

Clinical characteristics and management of hospitalized and ambulatory patients with heart failure—results from ESC heart failure long-term registry—Egyptian cohort

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Abstract

Aims Our aim is to describe the clinical characteristics and management of patients hospitalized with acute heart failure (HHF) and ambulatory patients with chronic heart failure (CHF) in Egypt and compare them with heart failure (HF) patients from other countries in the European Society of Cardiology-Heart Failure (ESC-HF) registry.

Methods and results The ESC-HF Long-term Registry is a prospective, multi-centre, observational study of patients presenting to cardiology centres in member countries of the ESC. From April 2011 to February 2014, a total of 2145 patients with HF were recruited from 20 centres all over Egypt. Of these patients, 1475 (68.8%) were hospitalized with HHF, while 670 (31.2%) had CHF. Less than one-third (32.1%) of all patients were females. HHF patients {median age of 61 years [interquartile range (IQR), 53–69]} were older than CHF patients [median age of 57 years (IQR, 46–64)]; $P < 0.0001$. They had more diabetes mellitus (45.4% vs. 31.8%; $P < 0.0001$). Left ventricular ejection fraction $> 45\%$ was present in 22% of HHF vs. 25.6% of CHF ($P = 0.17$). Atrial fibrillation existed in about a quarter of all patients (24.5%). Ischaemic heart disease was the main cause of HF in Egyptian patients. All-cause in-hospital mortality was 5%. Egyptian patients presented at a much earlier age than in other regions in the registry. They had more diabetes mellitus. Atrial fibrillation prevalence was remarkably lower. Other co-morbidities (renal dysfunction, stroke, and peripheral arterial disease) occurred less frequently.

Conclusion Patients in the Egyptian cohort exhibited distinct features from HF patients in other countries in the ESC-HF Long-term Registry.

Keywords Egypt; Heart failure; Registry; Demographic features; Co-morbidities

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Introduction

Heart failure (HF) is a major and growing public health problem worldwide given the ageing of the population and the success in prolonging the survival of those with coronary events.¹ Heart failure has become the leading cause of hospitalization in persons older than 65 years of age. Reported death rates appear excessive both during and after hospitalization, and high re-admission rates reveal the failure of admission to result in effective long-term care.²

Most of large registries and surveys have been performed in North America and Europe, and limited data are available for Middle East countries that have different ethnic and cultural backgrounds. Apart from a small number of single-centre studies,^{3,4} there are limited descriptive data about HF patients in Egypt. Data on the clinical characteristics of patients, physician practice, and treatment patterns as well as the impact of management on outcomes during admission for HF remain incomplete and inconsistent. Lack of representative data and the bleak picture of morbidity and mortality associated with admission for HF underscore the need for a national representative registry database.

Methods

Study design

The European Society of Cardiology-Heart Failure (ESC-HF) Long-term Registry is a prospective, multi-centre, observational study of patients presenting to 211 cardiology centres of 21 European and Mediterranean countries which are members of the ESC. The ESC-HF Long-term Registry study design has been described in detail in a recent publication in the *European Journal of Heart Failure*.⁵ Egypt, as a member country of the ESC willingly participated in this registry as there is no available national database concerning this serious disease. Twenty centres, representing diverse geographic regions of Egypt (Mediterranean coast, Nile delta, Cairo, Upper Egypt and Suez Canal region), voluntarily participated in this registry. Site selection was aimed to target a sample of hospitals of different levels of complexity from which patients were recruited, focusing on capturing a broad spectrum of cardiology and HF specialty units regularly following outpatients with HF and admitting patients with acute, pre-existing, or new onset HF in order to build-up a network of centres representative of Egyptian reality. Nine participating centres were university hospitals. Seven centres had neither catheterization laboratories nor cardiac surgery facilities. Outpatients' visits were performed according to the usual practice of the participating centres.

