients with HFpEF compared to those with HFrEF (26). Very elder patients with HFpEF were found to be older than patients with HFrEF in some studies that do not consider patients aged ≥80 years. However, in our study, there was no age difference between very elderly patients with HFrEF and HFpEF (28, 29). The prevalence of DM in patients aged ≥80 years with HFrEF was lower than in patients aged 65–79 years with HFrEF. This result was consistent with the EHFS I and II studies. This may be related to reduced likelihood of surviving in older patients with DM compared to those without DM.

One of the predictors of all-cause mortality in patients aged ≥70 years with HF is PAD (21). In this study, PAD was significantly higher in very elderly with HF compared to those without HF.

AF has a great prognostic importance with regard to long-term mortality in very elderly with HF (30). In our study, the prevalence of AF was lower in very elderly with HF compared to those without HF. This may be a satisfactory result for a better long-term survival in very elderly with HF in Turkey. In the EFHS II study, the prevalence of AF was 48% in patients aged ≥80 years with HF, and this was also close to our result (23).

Smoking status should also be questioned and identified in cardiology clinics. The prevalence of smoking for very elderly with HF was as high as for those without HF in our study. The cardiologist should be focused more on smoking-cessation efforts for primary care in those patients. Smokers need to be identified and offered pharmacological or behavioral smoking-cessation support. Moreover, guidelines should focus on smoking cessation for very elderly with HF.

In our study, the prevalence of COPD in very elderly with HF was higher than in the EHFS II study (23), whereas the prevalence of renal failure was similar with the HAPPY cohort (25). Renal failure is a strong predictor of both in-hospital mortality and follow-up mortality (31). In our study, the mean creatinine value was significantly higher in very elderly with HF, which may be associated with poor outcome.

Study limitations

This study included only patients who were admitted to outpatient cardiology clinics and inpatient wards. Hence, the prevalence of HF is higher than in the population-based studies. This is thought to be the cause of selection bias and is one of the study limitations.

Very elderly who were followed up at outpatient wards were less frail and were functioning better, and we believe that this led to underestimated prevalence of cardiovascular disease and risk factors. In addition, some comorbidities lead to a reduced survival rate. This could also have caused underestimated prevalence of CAD and risk factors, such as DM.

Conclusion

In this study, we provide a national database about the prevalence of cardiovascular diseases, risk factors, and comorbidities of a large population of Turkish elderly patients with HF and compare it with other large studies. Despite the high prevalence of comorbidities and risk factors, there is no evidence-based therapy for the treatment of very elderly with HF. Consequently, there is a need to develop more effective and targeted management strategies for this population.

