Heart failure in the family practice: a study of the prevalence and co-morbidity

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Background. Heart failure (HF) is a health problem that particularly affects the elderly population. Its onset is associated with other chronic diseases, a circumstance that makes it a challenge for health care services. The aim of this study is to quantify the prevalence of HF in family medicine offices and describe the chronic co-morbidity associated with it.

Methods. A cross-sectional, observational descriptive study set in a health area of the Community of Madrid, Spain. The study was carried out in a population of 198 670 individuals over 14 years of age, attended to by 129 specialists in family medicine. The patient was considered to have HF when this diagnosis (ICPC code K77) appeared in his or her electronic medical record. The prevalence of HF was quantified and its association with another 25 chronic diseases was analysed.

Results. The prevalence of HF was 6.9% among women and 7.9% among men. Patients with HF had a high rate of chronic co-morbidity, with an average of 5.2 ± 2.1 chronic diseases. Only 3% of the patients present with isolated HF and >60% have four or more additional chronic problems. Hypertension, cardiac arrhythmias, hyperlipidaemia, obesity and diabetes mellitus are the chronic diseases most frequently detected in HF patients.

Conclusion. Patients with HF frequently visit the offices of family physicians, presenting with a high rate of cardiac and non-cardiac co-morbidity that proves to be a challenge on the clinical level and in terms of the organization of health care services.

Keywords. Cardiology, epidemiology, family medicine, patient-centred care, public health.

Background

Heart failure (HF) is one of the major public health problems in developed countries. In Spain, 1–2% of the population over 40 years of age has HF; it is the third most important cause of cardiovascular death and the most common cause for hospital admission in individuals over 65 years of age. The prevalence increases clearly and significantly with age and it is detected in 16% of men and women over the age of 75 years. It is likely to continue to increase over the coming years due to the aging of the population, to the higher rate of survival owing to the better results with drug treatments, to the improvement in care and to the fact that it constitutes the end stage of many heart diseases in which survival has also been improved.

In the health care systems in which the family physician acts as the gatekeeper to the system, patients with HF first consult their family doctor. HF is a syndrome characterized by dyspnoea and oedemas produced by anatomical and functional changes in the heart that are revealed by echocardiography. There is no single clinical symptom or sign that points to a diagnosis of HF with reasonably reliable sensitivity, specificity and predictive values. As a consequence, the clinical diagnosis of mild HF is difficult, there being no difference between the diagnostic capabilities of GP and cardiologists; moreover, echocardiography, the only objective diagnostic test, is underutilized.

There are effective treatments for HF but, nevertheless, the prognosis of this disease is worse than would be expected. Some authors argue that among the possible causes of the poor results is the fact that these
patients have a high rate of co-morbidity and that, for this reason, they are excluded from the clinical trials that deal with this subject, while the recommendations of the guidelines, except for a few associated diseases, do not take this situation into consideration. Moreover, co-morbidity is known to increase the risk of hospital stays and mortality. In this context, caring for HF patients constitutes a challenge, and the most effective way to organize the health care services is a matter of debate. While some authorities promote disease management programmes, depending on hospital units, others affirm that, given their co-morbidity, these patients would be better treated by the family physician. Under experimental conditions and in studies of less than 1 year’s duration, disease management programmes reduce mortality and the number of hospital admissions, but doubts still remain concerning their utility in routine clinical practice. On the other hand, the comparison of the care of these patients by cardiologists with that provided by family physicians has shown that the former see younger patients, with less co-morbidity, and subject their patients to more diagnostic tests but that the health outcomes are similar.

Regardless of the model chosen, the approach to co-morbidity is a key element in the care of these patients. However, the co-morbidity studies are relatively recent and few in number; they have generally been carried out in the hospital setting and they have been limited to analysing the association with a small number of diseases. The aim of this study is to quantify the presence of HF in the offices of family physicians and describe the associated chronic co-morbidity.