The aim of this registry was to describe the demographic and clinical characteristics of outpatients with chronic HF

(CHF) seen in the clinics and inpatients admitted with acute HF (HHF) who were being taken care of by the participating centres. Specific attention was focused on clinically relevant co-morbidities, which frequently were associated with HF and impact patient outcomes. We aimed to describe the diagnostic and therapeutic approaches undertaken in the routine practice of physicians in following outpatients with CHF or during the hospital phase for HHF and to assess the in-hospital outcomes of patients with HF. We also performed a comparative descriptive analysis of HF patients recruited from Egypt and those HF patients enrolled from other countries participating in the same registry. The aim of such analysis was to look for differences in demographic and clinical characteristics between the Egyptian HF cohort and other populations in this registry. The EURObservational Research Programme (EORP) department at the European Heart House co-ordinated the project operationally, provided support to the participating centres, and guarded the methodological aspects of the survey. Moreover, study sites were monitored on a random basis by an audit, named by the Executive Committee, who checked compliance with the protocol and reviewed consecutiveness and quality of data. The database was set up at the European Heart House according to the requirements defined by the appointed Executive Committee, with the support of the EORP department.

Patient population

This included all outpatients with HF seen at the clinics and those admitted for acute, pre-existing, or new onset HF in participating centres during the enrolment period. To facilitate consecutive enrolment, patients were enrolled in the registry on a 1-day-per-week basis and followed up for at least once a year. In the latter phase of the ESC-HF Long-term Registry (autumn 2013), the 1-day-per-week policy was changed to 5 days per season, as recommended by the steering committee of the registry. So, for CHF, every outpatient with CHF diagnosed, according to the clinical judgement of participating centres' responsible cardiologist, was enrolled in the registry. Acute heart failure was defined as either new-onset HF or decompensation of chronic established HF with symptoms sufficient to warrant hospitalization. Registry participation did not require any alteration of treatment or hospital care, and entry of data was not contingent on the use of any therapeutic agent or treatment regimen. There were no specific exclusion criteria, with the exception of age that should be over 18 years. Data were collected in the period from April 2011 to February 2014. The survey was approved by each local Institutional Review Board according to the rules of each participating centre. No data were collected before detailed information was given to the patient and a signed informed consent was obtained.

Statistical analysis

Continuous variables were reported as median and interquartile range (IQR). Categorical variables were reported as percentages and compared using the χ^2 test. Continuous variables were compared by the Mann–Whitney *U*-test. Kruskal–Wallis test was used when more than two groups were compared. A *P*-value of < 0.05 was considered statistically significant. All tests were two-sided. Analyses were performed using the R program software.⁶

Results

Baseline characteristics

From April 2011 to February 2014, 2145 patients with HF were recruited from all participating centres. Of these patients, 1475 (68.8%) were patients hospitalized for acute heart

failure (HHF), while 670 (31.2%) were outpatients with CHF seen and followed up in outpatient clinics.

Table 1 shows the demographic–clinical characteristics of patients enrolled in Egypt. Hospitalized patients were older than outpatients and they were more often males. Comorbidities were more frequently observed in hospitalized patients. Obesity was more prevalent in hospitalized patients. Patients with HF and preserved ejection fraction (>45%) comprised 22% of HHF vs. 25.6% of CHF, *P* = 0.170. Atrial fibrillation existed in 24.3% of hospitalized vs. 24.8% of outpatients, *P* = 0.870. Ischemic heart disease was the dominant cause of HF in 68.1% of hospitalized vs. 41% of outpatients; *P* < 0.0001.

