Research Article

Prevalence of Chronic Heart Failure in a General Practice Study Performed in the Autonomous Province of Bolzano, Italy

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ABSTRACT

Background: Estimates of chronic heart failure prevalence provided by population-based studies differ from those derived from administrative and general practice databases. Chronic heart failure prevalence in the general practice population of the Autonomous Province of Bolzano is unknown.

Methods: In a general practice study, practitioners documented all patients diagnosed with chronic heart failure. A random sample of these cases was referred to hospital-based specialists for diagnostic validation. Descriptive statistics were used to present the data.

Results: Thirty nine general practitioners participated. Out of 67,256 subjects cared by the general practitioners, 693 patients were diagnosed, during a consecutive 12 week period, with chronic heart failure representing 1.03% (males 47%, average age 75.1 years, age range 30-95; females 53%, average age 79.6 years, age range 43-97). Prevalence were 1.1% (CI 95%, 0.9-1.3) in patients aged >18 years (N=61,758), 2.2% (2.0-2.4) in the >45 years of age group (N=32,614) and 4.7%

(4.3-5.0) in the >65 years of age group (N=13,821). At the time of inclusion, 76% had undergone at least one echocardiography, 82.4% thoracic x-ray, and 93.9% electrocardiogramm tests; the original reports for these investigations were available in 81.1%, 87.9% and 88.2% of cases, respectively. The majority these patients were in early, low-severity stages of the disease. Validation by specialists of a random sample of 292 of these patients failed to confirm diagnosis in 38 cases (13%).

Conclusion: The crude point prevalence rates of chronic heart failure in our general practice population matches those reported for other Italian regions. In the >65 years of age group, prevalence rates are lower than those reported for other European regions. Since rural communities are prevalent in the Province of Bolzano, data suggest that living in a rural setting may be associated with changes in heart failure prevalence. Specialist involvement in heart failure care is recommended.

Keywords: General practice; Heart failure; Burden; Diagnosis

What do we know?

Key to reducing mortality, morbidity and costs associated with congestive heart failure is early, accurate diagnosis and appropriate management. Confidence varies among professional groups in diagnosing congestive heart failure.

What does this paper add?

Prevalence rates of chronic heart failure in general practice in South Tyrol match those reported for other Italian regions, however, in the elderly population they are lower than those generally reported. Efforts should be made to assure correct early diagnosis of congestive heart failure particularly in the elderly.

Abbreviations: CHF: Congestive Heart Failure; CI: Confidence Index; ECG: Electrocardiogram; GP: General Practitioner; NYHA: New York Heart Association

Background

Chronic heart failure (CHF) is among the most important

public health concerns because of increasing prevalence and hospitalization rates. Key to reducing mortality, morbidity and costs associated with CHF is early, accurate diagnosis and appropriate management [1].

Surveillance of CHF is conducted using survey, hospital or administrative health data, all of which have limitations. The prevalence and incidence of CHF using hospital data alone likely underestimated the population rates [2]. Today, more patients are diagnosed as outpatients compared with a hospital setting [3]. Population-based studies have shown over time that incidence rates are stable or even decrease while survival improved, however, prevalence and mortality rates remained high [4,5]. Therefore, the heart failure epidemic is chiefly one of hospitalizations after the age of 65 years.

In responses to a survey in United Kingdom, it was found that confidence varied among professional groups in diagnosing CHF due to left ventricular systolic dysfunction (95% of cardiologists, 93% of general physicians, 66% of general practitioners and 32% of heart failure nurses); for CHF with preserved ejection fraction, confidence levels were much lower (58% of cardiologists, 43% of general physicians, 7% of GPs and 6% of heart failure nurses); importantly, only up to a third of respondents used natriuretic peptides for diagnosis [6]. As such kind of uncertainties translate into evidence-practice mismatch for CHF diagnosis and management, difficulties are faced by clinicians in implementing current guidelines.

