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The burden of multiple cardiac and non-cardiac comorbidities in hospitalized patients with worsening congestive heart failure in Misan province

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ABSTRACT

To determine the burden of cardiac and noncardiac common comorbid diseases in patients with chronic heart failure. Inpatient-based prospective cross-sectional study. Medical wards and coronary care unit in Al-Sadder Teaching Hospital Misan, Iraq. Over 5 years from 1st September 2014 to 2nd September 2019. A total sample was 778 adult inpatients with chronic heart failure associated comorbid diseases were enrolled in this study. Women were 40% and men 60%. The most common cardiac and non-cardiac comorbid diseases in both HFrEF, HFmeEF, and HFpEF as follow: Coronary artery diseases, chronic kidney diseases, systemic hypertension, diabetes mellitus type II, atrial fibrillation, chronic obstructive pulmonary diseases, anemia, obstructive sleep apnea syndrome, obesity, previous history of cerebrovascular accident, depression and thyroid dysfunction. Multi-morbidity very common, about 70% had 3+ comorbid diseases, and 54% had 5+comobid conditions, only 8% hand one co-morbid disease. Cardiac and non-cardiac comorbid diseases are frequent associated with chronic heart failures, adversely increased the burden of the diseases in terms of an increase the frequency of admission and re-admission, besides days stay at a hospital, impaired quality of life, multiple medicines, increased side effect of drugs and poor compliance with an increase in the mortality.

Keywords: Heart Failure; Chronic congestive heart failure; Co-morbidities

Introduction

Heart failure (HF) is a complex clinical syndrome that resulted from any structural or functional cardiac disorder, which impairs the ability of the ventricle to fill with or eject blood [1]. EF has been considered essential in the classification of patients with HF according to the American College of Cardiology/American Heart Association [2, 3]. HFrEF has been variably defined as EF values of ≤35%, <40%, and ≤40% [2, 3]. HFpEF has been classified as EF values of >40%, ≥45%, >45%, ≥50%, >50%, and ≥55% [2,3]. In the last decade, both the incidence and the prevalence of HF are growing, as is the resulting burden of deaths and hospitalizations [4]. There was a strong association between HF and advancing age, they also are influenced by the rising prevalence of co-morbid precursors, such as hypertension, diabetes, dyslipidemia, COPD, chronic renal failure (CRF), and obesity and the improved long-term survival of patients with ischemic and other forms of heart disease [4]. Because over 80% of HF patients are ≥65 years, most of these patients suffer from the burden of one or more comorbidities [5].

The comorbidities cardiac and non-cardiac are common in HF and associated with increased mortality and morbidity risk, increased complexity of clinical management, multidrug regimens often difficult to adhere to, increased disability and poor quality of life, and high health care resource utilization [6-8].

In the present study, we investigated the impact and burden of cardiac and non-cardiac comorbidities and their distribution in patients with chronic congestive HF with reduced ejection fraction (HFrEF), those with preserved ejection fraction (HFpEF), and mid-range ejection fraction (HFmrEF). Although the outlook depends, to some extent, on the underlying cause of the problem, untreated heart failure generally carries a poor prognosis.

Patients and Methods

Study design

An inpatient-based prospective cross-sectional study was conducted in the Al-Sadder Teaching Hospital, Misan, Iraq, over 5 years from 1st September 2014 to 2nd September 2019.

Study size

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A total sample was 778 patients, 40 patients were excluded from the study because of missing inclusion criteria like values for 2D EF% and BMI, and 30 were lost to follow-up, therefore only 708 patients were available for analysis.

Participants

We included all patients with congestive HF that admitted to the hospital, medical ward, and coronary care unit (CCU) due to the worsening of their symptoms and decomposition. Inclusion criteria were: adult patients, diagnosed with symptomatic congestive HF mostly (stage C and D), few cases stage B, whereas stage A excluded since they under medical treatment and other intervention treatment, in-hospital patients and a baseline characteristics variable were considered: hypertension, DM, obesity, atrial fibrillation, coronary heart disease (CHD), COPD, previous cerebrovascular accidents, chronic liver disease (CLD), thyroid disease, chronic kidney diseases (CKD), and anemia.