Hospital presentation and events and procedures during hospitalization

Table 2 shows that acute decompensated HF was the most common presentation (54.3%) followed by HF associated

Table 1 Baseline characteristics

	HHF (n = 1475)	CHF (n = 670)	<i>P</i> -value
Demographics			
Age (years), median (IQR)	61 (53–69)	57 (46–64)	<0.0001
Age ≥ 70 years, %	22.9	12.4	<0.0001
Females, %	30.4	35.8	0.010
BMI (kg/m ²), median (IQR)	29.4 (26.5–33.2)	27.7 (24.2–31.2)	<0.0001
BMI ≥ 30 kg/m ² , %	46.9	33.2	<0.0001
Smoker (current/ever), %	61.0	51.8	<0.0003
Female smokers, %	5.0	6.0	0.441
Initial symptoms and evaluation			
NYHA class III/IV	92.3	30.9	<0.0001
SBP (mmHg), median (IQR)	130 (110–150)	120 (110–133)	<0.0001
HR (bpm), median (IQR)	100 (90–114)	90 (80–100)	<0.0001
EF (%), median (IQR)	36 (30–45) ^a	40 (30–46) ^b	0.020
EF > 45%	22.0	25.6	0.170
Atrial fibrillation %	24.3	24.8	0.870
Haemoglobin gm/dL median (IQR)	12 (11–13)	11 (10–12)	<0.0001
Haemoglobin ≤ 12 g/dL, %	42.3	62.9	<0.0001
Medical history			
Prior HF without previous hospitalization, %	43.4	34.5	<0.001
MI	67.6	41.6	<0.0001
Diabetes mellitus, %	45.4	31.8	<0.0001
Hypertension, %	43.5	40.8	0.250
Renal dysfunction, %	17.6	13.4	0.020
COPD, %	14.8	13.3	0.400
Prior stroke/TIA, %	7.7	5.1	0.030
PAD, %	5.3	7.5	0.060
Hepatic dysfunction, %	9.2	5.4	0.004
Primary aetiology			
Ischaemic	68.1	41.0	<0.0001
DCM	15.5	24.6	
Valvular	7.7	17.5	
Hypertension	3.7	9.7	
Other	5.0	7.2	

BMI, body mass index; CHF, chronic heart failure patients; COPD, chronic obstructive pulmonary disease; DCM, dilated cardiomyopathy; EF, ejection fraction; HHF, hospitalized heart failure patients; HR, heart rate; IQR, interquartile range; NYHA, New York Heart Association; MI, myocardial infarction; PAD, peripheral arterial disease; SBP, systolic blood pressure; TIA, transient ischemic attack.

^aAvailable for 1076 patients.

^bAvailable in 391 patients

Table 2 Hospital presentation, events, and procedures during hospitalization

	(n = 1475)
Hospital presentation	
ACS/HF, %	20.5
Decompensated HF, %	54.3
Cardiogenic shock, %	3.2
Pulmonary edema, %	12.9
Hypertensive HF, %	4.5
Right HF, %	4.5
ECG, %	97.3
Echo, %	76.3
CXR, %	83.7
Cardiac CT, %	0.3
RHC, %	0.3
DC-cardioversion, %	1.9
PM, %	0.9
CRT-D, %	0.1
CRT-P, %	0.3
ICD, %	0.1
LOS (days), median (IQR)	4(3–5)
Mortality, %	5.0

ACS, acute coronary syndrome; CRT, cardiac resynchronization therapy; CT, computed tomography; CXR, chest X-ray; D, defibrillator; ECG, electrocardiogram; HF, heart failure; ICD, implantable cardioverter defibrillator; LOS, length of stay; P, programmed; PM, permanent pacemaker; RHC, right heart catheterization.

with acute coronary syndromes (20.5%). Electrocardiography, chest roentgenography, and echocardiography were frequently performed (97.3%, 83.7%, and 76.3%, respectively). More sophisticated techniques like cardiac computed tomography and right heart catheterization were rarely used. Devices were greatly underutilized in hospitalized patients (1.5%). Median hospital length of stay was 4 days (IQR, 3–5). The all-cause in-hospital mortality was 5%.

Pharmacologic treatment at hospital discharge and in outpatients

Table 3 shows that oral treatments recommended by guidelines [ACE/ARBs, beta blockers (BBs) and mineralocorticoid antagonists (MRAs)] were well prescribed in both types of patients. Diuretics were more commonly used during hospitalization, whereas MRAs were quite frequently used in outpatients. Digitalis was used in a high percentage of outpatients (47%). Ivabradine was used in 20.4% of outpatients.