Methods

We performed a cross-sectional, descriptive observational study in the health care setting of the Community of Madrid, Spain, with a population of 887 134 inhabitants, 86% over the age of 14 years, using data corresponding to the year 2007. Family physicians see individuals who are over 14 years of age; children aged 14 years and under are attended to by pediatricians. This population is attended to by 476 family physicians and 112 pediatricians.

The study was based on the electronic medical records of 198 670 individuals, corresponding to the population over 14 years assigned to 129 family physicians, distributed among 34 health centres, who fulfilled, as inclusion criteria, two quality requirements in the electronic medical record registry: (i) they took notes on >64% of the visits received (75th percentile) and (ii) the mean number of care episodes per patient was >4.

The data were obtained from the medical records. For the codification of the diagnoses, the International Classification of Primary Care (ICPC) was employed. The patients were classified using version 7 of the ACG® Case-Mix System, a programme developed at Johns Hopkins University. The ACGs (Adjusted Clinical Groups) are mutually exclusive groups of patients that have access to the same resources (iso-resource groups). The classification system also generates categories that group patients on the basis of clinical criteria, Expanded Diagnosis Clusters (EDCs). Moreover, the system makes it possible to group the patients into six categories, or Resource Utilization Bands (RUBs), according to the expected resource use, ranging from zero expected use (RUB 0) to a very high expected use (RUB 5).

The data collected for each patient included age, sex and all the diagnoses for which he or she had visited the physician throughout 2007.

The research team, with pre-established criteria, made an initial selection of 40 chronic EDCs, and in a second stage, 26 EDCs were identified (Appendix 1), which we refer to as having high prevalence and/or high impact and that met one of the following two criteria: (i) prevalence above the 50th percentile and (ii) >50% of the patients were included in categories RUB 4 and RUB 5 (high resource utilization). HF is included in this list of 26 EDCs and the association with the other 25 chronic high-prevalence/high-impact EDCs was analysed.

From a pragmatic point of view, the patient was considered to have HF if this diagnosis (ICPC code K77) appeared in his or her medical records. With this criterion for case definition, the prevalence of HF attended to in family practices was calculated, with a 95% confidence level. The specific rates according to age and sex were also calculated.

The statistical analysis was carried out using the SPSS statistical software package (version 15.0). For the qualitative variables, the frequency distributions were calculated, with their 95% confidence intervals (CI) when appropriate; for the quantitative variables, the means and standard deviations were calculated, the existence of a normal distribution was verified and parametric or non-parametric tests were applied depending on the distribution of the variable. The growth in prevalence in the different age groups was studied; for this purpose, first they were stratified by sex, followed by analysis of the grouped data using the chi-square test for linear trend.

We analysed the presence of co-morbidity, quantifying the proportion of patients included in each of the six levels of co-morbidity established, ranging from isolated HF to that associated with five or more co-morbidities. The association between HF and each of the 25 high-prevalence/high-impact diseases was quantified, and the ratios of observed morbidity (in HF
patients) to expected morbidity (in the general population) were calculated, assuming independence of the diseases analysed with respect to HF. To calculate the expected frequencies, the data were adjusted for age and sex according to the indirect method.

Results

The 129 physicians in the study covered a population of 198,670 patients: 104,003 women (52.35%) and 94,667 men (47.65%); of these, 1377 patients, 821 women (59.6%) and 554 men (40.2%), were diagnosed as having HF, representative of the population of Madrid. In 2007, 149,417 patients consulted with their family physicians, 75.2% of the patients registered in the region.

The prevalence (6.9\%/overall) was higher in women than in men (7.9\%/ versus 5.9\%), for a difference of 2\% (P = 0.66). The prevalence increased with age, from 0.3\%/ among individuals of <40 years of age to up to 75\% in those over the age of 80 years (Table 1) (chi-square test for linear trend, 6198.86 with 1 d.f.; P < 0.0001).

Patients with HF constituted a population of advanced age. The mean age was 77.62 ± 12.47 years. The women were older than the men: 78.97 ± 11.90 versus 75.55 ± 12.98 years, for a difference of 3.41 years (95% CI 2.08–4.74).