Data collection

All data were collected from a participant and their official records during admission to the hospital. BMI was categorized. Renal impairment was defined as an estimated glomerular filtration rate (eGFR) <60 mL/min/1. 73 m^2. Anemia as hemoglobin <12 g/dL. CHD as having a documented history of myocardial infarction, percutaneous coronary angioplasty, or coronary artery bypass grafting. The 2D-Transthoracic Echocardiography with the estimation of EF%, convectional 12-leads resting ECG. TSH**,** CBC, lipid profile, blood urea, and serum creatinine were done. Measuring Health-Related Quality of Life (HRQOL), by using The Duke Health Profile[9]. The QOL scale is scored by simply the score on each item. The range of scores is between 15 to 105, with a higher score being indicative of higher QOL. An average total rating for a healthy person usually around 90, whereas a low QOL measure around 15.

Ethical considerations

Written informed consent was obtained from the patients, for participating in this study, and was conducted according to the ethical standards established by the current (2013) version of the Declaration of Helsinki (1964). The Local Medical Ethical Committee of Misan University/ Faculty of Medicine approved this study (Code Dean office:1398/2018).

Statistical analysis

We implemented standard descriptive statistics and data analysis using IBM SPSS Statistics Software (version 25). All p-values < 0. 05 were considered statistically significant for a one-sample t-test. Mean and the standard deviation was used to present data.

Data are reported as means and standard deviations or medians and percentages of patients for categorical variables.

Results

In this study is, women were 283 (40%) and 425 were men (60%), male/female ratio of 3:2, (Figure 1). The mean age was 69.93±27.34 (CI 95% 1.19–1.46, P value <0. 0001), (Table 1). The most common cardaic and non-cardiac comorbid diseases in both HFrEF, HFmeEF and HFpEF as follow: descending sequence from most common to least common: CAD, CKD, HT, DM type II, AF, COPD, anemia, obstructive sleep apnea syndrome, obesity, CVA, depression, and thyroid dysfunction: (68%; < 0.01), (56%; <0.0002), (54%; <0.36), (40%; <0.300), (34%; <0.038), (30%; <0.03), (26%, <0.002), (25%; <0.12), (20%; <0.33), (11%; <0.21), (10%; <0.56) (8%; <0.154), respectively, (Table 1). Almost all patient in this study with symptomatic HF and concomitant cardaic and noncardiac co-orbidities with multipel medication and at least 1-2 admissin to hospital for past 30 days score of thier quality of life foe one week before adfmissin was very poor and low mean score of QOL is (23.18±7.05; CI95% 0.60–0.89; < 0.340) (Table 1, Figure 2).

Multi-morbidity very common, about 70% had 3+ comorbid diseases, and 54% had 5+comobid conditions, only 8% have one co-morbid disease, (Table 1).

Because of almost all patient symptomatic CHF and on treatment, stage B observed in 6%, stage C in 46%, and stage Dref in 24%, stage Dpef in 24% (Table 2).

Figure 3, we figured the percentage of age/year distribution in the total sample of 708 patients.

2D EF% mean was 38.32±6.68 (CI95% 0.79–1.45; <0.507), HFrEF 51%, HFpEF 49%, (Figure 4).

Discussion

It was found the effect of gender at age <60/ year were CHF more common in male while after 70/year female slightly more common [10, 11]. In the comparison of multiple comorbidities, cardiac and non-cardiac between HFpEF and HFrEF, it was 52% vs 48%, especially in cardiovascular co-morbid diseases like HT and AF, while non-cardiac co-morbidities and CAD were more common in HFrEF. The single most common cardiovascular co-morbid disease is CAD, especially in HFrEF patients, thus

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contributing to poorer health-related quality of life (HRQOL) [12-14]. But if associated with DM, AF, overweight, and anxiety, these factors make the HF syndrome more complex and added more burden to the patients of CHF in the context of admission, readmission, multiple medicines, the frequent side effect of multiple drugs, the problem of non-compliance to medicines [15].