Comparison between heart failure patients in Egypt and other member countries of the ESC participating in the registry (other regions)

Table 4 shows that patients were hospitalized with acute HF in Egypt at a much earlier age. Patients ≥ 70 years old accounted for 22.9% of all HHF patients in Egypt vs. 59.6% in other regions ($P < 0.0001$). Acute heart failure patients in Egypt had a higher BMI and were more obese. Women were less

Table 3 Oral medications at hospital discharge and in outpatients with chronic heart failure

	HHF	CHF	P-value
ACE/ARBs, %	85.8	89.8	<0.0001
Beta blockers, %	65.8	67.0	0.252
MRAs, %	68.2	86.4	<0.0001
Diuretics, %	93.0	84.9	<0.0001
Digitalis, %	36.1	47.0	<0.0001
Statins, %	71.5	50.9	<0.0001
Anti-platelets, %	79.7	58.2	<0.0001
Nitrates, %	51.7	41.0	<0.0001
CCBs, %	8.4	5.4	0.017
Anticoagulants, %	30.7	30.0	0.962
Amiodarone, %	10.7	10.8	0.868
Ivabradine, %	6.4	20.4	<0.0001

ACE, angiotensin converting enzyme inhibitors; ARB, angiotensin receptor blocker; CCBs: calcium channel blockers; CHF, chronic heart failure patients; HHF, hospitalized heart failure patients; MRAs, mineralocorticoid antagonists.

frequent in the Egyptian hospitalized cohort. Ejection fraction $> 45\%$ was more prevalent in HHF patients in other regions than in Egypt (35.7% vs. 22%, $P < 0.0001$). Atrial fibrillation occurred in 24.3% of HHF patients in Egypt vs. 48.4% of patients in other regions, $P < 0.0001$ (Figure 1). Diabetes mellitus was more prevalent in HHF patients in Egypt, whereas hypertension occurred less frequently. Co-morbidities (renal dysfunction, COPD, prior stroke, and peripheral arterial disease) occurred more frequently in HHF patients in other regions (Figure 2). A higher percentage of HHF patients in Egypt had underlying ischaemic aetiology. Devices were much less frequently utilized among Egyptian patients. In-hospital mortality was close to that seen in other regions (5% vs. 4.7%, $P = 0.670$).

Table 5 compares between CHF patients from Egypt and other regions. Egyptian patients still presented at a relatively younger age. Women were more frequently represented in the Egyptian outpatient cohort. Median left ventricular EF was higher in Egyptian patients, but an EF $> 45\%$ was not significantly different between both groups. Atrial fibrillation prevalence was still far less frequent in Egyptian patients than in other regions (24.8% vs. 38%; $P < 0.0001$). A haemoglobin < 12.0 g/dL was remarkably higher in Egyptian CHF patients. Valvular heart disease contributed more to HF in the Egyptian CHF patients than in other regions. Devices for treatment of HF were still largely underutilized in the Egyptian cohort.

Discussion

This is the first national large-scale prospective multi-centre registry to study HF patients in Egypt. Here, we report the demographics, overall clinical presentation, primary aetiology, co-morbidities, management, and in-hospital mortality of this cohort of patients. The participating centres represent diverse geographic regions of the country. The diversity of hospitals (university, non-university, and community) reflects the actual practice and management of HF in this country.

Table 4 Comparison between hospitalized patients with heart failure in Egypt and other countries participating in ESC-HF long-term registry (other regions)

