



Epidemiology and Prognosis of Heart Failure

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Abstract

In this article the state of the art of prevalence, incidence and prognosis of heart failure is discussed. Prevalence and incidence are two measures of disease occurrence. Briefly, prevalence is the proportion of the population affected by the disease at a certain point in time. Incidence indicates the number of new cases within a given time period in a population at risk for the disease (for example, elderly people). A related, prognostic measure is mortality, i.e. the incidence of death from the disease occurring in a period of time. In the case of chronic, steady-state disease such as heart failure, disease duration is directly affected by mortality, and prevalence may correspond to the incidence of disease multiplied by the average duration of disease. Prevalence rates of heart failure may, therefore, vary across studies depending on the variability in incidence as well as in survival between population samples. Also, given that heart failure is a complex syndrome with different phenotypes (see article 1), each with specific clinical characteristics and associated risk factors, prevalence and incidence rates may vary according to the definition of the heart failure subtype. Finally, rates may vary on the basis of the method of collecting data and the criterion for defining left ventricular systolic dysfunction that is applied in the study.

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Introduction

In this article the state of the art of prevalence, incidence and prognosis of heart failure is discussed. Prevalence and incidence are two measures of disease occurrence. Briefly, prevalence is the proportion of the population affected by the disease at a certain point in time. Incidence indicates the number of new cases within a given time period in a population at risk for the disease (for example, elderly people). A related, prognostic measure is mortality, i.e. the incidence of death from the disease occurring in a period of time. In the case of chronic, steady-state disease such as heart failure, disease duration is directly affected by mortality, and prevalence may correspond to the incidence of disease multiplied by the average duration of disease [1]. Prevalence rates of heart failure may, therefore, vary across studies depending on the variability in incidence as well as in survival between population samples [1]. Also, given that heart failure is a complex syndrome with different phenotypes (see article 1), each with specific clinical characteristics and associated risk factors, prevalence and incidence rates may vary according to the definition of the heart failure subtype [2]. Finally, rates may vary on the basis of

the method of collecting data and the criterion for defining left ventricular systolic dysfunction that is applied in the study [3].

Prevalence and incidence of heart failure

Heart failure represents an increasing issue for global healthcare systems. Even before the millennium a prevalence of 23 million individuals living with heart failure is estimated worldwide [4]. However, epidemiological data predominantly derive from North America and Europe [3] with overall prevalence rates of 1–2% [1]. In particular, the current prevalence is up to 3% [5]. Also, the prevalence of heart failure is growing despite substantial improvements in its management, and for this reason heart failure represents an exception among cardiovascular disorders [6]. Indeed, from the 1970s to 1990s, an epidemic was declared [7], due to a steep rise in prevalence and hospitalisation rates [8]. Since then, the worldwide prevalence of heart failure has progressively increased, although this mainly relates to increases in crude prevalence rates, with standardised rates even decreasing somewhat due to the ageing population and improved survival after acute MI for example.

One of the possible explanations for this growth is that heart failure is predominantly a disease of the elderly. Indeed, its prevalence rises with age, increasing sharply from 1% in 40-year-old individuals, affecting about 10% of men and 8% of women aged more than 60 years, and exceeding 10% in both sexes over the age of 70 years [9]. Indeed, among elderly people (≥ 65 years) referred to primary care services for shortness of breath on exertion, 1 out of 6 presents with previously unrecognised heart failure, mainly heart failure with preserved ejection fraction (HFpEF) [10,11]. Also, more than 80% of the deaths and prevalent cases of heart failure occur among people aged ≥ 65 years [1]. Other explanations for the growing prevalence of heart failure may be the increasing incidence and, paradoxically, advances in awareness and diagnosis as well as in management [1]. Also this trend mirrors the increasing prevalence of major heart failure risk factors, including obesity and diabetes [12].

As for prevalence, the incidence of heart failure is greater in males and in the elderly, especially for HFpEF [1]. In the Framingham Heart study [13] conducted from 1950 to 1999, the incidence of heart failure was nearly 5.6 in men and 3.3 in women per 1,000 person-years but remained unchanged in men whilst it decreased in women. In the Olmsted County study [14] the incidence was nearly 3.8 and 2.9 per 1,000 person-years, respectively, and remained stable between 1979 and 2000 in both sexes. Beyond age and gender, further studies have also highlighted epidemiological differences according to the heart failure syndrome (mainly HFpEF and heart failure with reduced ejection fraction (HFrEF)) [15–22]. It is now acknowledged that there are pathophysiological characteristics and specific associated risk factors for each heart failure subtype [2].