Lower hemoglobin was associated with higher EF. Besides, female sex, DM, and worse renal function were several of the strongest predictors of anemia. These findings suggest a complex relationship between anemia and CHF [16, 17], these may be due to morbidity and mortality in HF patients because of adverse LV remodeling effects, increased neurohormonal and inflammatory cytokines, adverse cardiorenal effects, and the association with poor nutritional status [16, 17].

COPD occurs in 30 % of CHF patients with a slightly higher prevalence in HFpEF patients compared with HFrEF patients, the rationale explanation for the increased prevalence in HFpEF patients is suggested by the induction of a proinflammatory state that causes endothelial and cardiomyocyte dysfunction, with resultant myocardial fibrosis and clinical HFpEF [18, 19]. Chronic smoking was also identified as an independent predictor of HFpEF, but not HFrEF, in epidemiological studies [20, 21], which supports the inflammatory hypothesis. Other explanations for the close association between COPD and HFpEF involve coupling between impaired LV filling and pulmonary venous changes due to lung parenchymal abnormalities [22].

Renal dysfunction associated with CHF in our study very common and dramatically increased morbidity occurs nearly the same in HFrEF and HFpEF. HFpEF patients may be more likely to have underlying renal dysfunction related to diabetic nephropathy, whereas atherosclerosis may contribute to renal function changes in patients with HFrEF due to ischemic/nephrosclerotic etiology [23]. Renal dysfunction may worsen HF through multiple mechanisms, including increased sodium and fluid retention, anemia, inflammation, and uremic toxins, as well as RAAS and sympathetic activation. Conversely, HF may lead to renal dysfunction and cardiorenal syndrome through mechanisms related to low cardiac output, accelerated atherosclerosis, inflammation, and increased venous pressure [23].

The impact and association of DM type II on CHF may be resampling diabetic cardiomyopathy [24]. DM is associated with increased morbidity and mortality in patients with chronic HF [25]. The development of systolic dysfunction may be preceded by myocardial fibrosis and collagen deposition, resulting in diastolic dysfunction [26]. The relationship between DM and HF seems bidirectional, with HF also increasing the risk for subsequent DM [27]. The mechanisms underlying may be due to involve sympathetic and RAAS activation, with subsequent lipolysis and increased cytokine production [27].

The combination of HF and AF may carry a worse prognosis than either condition alone; however, the magnitude of this risk remains controversial [28]. AF is frequent in the setting of HF, in this study 34% and is associated with a large excess risk of morbidity and mortality. The magnitude of this excess risk differs markedly according to the timing of AF, with AF developing after HF conferring the largest increased risk of death compared with HF patients without AF [29].

In recent years, the prevalence and impact of sleep-disorder breathing (SDB) in HF patients have been increasingly recognized. Previous studies have found that SDB is prevalent in both those with HFpEF and those with HFrEF, occurring in upward of 50% to 80% of patients [30, 31]. There are two primary types of SDB occur obstructive sleep apnea (OSA) and central sleep apnea (CSA). In our study, the OSA found in 25% nearly equal in both HFrEH and HFpEF and more common in males. SDB has been associated with increased morbidity and mortality in the general population [32]. The majority of studies in HF patients focused on HFrEF patients, who had SDB that was an independent predictor of cardiac readmission [33].

Obesity BMI >30Kg /m2 is common in the general HF population, in our study composed of 20%, with a higher prevalence in HFpEF patients. A higher weight may be associated with better outcomes compared with HF patients with cardiac cachexia and/or nutritional deficiencies [34].

Depression is a major comorbid inpatient with CHF, and constitute an additional burden on the management of these patients. Depression is present in about 10% of our study. There are shared pathophysiological mechanisms between HF and depression. The adverse effects of depression on the outcomes in HF include reduced quality of life, reduced healthcare use, rehospitalization, and increased mortality [35, 36].

Regarding QoL in CHF, in our study, the mean score of QoL was 23, which is low and poor. In severe HF, poor socioeconomic status and lack of social support result in poor QoL in CHF patients, which in turn leads to an increased risk of hospital admissions and death [37]. The burden of mortality did not estimate exactly to reflect the death rate of the whole sample and to be statistically significant, because

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the follow-up period maximally 30 days, but the burden of mortality in CHF had been studied extensively in more than one study [38].