	Egypt (n = 1475)	Other regions (n = 6131)	P-value
Age (years), median (IQR)	61 (53–69)	73 (63–80)	<0.0001
Age ≥ 70 years, %	22.9	59.6	<0.0001
SBP (mmHg), median (IQR)	130(110–150)	130(112–150)	0.650
BMI (kg/m ²), median (IQR)	29.4 (26.5–33.2)	27.2 (24.4–30.5)	<0.0001
BMI ≥ 30, %	46.9	28.5	<0.0001
Females, %	30.4	39.2	<0.0001
EF (%), median (IQR)	36 (30–45)	40 (30–54) ^a	0.0035
EF > 45%, %	22.0	35.7	<0.0001
Atrial fibrillation %	24.3	48.4	<0.0001
Diabetes mellitus, %	45.4	36.9	<0.0001
Hypertension, %	43.5	70.8	<0.0001
Renal dysfunction, %	17.6	27.6	<0.0001
Hepatic dysfunction, %	9.2	7.4	0.030
COPD, %	14.8	21.1	<0.0001
Prior stroke/TIA, %	7.7	13.4	<0.0001
PAD, %	5.3	16.7	<0.0001
Smoker (current/ever), %	61.0	47.0	<0.0001
Haemoglobin ≤ 12 g/dL, %	42.3	39.3	0.080
Primary aetiology			<0.0001
Ischaemic, %	68.1	52.8	
Hypertension, %	3.7	9.8	
DCM, %	15.5	12.8	
Valvular	7.7	13.2	
Other	5.0	10.9	
Hospital presentation			<0.0001
ACS/HF, %	20.5	12.5	
Cardiogenic shock, %	3.2	2.9	
Decompensated HF, %	54.3	63.2	
Pulmonary edema, %	12.9	13.1	
Hypertensive HF, %	4.5	5.3	
Right HF, %	4.5	3.0	
In-hospital mortality, %	5.0	4.6	0.670
Devices, %	1.5	18.6	<0.0001
Medications, %			
ACE/ARBs, %	85.5	74.8	<0.0001
Beta blockers, %	65.8	76.2	<0.0001
MRAs, %	68.2	50.8	<0.0001
Diuretics, %	93.0	90.3	0.0018
Digitalis, %	36.1	22.1	<0.0001

ACE, ACE inhibitors; ACS, acute coronary syndrome; ARB, angiotensin receptor blocker; BMI, body mass index; COPD, chronic obstructive pulmonary disease; DCM, dilated cardiomyopathy; EF, ejection fraction; HF, heart failure; MRA, mineralocorticoid receptor blocker; PAD, peripheral arterial disease; SBP, systolic blood pressure; TIA, transient ischemic attack.

^aAvailable for 3709 patients.

Furthermore, we carried out a detailed descriptive comparative analysis between HF cohort in Egypt and other ESC member countries participating in the same registry.

Patients' baseline characteristics

The median age of presentation of our patients was much earlier than the other countries participating in this registry.⁵ Those patients who were ≥ 70 years of age comprised a minority in our population, whereas they were the majority in the rest of the registry. The relatively younger age of our patients is again confirmed when compared with other Western HF populations from the Acute Decompensated Heart Failure

National Registry⁷ and Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure⁸ registries. On the other hand, the age of the Egyptian HF patients was very close to Saudi HF patients from the recent HEARTS registry.⁹ This might be explained in part by the observation that patients in this region of the world suffer from myocardial infarction at a relatively younger age.¹⁰ Ischemic heart disease was the primary aetiology of HF in the majority of our patients.

Fewer women were hospitalized with HF in our cohort compared with the other regions in this registry and with those reported by Masoudi *et al.*¹¹ Women were less afflicted with ischemic heart disease than men in the ACCESS registry.¹⁰ Obesity among our hospitalized HF patients was a salient feature. Little less than half of our hospitalized

Figure 1 Comparison between hospitalized heart failure patients in Egypt and other regions in the registry: baseline characteristics. **P*-value < 0.0001 for all parameters. BMI, body mass index; EF, ejection fraction; AF, atrial fibrillation.