This population exhibited a high rate of chronic comorbidity with a mean number of high-prevalence/high-impact chronic diseases of 5.2 ± 2.13, with no significant differences between men and women (Mann–Whitney U-test; P = 0.125). Only 3% of the patients had isolated HF and >60% of them had four or more chronic problems in addition to HF (Table 2). After adjustment for age and sex, the association of five or more diseases was 3.84-fold more frequent in HF patients than in the general population (95% CI 3.53–4.16).

Table 3 shows the observed and expected prevalences of high-prevalence/high-impact chronic diseases associated with HF, assuming the mutual independence of the associated disease and HF, adjusted for age and sex and the observed prevalence to expected prevalence ratios and their corresponding CIs. Practically, all the diseases studied, independently of age and sex, were found more frequently in the patients with HF than in the general population. The prevalences of heart valve disease, cardiac arrhythmia, chronic renal failure, chronic respiratory disease, ischaemic heart disease and chronic skin ulcers are more than twice as high as those expected.

Discussion

HF is a problem of unclear magnitude. In our study, the prevalence of HF treated in family medicine offices is 6.9\%. The morbidity treated in primary care approximates that encountered in population-based studies since, at the end of any given year, 75% of the

### Table 1

<table>
<thead>
<tr>
<th>Years</th>
<th>Women</th>
<th>Men</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>0.3 (0.1–0.5)</td>
<td>0.3 (0.1–0.4)</td>
<td>0.3 (0.2–0.4)</td>
</tr>
<tr>
<td>40–49</td>
<td>0.8 (0.4–1.3)</td>
<td>0.6 (0.3–1.1)</td>
<td>0.7 (0.4–1.0)</td>
</tr>
<tr>
<td>50–59</td>
<td>2.5 (1.6–3.7)</td>
<td>3.5 (2.3–4.6)</td>
<td>2.9 (2.2–3.8)</td>
</tr>
<tr>
<td>60–69</td>
<td>7.0 (5.4–9.0)</td>
<td>9.9 (7.7–12.5)</td>
<td>8.3 (6.9–9.9)</td>
</tr>
<tr>
<td>70–79</td>
<td>27.0 (23.8–30.5)</td>
<td>29.7 (25.8–34.2)</td>
<td>28.1 (25.6–30.8)</td>
</tr>
<tr>
<td>&gt;80</td>
<td>71.9 (65.7–78.4)</td>
<td>82.1 (72.5–92.5)</td>
<td>75.1 (69.8–80.6)</td>
</tr>
<tr>
<td>Total</td>
<td>7.9 (7.4–8.5)</td>
<td>5.9 (5.5–6.4)</td>
<td>6.9 (6.6–7.3)</td>
</tr>
</tbody>
</table>

The values correspond to every 1000 assigned patients.
The population has visited his or her family physician and, over a 5-year period, nearly the entire population has sought medical attention. Patients with HF first consult their family physicians. Although clinical practice guidelines recommend that the diagnosis of HF be based on objective tests, family physicians make this diagnosis on the basis of clinical symptoms and signs and, when they resort to diagnostic tests, electrocardiography and chest x-ray are those most widely used, while echocardiography is employed in less than a third of the cases; thus, the possible classification biases make it difficult to extrapolate the prevalence of treated HF to the prevalence in the general population.

The data for this study are provided by a clinical/administrative database, a circumstance that has allowed us to include all the patients received and all the visits to all the physician’s offices throughout 2007; consequently, the sample was not selected. However, these databases introduce study biases involving the quality, validity and thoroughness of the data; thus, we selected the physicians whose records we considered most reliable in terms of quality. Another limitation to the extrapolation of the data to the general population is the fact that the study population was limited to those individuals over 14 years of age.

The authors of a Spanish study carried out in a general population aged over 45 years found a prevalence of 6.8%. However, the age-specific prevalence in the groups comparable to those of our study was lower in all of them. In three British studies in which, as in our study, a pragmatic case definition was utilized, the prevalence values were similar to those observed by us. As in the studies of Hood et al. and Majeed et al., the crude prevalence was higher in women than in men (7.9 versus 5.9%); however, in the age groups, the prevalence is higher in men than in women, and thus, the differences are confounded by age.