Conclusions

Cardiac and non-cardiac comorbid diseases are very common in association with CHF, adversely increased the burden of the diseases in terms of an increase the frequency of admission and re-admission and days stay at the hospital, an impaired QoL, multiple medicines, increased side effect of drugs and poor compliance with the increase in the mortality. Coronary heart disease is the most common comorbid disease associated with CHF. The prognosis of patients with HF due to IHD worse than that associated with many other aetiologies. The presence of IHD and other comorbidities may influence both the efficacy and choice of treatment.

Abbreviation

AF Atrial fibrillation
CHO chronic heart failure
BMI Body mass index
QoL Quality of life
COPD Chronic obstructive pulmonary diseases
CKD Chronic kidney diseases
CRF Chronic renal failure
DM Diabetes mellitus
EF %. Ejection fraction
e GFR. Electronic glomerular filtration rate
Hb hemoglobin
HF. Heart failure
HFrEF. Heart filature with a preserved ejection fraction
HFpEF. Heart failure with a preserved ejection fraction
HF mrEF. Heart failure with a midrange ejection fraction
OSA. Obstructive sleep apnea syndrome
PTCI Percutaneous transluminal coronary intervention
QoL Quality of life
RAAS Renine angiotensin aldosterone system
SDB Sleep-disorder breathing SDB

SOURCE OF SUPPORT

Nil

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Nil

CONFLICTS OF INTEREST

Nil

AUTHORS CONTRIBUTION

This manuscript has been read and approved by all the authors.

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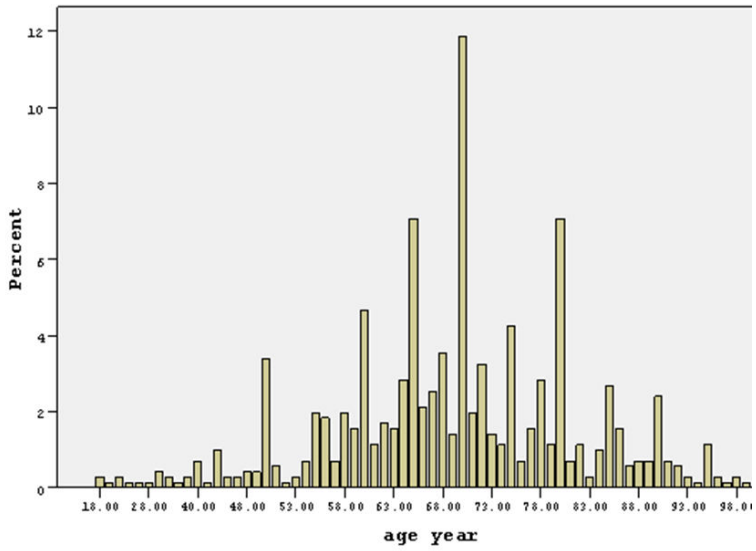

Figure 1. Gender distribution in the study.

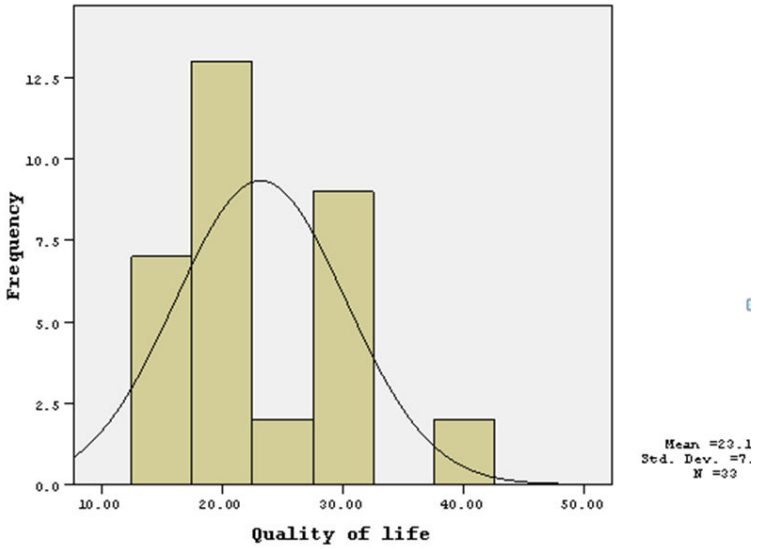

Figure 2. The score of quality of life QoL.