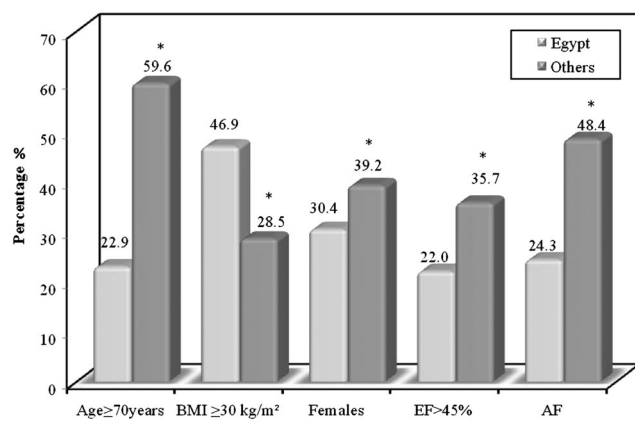
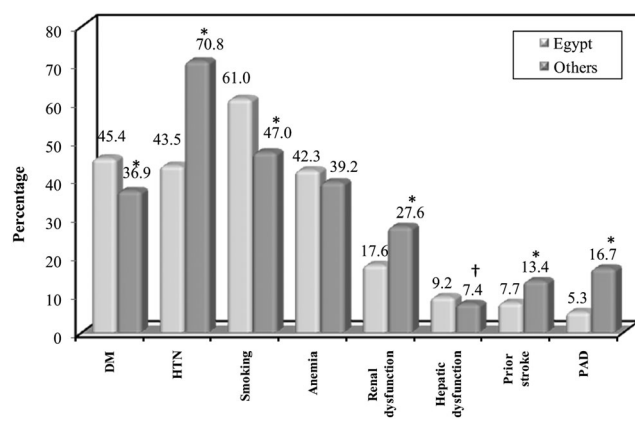


Figure 2 Comparison between hospitalized heart failure patients in Egypt and other regions in the registry: cardiovascular risk factors and co-morbidities. **P*-value < 0.0001; †*P*-value = 0.030. DM, diabetes mellitus; HTN, hypertension; PAD, peripheral arterial disease.



patients had a body mass index ≥ 30 kg/m². This is significantly higher than other regions in the registry. El-Zanaty and Way¹² reported in a survey carried out in Egypt in 2008 that obesity in women increased directly with age, from a level of 10% among women aged 15–19 years to 65% or more among women in the 45–59 years age groups. Obesity increased in Egyptian women by 1.67 kg/m² per decade.

Less than one quarter of our hospitalized patients had HF with preserved ejection fraction (HFpEF > 45%). This was confirmed in a previous Egyptian cohort by Ibrahim.³ This prevalence is significantly lower than the other regions participating in this registry (35.7%) and definitely lower than that of 47% reported by Owan *et al.*¹³ The prevalence of HFpEF was 50.4% in the ADHERE database as reported by Yancy *et al.* among 52 187 HF hospital admissions.¹⁴ The

Framingham Study investigators¹⁵ reported increased systolic blood pressure, atrial fibrillation, and female sex as predictors of HFpEF. Besides, HFpEF is mostly a disease of the elderly.¹⁶ All these factors were less frequent in the Egyptian cohort. This might explain why HF with reduced ejection fraction was the more dominant clinical presentation in our patients.

Atrial fibrillation prevalence was intriguingly low in our population (24.3%) compared with other regions in the registry (48.4%), almost half the prevalence rate. This large difference may be attributed to the younger age of the Egyptian cohort and lower prevalence of hypertension. In the Saudi HEARTS registry,⁹ 17.2% of patients had atrial fibrillation. The prevalence of atrial fibrillation in patients with HF varies from <10% to 50%, depending on in part upon the severity of HF and New York Heart Association class.¹⁷

Ischaemic heart disease was the principal primary aetiology in our HF cohort. Mokdad *et al.*¹⁸ reported that ischaemic heart disease was the top cause of death in the Arab world in 2010, contributing to 14.4% of deaths, whereas, in 1990, it was ranked second. It was also the leading cause of disability-adjusted life years in middle-income countries in the region (including Egypt) in 2010 for male individuals. Valvular heart disease (particularly rheumatic) was not a major contributor to HF in our hospitalized cohort. Rheumatic fever and rheumatic heart disease which were quite prevalent in Egypt during the last century have been declining, probably due to better socio-economic structure and health care in the community.¹⁹