Family physicians treat patients with multiple chronic problems. Patients with HF exhibit a higher co-morbidity than other chronically ill patients. Although co-morbidity is common and is increasing, our knowledge of the tendency of certain diseases to occur as a group is limited. In our study, >60% of the patients had four or more high-prevalence/high-impact chronic diseases, and only 3% had isolated HF.

HF is associated with cardiac and non-cardiac diseases; the latter are particularly common in elderly individuals. In our study, the most prevalent diseases include non-cardiac processes: hypertension, hyperlipidaemia, obesity, diabetes, anxiety/depression, chronic renal failure and cerebrovascular disease. However, when adjustment is made for age and sex, cardiac diseases acquire greater weight; among them are cardiac valve disease, cardiac arrhythmia and ischaemic heart

<table>
<thead>
<tr>
<th>EDC</th>
<th>Observed prevalence HF (%)</th>
<th>Expected prevalence HF (%)</th>
<th>SMR+</th>
<th>95% CI lower</th>
<th>95% CI upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac valve disease</td>
<td>74.07</td>
<td>21.77</td>
<td>3.40</td>
<td>2.63</td>
<td>4.18</td>
</tr>
<tr>
<td>Cardiac arrhythmia</td>
<td>453.16</td>
<td>153.53</td>
<td>2.95</td>
<td>2.68</td>
<td>3.22</td>
</tr>
<tr>
<td>Chronic renal failure</td>
<td>155.41</td>
<td>56.27</td>
<td>2.76</td>
<td>2.33</td>
<td>3.20</td>
</tr>
<tr>
<td>Emphysema, chronic bronchitis COPD</td>
<td>182.28</td>
<td>71.87</td>
<td>2.54</td>
<td>2.17</td>
<td>2.90</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>135.08</td>
<td>59.31</td>
<td>2.28</td>
<td>1.89</td>
<td>2.66</td>
</tr>
<tr>
<td>Chronic skin ulcer</td>
<td>70.44</td>
<td>32.14</td>
<td>2.19</td>
<td>1.68</td>
<td>2.70</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>38.49</td>
<td>20.47</td>
<td>1.88</td>
<td>1.29</td>
<td>2.47</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>139.43</td>
<td>80.47</td>
<td>1.73</td>
<td>1.45</td>
<td>2.02</td>
</tr>
<tr>
<td>Generalized atherosclerosis</td>
<td>85.69</td>
<td>50.15</td>
<td>1.71</td>
<td>1.35</td>
<td>2.07</td>
</tr>
<tr>
<td>Diabetes</td>
<td>318.81</td>
<td>188.43</td>
<td>1.69</td>
<td>1.51</td>
<td>1.88</td>
</tr>
<tr>
<td>Obesity</td>
<td>324.62</td>
<td>223.23</td>
<td>1.53</td>
<td>1.37</td>
<td>1.70</td>
</tr>
<tr>
<td>Parkinson's disease</td>
<td>29.77</td>
<td>21.58</td>
<td>1.38</td>
<td>0.88</td>
<td>1.88</td>
</tr>
<tr>
<td>Schizophrenia and affective psychoses</td>
<td>12.35</td>
<td>9.06</td>
<td>1.36</td>
<td>0.60</td>
<td>2.12</td>
</tr>
<tr>
<td>Asthma</td>
<td>61.73</td>
<td>45.69</td>
<td>1.35</td>
<td>1.01</td>
<td>1.69</td>
</tr>
<tr>
<td>Anxiety and depression</td>
<td>276.69</td>
<td>217.99</td>
<td>1.27</td>
<td>1.12</td>
<td>1.42</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>172.84</td>
<td>136.26</td>
<td>1.27</td>
<td>1.08</td>
<td>1.46</td>
</tr>
<tr>
<td>Disorders of lipid metabolism</td>
<td>388.53</td>
<td>329.53</td>
<td>1.18</td>
<td>1.06</td>
<td>1.30</td>
</tr>
<tr>
<td>Hypertension</td>
<td>680.46</td>
<td>579.23</td>
<td>1.17</td>
<td>1.09</td>
<td>1.26</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>66.81</td>
<td>58.01</td>
<td>1.15</td>
<td>0.88</td>
<td>1.43</td>
</tr>
<tr>
<td>Degenerative joint disease</td>
<td>94.41</td>
<td>82.26</td>
<td>1.15</td>
<td>0.92</td>
<td>1.38</td>
</tr>
<tr>
<td>Dementia and delusions</td>
<td>51.56</td>
<td>47.99</td>
<td>1.07</td>
<td>0.78</td>
<td>1.37</td>
</tr>
<tr>
<td>Malignant neoplasms</td>
<td>112.56</td>
<td>104.94</td>
<td>1.07</td>
<td>0.87</td>
<td>1.27</td>
</tr>
<tr>
<td>Deafness, hearing loss</td>
<td>93.68</td>
<td>91.63</td>
<td>1.02</td>
<td>0.82</td>
<td>1.23</td>
</tr>
<tr>
<td>Benign prostatic hyperplasia</td>
<td>86.42</td>
<td>91.92</td>
<td>0.94</td>
<td>0.74</td>
<td>1.14</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>99.49</td>
<td>106.46</td>
<td>0.93</td>
<td>0.75</td>
<td>1.12</td>
</tr>
</tbody>
</table>