In the Autonomous Province of Bolzano in Italy, the adjusted hospitalization rate for CHF in 2014 was 4.48 patients per 1,000 inhabitants which is significantly higher than the Italian median (adjusted risk ratio 1.19, p<0.001) [7]. Although 30 day post-discharge mortality and readmission rates were not different from the Italian median (104/1089, 9.6%, and 143/799, 17.9%, versus 10.3% and 14.8%, respectively) [7], the high hospitalization rate of patients with CHF warrants better understanding of why this difference might exist. Inaccurate, and consequently late, CHF diagnosis may contribute to management problems. Therefore the burden of CHF as assessed in this investigation in South Tyrol is presented. In the study, prevalence rates of CHF as seen by general practitioners were evaluated and, in a subgroup, it was tested in what proportion of CHF of patients seen by general practitioners the diagnosis is confirmed by general physicians or cardiologists.

Methods

Participating general practitioners and inclusion/exclusion criteria for patients

South Tyrol has a gate-keeper system of care and patients have to be inscribed to one surgery. Any visit to another doctor – general practitioner or specialist – without referral has to be paid on private base. Medications possible to prescribe are sufficient for a maximum of 3 months, usually 2 months. All 270 registered general practitioners in South Tyrol were invited to participate. The participating general practitioners were reimbursed with 1000-2500 € for the whole study, the total depending on the number of documented patients.

All inscribed patients aged 18 years or over who had been registered with the practice for at least one year and had who CHF according to the general practitioners were included. A computer-generated random sample of all included patients had, if the patient agreed, to undergo further investigations by specialists and by echocardiography.

Patients with less than six months of life expectancy were excluded.

The first 40 general practitioners to respond to the invitation for participation were included in 2009. One dropped out after inclusion. The remaining 39 general practitioners who participated in the study offered primary care to a population of 67,256 citizens (on average 1,725 persons per physician). Males were over-represented among the participating GPs (91% compared to 74% male doctors on average in South Tyrol). Their age range was 38-65, average 55 years (average age of doctors in South Tyrol: 55; range: 27-69).

Ethical approval

Ethical approval for the study was obtained from the South Tyrolean Public Health Service Ethics Committee. All data obtained from the general practices were pseudoanonymized/acronymized by the general practitioner (only the treating physician knew the key for code numbers). An informed consent form was signed by all patients who later took part in the part of validation by specialists.

Specialist validation of congestive heart failure diagnosis by cardiologists and general physicians

A random sample of patients was referred to specialists. For the validation process, information from the general practitioner about case history, previous medical reports and patient examination findings was placed at the disposal of the specialists. On the basis of relevant international guidelines, five participating specialists defined criteria for diagnosis and treatment of CHF they would use in the validation assessment of the patients, and the treatment given by the general practitioners, before the start of the study. According to these criteria, diagnosis of CHF was based on clinical presentation, echocardiographic findings, past medical history as documented in medical reports, and the current clinical picture under treatment. A five-point Likert scale ranging from "quite sure" to "unsure" or "not present" was used to determine presence or absence of CHF as seen by the specialists. Those being marked as "not present" or "unsure", were recorded as not having CHF.

Measurement of plasma natriuretic peptide was not a requirement for study participation and was not uniformly available when the study was performed.

Data analysis and statistics

Prevalence rates were based on the total number of included patients corrected by extrapolations from the sample of validated patients which comprised 40% of the total. Age-specific prevalence was calculated for corresponding age groups of patients in all the participating practices (number of inscribed persons over 18 yrs. of age at the beginning of the study). Descriptive statistics were used

and confidence intervals were calculated using the statistics tool in Microsoft Excel's Data Analysis.

Results

Over the initial 12 week period of investigation, during which patients with CHF had to visit their GPs at least once for continuation of chronic drug therapy (prescriptions cover a maximum of 8 weeks), 693 patients (males 47%, average age 75.1 years, age range 30-95; females 53%, average age 79.6 years, age range 43-97) were identified as having CHF.

Table 1: Characteristics of patients with general practitioners' diagnosis of chronic heart failure.