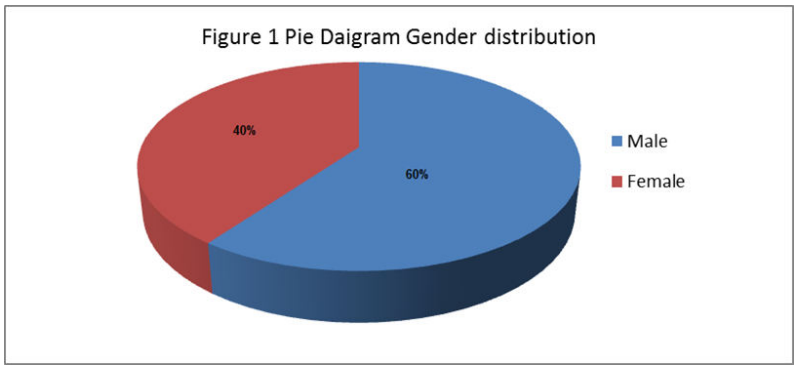

Figure 3. Percentage of age/year distribution in the study.

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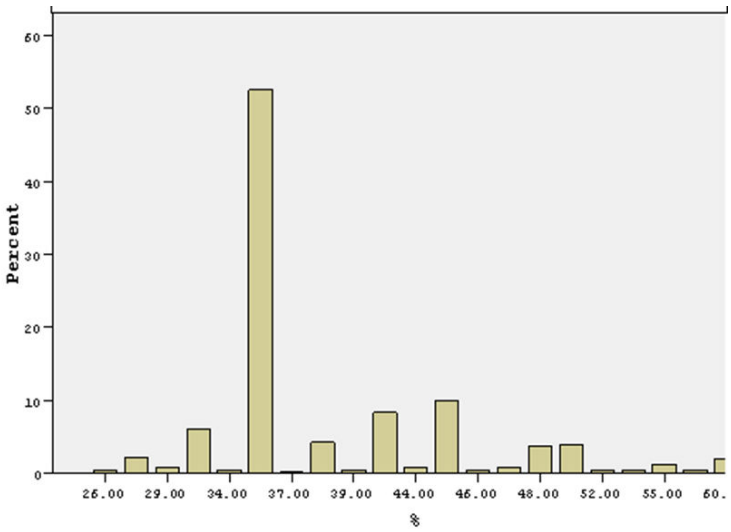

Figure 4. Frequency of EF % in the study.

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Table 1. The common cardiac and non-cardiac co-morbidities in the study.

Variable	No.	%	Mean	SD	CI 95%	P value
Female	283	40				0.429
Male	425	60				0.260
Age (per 10-year increase above 60)			69.92	27.34	(1.19–1.46)	<0.0001
EF %			38.32	6.68	(0.79–1.45)	0.507
Hypertension	385	54				0.36
DM type II	285	40				0.3
CAD	480	68				0.01
BMI > 30 Kg/m2	143	20				0.33
COPD	210	30				0.03
AF	240	34				0.038
(eGFR) <60 mL/min/1.73m2	397	56				0.002
hemoglobin <12 g/dL	186	26				0.002
CVA	78	11				0.56
Hypothyrodism	66	8				0.154
Hyperthyrodism	7	1				0.089
Depression	73	10				0.21
OSA	175	25				0.12
QoL	23.18		49.7	7.05	(0.60–0.89)	0.34

DM: Diabetes mellitus type II, CAD: Coronary artery diseases, COPD: Chronic obstructive pulmonary diseases, AF: Atrial fibrillation, CHF: Chronic renal failure, CVA: Cerbrovascular Accident, OSA: Obstructive sleep apnea syndrome, QoL: Quality of Life

Table 2. Stages of HF of the study

Stage of HF	%	Notes
A	0	Excluded from study
B	6	Symptoms mostly due to co-morbid diseases
C	46	Symptomatic and on treatment
D ref	24	Symptomatic and on treatment
D pef	24	Symptomatic and on treatment