+Standardized morbidity ratio according to age and sex.
disease, all of which are included among the reported causes of HF. Some of these associations have been reported in other Spanish studies.\textsuperscript{27,28}

Patients with HF constitute a subpopulation with a much higher prevalence of other diseases than that observed in the general population. It is an elderly population but, after adjustment for age and sex, the diseases studied continue to show a much higher prevalence than that observed in the general population. This coexistence of diseases has relevant clinical implications that complicate the treatment of patients with COPD; because of the common clinical signs, the diagnosis is delayed in \(\sim 20\%\) of these cases, which, moreover, are usually deprived of the beneficial effect of beta-blockers.\textsuperscript{25,30} There is, also frequent, an association with anxiety/depression, although risk of death is not increased by this association, it substantially increases the use of health services and adds uncertainty to the use of some antidepressants drugs.\textsuperscript{31,32}

Conclusions

HF is a common disease in family medicine offices and its prevalence increases with age; thus, owing to the aging of the population; it will be detected with increasing frequency. These patients comprise a population with a high co-morbidity, both cardiac and non-cardiac, that poses clinical and organizational challenges. Consequently, caring for these patients requires integrated services, with polyvalent professionals capable of dealing with their problems and work in coordination with other professionals when necessary.

Declaration

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Ethical approval: all patient registration data will be treated confidentially according to the Spanish Organic Law on Data Protection of 1999. Patients were registered by age and sex only. No electronic patient identifier was used, and there was no information that can be used to identify individual registry patients by personal analysis of the data. The identity of the participating was considered to be confidential information.

Conflict of interest: the authors declare that they have no competing interests.

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Appendix 1

List of high-prevalence/high-impact expanded diagnosis clusters (EDCs)

1. Hypertension (with and without complications)
2. Anxiety/depression
3. Disorders of lipid metabolism
4. Obesity
5. Thyroid disease
6. Diabetes (with and without complications)
7. Asthma
8. Osteoporosis
9. Cardiac arrhythmia
10. Deafness, hearing loss
11. Malignant neoplasms
12. Degenerative joint disease
13. Benign prostatic hypertrophy
14. Emphysema, chronic bronchitis, COPD
15. Generalized atherosclerosis
16. Cerebrovascular disease
17. Glaucoma
18. Ischaemic heart disease (excluding acute myocardial infarction)
19. Chronic liver disease
20. Chronic renal failure
21. Congestive heart failure
22. Schizophrenia and affective psychosis
23. Dementias and delusions
24. Chronic skin ulcer
25. Cardiac valve disease
26. Parkinson’s disease