Characteristics	Study Population (N=61,578)		
	No.	%	95% CI
CHF prevalence>18 years	693	1.1	1.0-1.2
	Chronic Heart Failure (N=693)		
	No.	% or Mean	95% CI or SD
Age (years)	693	77.5	9.0
Age at onset (years)	693	72.0	8.8
BMI (kg m^{-2})	693	26.5	4.6
BMI>30	141	20.3	17.5-23.5
Waist circumference (cm)	693	98	13.0
Ever smoked, yes	216	31	27.8-34.5
Alcohol excess§	87	13	10.3-15.2
Family history of cardiomyopathy	178	26	22.5-29.0
Physical activity, yes†	298	43	39.3-46.7
Heart rate (beats per min)	693	75.0	12.0
Arrhythmia	332	47.8	44.1-51.5
Systolic BP (mm Hg)	693	135	18.9
Diastolic BP (mm Hg)	693	78	9.6

§Alcohol excess defined as more than two alcohol units daily for a woman and more than three for a man – 1 unit=1 glass of wine (125 ml) or 1 beer (330 ml)

†Physical activity defined as more than 30 min of moderate physical activity on five days a week or more than 20 min intensive activity on three days a week

Abbreviations: CHF: Chronic Heart Failure; BMI: Body Mass Index; BP: Blood Pressure

Altogether, 86 of eligible subjects were excluded based on given criteria. Patient characteristics are presented in Table 1.

On average, patients identified by their general practitioners with CHF had been initially diagnosed five years before study recruitment, and in 71% of cases this was done either in the hospital or by a cardiologist or general physician. At the time of inclusion, 76% had undergone at least one echocardiography, 82.4% thoracic x-ray and 93.9% ECG tests; the original reports for these investigations were available in 81.1%, 87.9% and 88.2% of cases, respectively. According to the available echocardiographic data, 21.6% had diastolic dysfunction, and 9.1% had normal findings. The rest of CHF patients (69.3%) had left ventricular systolic dysfunction.

Based on general practitioners' diagnoses, the overall prevalence of CHF was 1.03% (693 cases of CHF out of 67,256 patients receiving primary care). It was 1.1% (CI 95%, 0.9-1.3) in patients aged >18 years (N=61,758), 2.2% (2.0-2.4) in the >45 years of age group (N=32,614) and 4.7% (4.3-5.0) in the >65 years of age group (N=13,821). Prevalence rates stratified by age group and sex are given in Table 2.

A 42% (N=292/693) random sample of the group of cases with CHF identified by general practitioners was presented to participating cardiologists or general physicians for validation of diagnosis. In thirty-eight of these 292 patients (13%) CHF was not confirmed. Deducing this 13% from the total number – the 693 initially seen by their general practitioners as having CHF – 603 confirmed CHF cases remain. Symptoms of the patients not confirmed by specialist referral but treated for CHF by their general practitioners are in NYHA classes I and II (29% class I; 60.2% class II). Almost 90% of those patients were in NYHA classes I and II; the female to male ratio was 1:1. On average, patients with confirmed CHF had three additional diseases (mean ± standard deviation, 2.8 ± 1.6); 56% suffered from two chronic diseases. More than 66% (CI 95%, 63-70) had arterial hypertension as the most frequent comorbidity (female 71%, male 61.5%). The second most common pathology was atrial fibrillation, 46% (CI 95%, 42-49). In this respect, there was a difference between male and female patients (female 50.4%, male 40.3%; p<0.01). Coronary heart disease was present in 35% of the patient collective (CI 95%, 32-39), with a

Table 2: Estimates of chronic heart failure prevalence by age groups and by gender.

	Study Population								P-Value*
	Male (N=30,278)				Female (N=31,300)				
CHF Prevalence	N	CHF	%	95% CI	N	CHF	%	95% CI	Male vs. Female
18-64 years	24414	39	0.2	0.1-0.2	23343	11	0.0	0.0-0.0	<0.001
65-74 years	3432	104	3.0	2.5-3.7	3826	72	1.9	1.5-2.4	0.002
75-84 years	1961	132	6.7	5.7-7.9	2964	188	6.3	5.5-7.3	0.6
>84 years	471	50	10.6	8.0-13.8	1167	97	8.3	6.8-10.0	0.2

*P-value calculated by chi-squared test

§Alcohol excess defined as more than two alcohol units daily for a woman and more than three for a man – 1 unit=1 glass of wine (125 ml) or 1 beer (330 ml)

†Physical activity defined as more than 30 min of moderate physical activity on five days a week or more than 20 min intensive activity on three days a week

Abbreviations: CHF: Chronic Heart Failure; BMI: Body Mass Index; BP: Blood Pressure

difference between males and females (female 32%, male 39%; p=0.042). Diabetes mellitus was present in 23% (CI 95%, 20-26), dyslipidemia in 22%, COPD in 18% (male 23%, female 14%; p<0.01), depression in 14% (male 7.7%, female 19%; p<0.01) and chronic renal insufficiency in 13%.