Cardiovascular risk factors and co-morbidities

The prevalence of diabetes mellitus was higher in our HFF cohort (44.8%) compared with other regions (35.5%) and other Western populations (30%)²⁰ but definitely lower than that reported in the Saudi HEARTS database (64.1%).⁹ Egypt ranked ninth in the top 10 countries of number of people with diabetes (20–79 years old) in 2013 with a national prevalence rate of 15.5%.²¹ On the other hand, hypertension prevalence was lower in our cohort compared with other regions and HEARTS database. Renal dysfunction, prior stroke, and peripheral arterial disease were more prevalent in other regions in the registry than in the Egyptian cohort. This might be related to the older age and higher prevalence of hypertension in that group. The high prevalence rate of smoking among our male HF patients is consistent with the WHO global status report on non-communicable diseases²² which showed an age-adjusted prevalence of daily tobacco smoking in Egypt in adults aged 15 years or older of 37.2% in men and 0.6% in women.

Management and outcome

Devices (CRT-P, CRT-D, implantable cardioverter/defibrillators and pacemakers) were largely underutilized in our patients.

Table 5 Comparison between CHF patients in Egypt and other countries participating in ESC-HF long-term registry (other regions)

	Egypt (n = 670)	Other regions (n = 9625)	P-value
Age (years), median (IQR)	57 (46–64)	67 (58–76)	<0.0001
Age ≥ 70 years, %	12.4	41.9	<0.0001
SBP (mmHg), median (IQR)	120 (110–133)	121 (110–138)	<0.0001
BMI (kg/m ²), median (IQR)	27.7 (24.2–31.2)	27.5 (24.6–30.9)	0.450
BMI ≥ 30 kg/m ² , %	33.2	30.6	0.160
Females, %	35.8	28.3	<0.0001
EF (%), median (IQR)	40 (30–46)	35 (27–45)	<0.0001
EF > 45%, %	25.6 ^a	22.9 ^b	0.230
Atrial fibrillation, %	24.8	38.0	<0.0001
Diabetes mellitus, %	31.8	31.1	0.0012
Hypertension, %	40.8	60.5	<0.0001
Renal dysfunction, %	13.4	18.5	0.0014
Hepatic dysfunction, %	5.4	3.2	0.0035
COPD, %	13.3	14.2	0.550
Prior stroke/TIA, %	5.1	9.7	<0.0001
PAD, %	7.5	12.4	0.0002
Smokers (current/ever), %	51.8	51.5	<0.0001
Haemoglobin ≤ 12.0 g/dL, %	62.9	19.1	<0.0001
Primary aetiology			<0.0001
Ischaemic, %	41.0	43.7	
DCM, %	24.6	28.9	
Hypertension, %	9.7	7.9	
Valvular, %	17.5	8.0	
Other, %	7.1	11.5	
Devices, %	2.2	35.8	<0.0001
ACE/ARBs, %	89.8	88.6	0.370
Beta blockers, %	67.0	89.5	<0.0001
MRAs, %	86.4	56.5	<0.0001
Diuretics, %	78.7	89.3	<0.0001
Digitalis, %	47.0	21.0	<0.0001

ACE inhibitors; ACS, acute coronary syndrome; ARB, angiotensin receptor blocker; BMI, body mass index; COPD, chronic obstructive pulmonary disease; DCM, dilated cardiomyopathy; EF, ejection fraction; HF, heart failure; ACE, MRA, mineralocorticoid receptor blocker; PAD, peripheral arterial disease; SBP, systolic blood pressure; TIA, transient ischaemic attack.

^aAvailable for 391 patients.

^bAvailable for 8759 patients.