Prevalence and incidence of heart failure syndromes

Patients with HFpEF are more often older, female, and with a history of hypertension and atrial fibrillation than those with HFrEF, whilst a history of myocardial infarction is less frequent [23–24]. In a recent European retrospective cohort study [15], based on admissions in 2012, only 17% of heart failure patients had HFpEF type whilst the 83% were diagnosed with HFrEF. However, there is inconsistency across studies for the prevalence rates of HFpEF, generally ranging from 22% to 73% [25–32,24,11]. Such variability probably depends on the definition of HFpEF (e.g. what is the ‘normality’ threshold of ejection fraction) and, consequently, sample inclusion criteria [33]. Also the clinical setting (e.g. primary care, hospital clinic, etc.) plays a role in determining the differences of prevalence across studies. Other characteristics of the study samples affecting prevalence rates are age, gender and history of myocardial infarction [2].

Heterogeneous data also exist with regard to advanced heart failure, whose prevalence ranges from 1 to 10% of the total heart failure population [34]. As for HFpEF, this variability probably depends on the application of different definitions of this syndrome and epidemiological criteria across studies [35].

As for incidence, a substudy of the Prevention of Renal and Vascular End-stage Disease (PREVEND) [36], a European community-based cohort study, showed a higher percentage of new cases of HFrEF compared with HFpEF (66 vs. 34%, respectively) than other community-based studies [33,37]. Since patients with HFrEF are more often younger than HFpEF, these

Table 1 Markers of worse prognosis

Socio-demographic characteristics	Older age, male sex, low socioeconomic status
Clinical markers	Severity of heart failure, myocardial remodeling and severity of heart dysfunction
Biomarkers	Markers of neurohormonal activation, markers of renal function, markers of inflammation, markers of cardiac damage/dysfunction, and other markers. Specific genetic mutations
Cardiovascular comorbidities	Atrial fibrillation, ventricular arrhythmia, non-revascularizable coronary artery disease, previous stroke/TIA, peripheral arterial disease
Non-cardiovascular comorbidities	Diabetes, anaemia, iron deficiency, chronic obstructive pulmonary disease, renal failure, liver dysfunction, sleep apnoea, cognitive impairment and depression
Others	Non-adherence with treatment, heart failure hospitalisation, aborted cardiac arrest, implantable cardioverter-defibrillator shock

Adapted from: reference 2.

incidence rates may presumably be elucidated considering the younger age of this cohort (middle-age). In line with this explanation, there is evidence that incidence of HFrEF is decreasing among hospitalised patients at a greater extent than that of HFpEF [22,38].

Taking into account the available evidence, more studies are warranted to clarify prevalence and incidence rates of HFrEF. In fact, a much greater wealth of epidemiological data on HFpEF has been collected so far. Moreover, heart failure with mid-range ejection fraction (HFmrEF) has been completely neglected by epidemiological studies, as these patients –who stand in a “grey area” (see article 1) are usually excluded from study selection criteria. After the recent standard definition of HFmrEF from the European guidelines [2], upcoming epidemiological research will hopefully include patients with this syndrome to clarify its prevalence, incidence and prognostic correlates.

Prognosis of heart failure

Heart failure is associated with a poor long-term prognosis. Nearly 50% of patients with this diagnosis die within 4 years [12]. Also, heart failure leads to impairment in quality of life due to its very disabling symptoms [39]. Heart failure is still the most common cause of hospitalisation in industrialised countries. A study from the European Society of Cardiology [40] reported a 12-month hospitalisation rate of 44% and a mortality rate for any cause of 17% in hospitalised patients; and 32% and 7% respectively in stable/ambulatory patients. In this study, sudden death and worsening heart failure were the most common modes of death for the patients.

Despite the fact that all-cause mortality is reported in some studies to be higher in HFrEF than HFpEF [40–42] both the syndromes carry a similarly poor prognosis [15] and their hospitalisation rates are comparable [15,20,43–45]. Overall,



annual hospital discharges associated with heart failure are decreasing in Europe, and a consequent slight improvement in survival is observed in heart failure patients [46–47]. Such an improvement in survival has been observed in both men and women [13,48], and along with the ageing of the population can presumably lead to a steep rise in prevalence in spite of stable incidence rates [33]. Also, there is a change in the distribution of the causes of death (and also hospitalisation) toward non-cardiovascular causes in heart failure patients, consistent with the increased occurrence of non-cardiovascular comorbidities [48]. This trend toward non-cardiovascular causes of death is more evident for HFpEF [14] and is suggestive of the key role of comorbidities in heart failure, particularly the HFpEF pattern[49].

Thus, despite the encouraging European data on survival, the outcome is still poor [2]. For this reason, markers of worse prognosis have been identified to help clinicians (Table 1). Unfortunately, their clinical applicability is still limited [2] and, therefore, more studies are warranted.

In summary, survival after the diagnosis of heart failure remains unsatisfactory but has improved substantially over time. This trend, along with the aforementioned trend in incidence, indicates that heart failure is “an epidemic of hospitalizations among survivors who now live longer with the disease”.⁴⁸

Declarations of Interest

The authors declare no conflicts of interest.

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The authors state that they abide by the requirements for ethical publishing in biomedical journals. [50]

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