Discussion

Epidemiological studies based on survey, hospital and administrative data reported prevalence rates of CHF ranging from 1,1% to 3,1% for age ranges from 18 to 45 years on [8-11]. In two studies including only aged people (65 and over), prevalence rates were around 7% ranging from 4% in women to 10% in men [12,13]. The prevalence rates for CHF we have identified in general practices in the >18 years of age population of 1.1% is well in the range of the reported literature. However, the prevalence rate of 4.7% found in persons aged ≥ 65 is lower than what is published in the literature as European prevalence rate for older adults [14,15]. This finding may suggest that a significant portion of CHF patients in South Tyrol are undiagnosed, which is not uncommon particularly in the elderly [16]. The fact that general practitioners' CHF diagnoses were not specialist-confirmed in 13% of cases, does not contradict that CHF cases remain undiagnosed.

From a perspective of care, patients inappropriately diagnosed with CHF will be treated inappropriately, even though some would be prescribed medications similar to those administered for CHF, since most of those patients suffered from hypertension, for which identical drugs are recommended. However, these cases do not explain why there are excess hospitalizations of patients with CHF in South Tyrol; thirty-day post-discharge mortality and readmission rates in the expected range [7] suggest that, once correctly diagnosed, CHF patients receive appropriate treatment and standard of care.

CHF prevalence rises sharply among those aged 85 years and over and the majority of those is symptomatic und undiagnosed [16]. As there is limited awareness of CHF among older patients despite having clinical encounters during which CHF is diagnosed, self-reported CHF is an insensitive method for accurately identifying CHF cases [17]. Clinical symptoms suggestive of heart failure are frequently attributable to non-cardiac disorders [18]. The high prevalence of preclinical CHF in the elderly is mainly due to CHF with preserved systolic function [19]. Such patients typically have preclinical diastolic dysfunction, which is associated with development of symptomatic heart failure and hospitalization during follow-up [20,21]. Diagnostic biomarker use, circulating natriuretic peptide levels, were considered in CHF diagnoses by all, general practitioners and specialists, if available, however, was not implemented as part of the diagnostic pathway at the time the study was performed. It may therefore be useful to re-evaluate CHF diagnoses according to updated guideline recommendations, including determination of circulating natriuretic peptide levels [22] and eventual obligatory referral to specialists.

We analyzed the prevalence in a gate-keeping system where inscription of all inhabitants is obligatory and visits to other doctors cost money. We had a long enough period of inclusion (3 months) to make a visit to the general practitioner necessary at least once because of the size of packages of medication. We verified diagnosis by cardiologists in nearly half the sample. And we paid general practitioners by the number of included patients taking part. All of these conditions and variables make it very likely that we have included all patients being treated for CHF.

Limitations

As a limitation, even though current guidelines recommend the use for circulating natriuretic peptide level determinations in situations of diagnostic uncertainty, no systematic data on circulating natriuretic peptide had been collected in this study. Since a significant proportion of CHF patients were diagnosed before this tool had been established, the epidemiologic suggestion of a higher number of undiagnosed CHF patients in South Tyrol as also the observed 13% rate of unconfirmed CHF diagnoses may be corrected by the now implemented incorporation of diagnostic biomarker use in disease management pathways.

Conclusion

In conclusion, the prevalence rates of CHF in our study match those reported in epidemiological European studies for the age groups lower than 65 years only. CHF prevalence data in the study population, however, are low in subjects aged 65 years and over, possibly because CHF is undiagnosed in elderly patient groups. Delayed diagnosis of CHF in these subjects may be responsible for excess hospitalization rates seen for South Tyrol in national monitoring data during the last years. Efforts should be made to assure correct early diagnosis of CHF in the elderly population of the Autonomous Province of Alto Adige.

AUTHORS CONTRIBUTIONS

GP performed the draft of this paper together with H-HA and CJW. ES performed the statistical analyses. AE and GP initiated the study and obtained the funding. H-HA and CJW supervised the project. All authors read and approved the final manuscript.

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