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References

1. Aras D, Aydoğdu S, Bozkurt E, Cavuşoğlu Y, Eren M, Erol Ç, et al. Cost of heart failure management in Turkey: results of a Delphi Panel. Anatol J Cardiol 2016; 16: 554-62. [CrossRef]
2. Benjamin EJ, Virani SS, Callaway CW, Chamberlain AM, Chang AR, Cheng S, et al.; American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics-2018 Update: A Report From the American Heart Association. Circulation 2018; 137: e67-e492. [CrossRef]
3. Değertekin M, Erol Ç, Ergene O, Tokgözoğlu L, Aksoy M, Erol MK, et al. Heart failure prevalence and predictors in Turkey: HAPPY study. Turk Kardiyol Dern Ars 2012; 40: 298-308. [CrossRef]
4. TUIK-National Statistics Department of Turkey-National Health Report of 2017. Turkey in Statistics 2017, publication number: 27595 [cited March 15 2018]. Available at: http://www.turkstat.gov.tr.
5. Senni M, Tribouilloy CM, Rodeheffer RJ, Jacobsen SJ, Evans JM, Bailey KR, et al. Congestive heart failure in the community: a study of all incident cases in Olmsted County, Minnesota, in 1991. Circulation 1998; 98: 2282-9. [CrossRef]
6. Díez-Villanueva P, Alfonso F. Heart failure in the elderly. J Geriatr Cardiol 2016; 13: 115-7.
7. Meta-analysis Global Group in Chronic Heart Failure (MAGGIC). The survival of patients with heart failure with preserved or reduced left ventricular ejection fraction: an individual patient data meta-analysis. Eur Heart J 2012; 33: 1750-7. [CrossRef]
8. Zoghi M, Özyüncü N, Özal E, Çakmak HA, Yayla Ç, İçli A, et al. Frequency of Cardiovascular Diseases and Drug Use in Turkish Elderly Population Followed Up at Cardiology Clinics: The Elderturk Study. Turkish Journal of Geriatrics 2017; 20: 73-81.
9. Gök G, Sinan ÜY, Özyüncü N, Zoghi M; ELDER-TÜRK Investigators. 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. Turk Kardiyol Dern Ars 2018; 46: 283-95. [CrossRef]
10. Kilic S, Sümerkan MÇ, Emren V, Bekar L, Çersit S, Tunç E, et al. Secondary prevention of coronary heart disease in elderly population of Turkey: A subgroup analysis of ELDERTURK study. Cardiol J. 2017 Oct 5. [Epub ahead of print]
11. Nieminen MS, Böhm M, Cowie MR, Drexler H, Filippatos GS, Jondeau G, et al.; ESC Committe for Practice Guideline (CPG). Executive summary of the guidelines on the diagnosis and treatment of acute heart failure: the task force on acute heart failure of the European Society of Cardiology. Eur Heart J 2005; 26: 384-416. [CrossRef]
12. Writing Committee Members, Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, et al.; American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. Circulation 2013; 128: e240-327.
13. Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Böhm M, et al. 2013 ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). Eur Heart J 2013; 34: 2159-219. [CrossRef]
14. Hogg RJ, Furth S, Lemley KV, Portman R, Schwartz GJ, Coresh J, et al. National Kidney Foundation's Kidney Disease Outcomes Quality Initiative clinical practice guidelines for chronic kidney disease in children and adolescents: evaluation, classification, and stratification. Pediatrics 2003; 111: 1416-21. [CrossRef]
15. Rose GA, Blackburn H, Gillum RF, Prineas RJ, Cardiovascular Survey Methods, 2nd edn. Geneva, WHO; 1982: p.124-7.
16. Tiller D, Russ M, Greiser KH, Nuding S, Ebelt H, Kluttig A, et al. Prevalence of symptomatic heart failure with reduced and with normal ejection fraction in an elderly general population-the CARLA study. PLoS One 2013; 8: e59225. [CrossRef]
17. Bleumink GS, Knetsch AM, Sturkenboom MC, Straus SM, Hofman A, Deckers JW, et al. Quantifying the heart failure epidemic: prevalence, incidence rate, lifetime risk and prognosis of heart failure The Rotterdam Study. Eur Heart J 2004; 25: 1614-9. [CrossRef]
18. Ceia F, Fonseca C, Mota T, Morais H, Matias F, de Sousa A, et al.; EPICA Investigators. Prevalence of chronic heart failure in Southwestern Europe: the EPICA study. Eur J Heart Fail 2002; 4: 531-9.
19. Van Riet EE, Hoes AW, Wagenaar KP, Limburg A, Landman MA, Rutten FH. Epidemiology of heart failure: the prevalence of heart failure and ventricular dysfunction in older adults over time. A systematic review. Eur J Heart Fail 2016; 18: 242-52. [CrossRef]
20. Ho KK, Pinsky JL, Kannel WB, Levy D. The epidemiology of heart failure: the Framingham Study. J Am Coll Cardiol 1993; 22 (4 Suppl A): 6A-13A. [CrossRef]
21. Manzano L, Babalis D, Roughton M, Shibata M, Anker SD, Ghio S, et al.; SENIORS Investigators. Predictors of clinical outcomes in elderly patients with heart failure. Eur J Heart Fail 2011; 13: 528-36.
22. Eren M, Zoghi M, Tuncer M, Çavuşoğlu Y, Demirbağ R, Şahin M, et al.; TAKTIK Investigators. Turkish registry for diagnosis and treatment of acute heart failure: TAKTIK study. Turk Kardiyol Dern Ars 2016; 44: 637-46. [CrossRef]
23. Komajda M, Hanon O, Hochadel M, Lopez-Sendon JL, Follath F, Ponikowski P, et al. Contemporary management of octogenarians

hospitalized for heart failure in Europe: EuroHeart Failure Survey II. Eur Heart J 2009; 30: 478-86. [CrossRef]
24. Lazzarini V, Mentz RJ, Fiuzat M, Metra M, O'Connor CM. Heart failure in elderly patients: distinctive features and unresolved issues. Eur J Heart Fail 2013; 15: 717-23. [CrossRef]
25. Mogensen UM, Ersbøll M, Andersen M, Andersson C, Hassager C, Torp-Pedersen C, et al. Clinical characteristics and major comorbidities in heart failure patients more than 85 years of age compared with younger age groups. Eur J Heart Fail 2011; 13: 1216-23.
26. Fonarow GC, Stough WG, Abraham WT, Albert NM, Gheorghiade M, Greenberg BH, et al.; OPTIMIZE-HF Investigators and Hospitals. Characteristics, treatments, and outcomes of patients with preserved systolic function hospitalized for heart failure: a report from the OPTIMIZE-HF Registry. J Am Coll Cardiol 2007; 50: 768-77. [CrossRef]
27. Swedberg K, Pfeffer M, Granger C, Held P, McMurray J, Ohlin G, et al. Candesartan in heart failure--assessment of reduction in mortality and morbidity (CHARM): rationale and design. Charm-Programme Investigators. J Card Fail 1999; 5: 276-82. [CrossRef]
28. Owan TE, Hodge DO, Herges RM, Jacobsen SJ, Roger VL, Redfield MM. Trends in prevalence and outcome of heart failure with preserved ejection fraction. N Engl J Med 2006; 355: 251-9. [CrossRef]
29. Bhatia RS, Tu JV, Lee DS, Austin PC, Fang J, Haouzi A, et al. Outcome of heart failure with preserved ejection fraction in a population-based study. N Engl J Med 2006; 355: 260-9. [CrossRef]
30. Kepez A, Mutlu B, Degertekin M, Erol C. Association between left ventricular dysfunction, anemia, and chronic renal failure. Analysis of the Heart Failure Prevalence and Predictors in Turkey (HAPPY) cohort. Herz 2015; 40: 616-23. [CrossRef]
31. Smith GL, Lichtman JH, Bracken MB, Shlipak MG, Phillips CO, DiCapua P, et al. Renal impairment and outcomes in heart failure: systematic review and meta-analysis. J Am Coll Cardiol 2006; 47: 1987-96. [CrossRef]