This might be related to lack of knowledge of indications in recent guidelines or to socio-economic issues or both. Pharmacologic treatment at hospital discharge was satisfactory, and medications with class I level of evidence A (ACE/ARBs, BB's, MRAs) were properly prescribed. Digoxin was likely overprescribed (36.1%) in HHF patients. Using data from a large heart failure registry, Hussain *et al.*²³ reported a decline in the use of digoxin significantly from 31.4% in 2001 to 23.5% in late 2004 after the DIG trial.²⁴ Digoxin is a class IIb, B in recent ESC guidelines for HF.²⁵ Length of hospital stay was really short in Egyptian patients (median of 4 days). This is largely due to shortage in beds. Once the patient is decongested and feels better, it is the duty of the caring physician to get him out of hospital for a faster turnover of beds. It is also the wish of patients to continue their treatment at home where they feel more comfortable amidst their families. In-hospital mortality was 5% in our cohort, which was not significantly different from the rest of the registry. However, in light of the younger age presentation of our patients, this would be considered relatively increased.

Chronic heart failure cohort

Ambulatory patients with CHF represented less than one-third of the total number of patients recruited in the Egyptian cohort. The majority of HF patients in Egypt present to hospital when they are extremely ill. So, they are usually managed as inpatients. Moreover, few hospitals have dedicated outpatient HF clinics.

Major differences between hospitalized patients from Egypt and other regions were maintained in the outpatient setting of CHF patients, namely, younger age at presentation (even earlier than hospitalized patients), lower prevalence of atrial fibrillation, and lower prevalence of co-morbidities (except for diabetes mellitus, hepatic dysfunction, and anaemia). Prevalence of anaemia (haemoglobin < 12.0 g/dL) was remarkably high in CHF patients. This needs further study of causes of anaemia in Egyptian HF patients and in Egyptian population as a whole. El-Sahn *et al.*²⁶ reported an overall prevalence of anaemia of 46.6% among adolescents in Egypt. Another study²⁷ estimated prevalence of anaemia of 49.6%

among clients of family planning clinics. Women were more represented in the Egyptian CHF cohort in contrast to hospitalized patients and to CHF patients from other regions. Even though ischemic heart disease maintained its position as the dominant cause of HF among CHF patients, valvular heart disease (mostly rheumatic) emerged as a significant contributor to HF in this population. This may be related to the younger age of ambulatory patients with heart failure, and that patients with chronic valvular heart disease are usually managed on outpatient basis. The rate of prescription of beta blockers was lower, whereas that of MRAs was higher in the Egyptian cohort with CHF vs. their peers in the registry. Continuous medical education of physicians and general practitioners and raising awareness of the guidelines should lead to more frequent use of beta blockers. The wide availability of a low-priced single combination pill in the Egyptian market containing both furosemide and spironolactone may explain the more frequent prescription of MRAs in our patients.

Limitations

There are several limitations of this registry. First, the diagnosis of HF was made by each centre's practicing physician and was not validated centrally. Second, patients enrolled in the registry did not include those patients with HF admitted to other facilities in the hospital. Third, brain natriuretic peptide (BNP) testing was not included in the diagnosis of HF, because it was performed in a minority of our patients. Moreover, we did not record re-admission rates in our patients.

Conclusions

In conclusion, this is the first national registry of HF in Egypt which included patients admitted for treatment of CHF and ambulatory patients with CHF. Results showed that HF patients in Egypt had demographic and clinical features which were distinctly different from other countries participating in the registry. They presented at a much younger age; women were less represented, and obesity was more prevalent in the hospitalized cohort. The majority of our patients had HF with reduced ejection fraction. Of the cardiovascular risk factors, diabetes mellitus and smoking were more prevalent in Egyptian patients; co-morbidities were less frequent. Ischaemic heart disease was the dominant primary aetiology in Egyptian patients with HF. Prevalence of atrial fibrillation was remarkably lower than in the rest of the registry. Devices for treatment of HF were largely underutilized in the Egyptian cohort. In-hospital mortality was similar to other regions in the registry. These data highlight the value of national registries in exploring the dimensions of a worldwide epidemic from a national perspective and imply that

primary prevention programmes are urgently needed on a nationwide basis.

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Conflict of Interest

None declared.

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