Baseline characteristics of Polish patients with heart failure with ejection fraction >40%: Results of HF-POL, the first study of the Heart Failure Association

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DOI: 10.33963/v.phj.99195

Received:
October 29, 2023

Accepted:
January 31, 2024

Early publication date:
February 27, 2024

INTRODUCTION

Heart failure (HF) is a significant clinical and economic problem. Especially in Poland, HF patients are often hospitalized, and HF-related mortality is on the increase. About half of the HF population has left ventricular ejection fraction (EF) >40%. According to the literature, patients with HF and EF >40% constitute a heterogenic group with geographic differences [1]. In fact, this group of patients has not been yet well characterized in Poland. This study aimed to provide the characteristics of the real-life Polish population with heart failure and EF >40%.

METHODS

HF-POL is the first Polish multicenter observational prospective study of patients with HF and EF greater than 40%. The study was conducted by the Heart Failure Association of the Polish Cardiac Society in cooperation with the Committee for Clinical Initiatives of the Executive Board as part of the Scientific Platform. Fourteen, Polish, cardiology clinical centers participated in the study. The data were obtained from clinical centers between October 2021 and July 2022. Clinical centers that were interested in participating in the trial and also signed the contract with the legal office were selected for the study. The study was approved by the Bioethics Committee at the Medical University of Lodz (No. RNN/240/21/KE; October 21, 2021, ClinicalTrials.gov Identifier: NCT06030661). Detailed inclusion and exclusion criteria and the study design have been previously published [2]. We collected selected data in eCRF platform (https://rejestr.gbbsoft.pl/hf-pol) including demographics, medical history, HF hospitalization and etiology, concomitant medications, physical examination, vital signs, electrocardiographic and transthoracic echocardiographic results, laboratory test results and comorbidities as well as a history of invasive cardiac procedures. Ambulatory patients were recruited based on the most recent test results from medical records, from the last 12 months. For hospitalized patients results from current hospitalization based on hospital discharge summary were used. We also collected data on past coronavirus disease (COVID-19) infections and vaccination against COVID-19.

The patients with a previous episode of EF ≤40% were considered to demonstrate impro-

ved EF (HFimpEF) [1]. The studied patients were treated in the way recommended for hypertension, coronary artery disease, dyslipidemia, diabetes, and other comorbidities.

Additionally, this study described baseline characteristics of the HF-POL population in relation to the contemporary HF with EF >40% trials — DELIVER (Dapagliflozin Evaluation to Improve the Lives of Patients with Preserved Ejection Fraction Heart Failure) [3] and EMPEROR-Preserved (The Empagliflozin Outcome Trial in Patients with Chronic Heart Failure with Preserved Ejection Fraction) [4].

Statistical analysis

While describing quantitative variables with normal distribution the mean and standard deviation were used, for non-normal distribution, the median and interquartile range were used. The normality of variables was verified using the Shapiro–Wilk test for normality. For categorical variables, the number of observations for each category (n) with the corresponding percentage (%) was given.

To compare the characteristics of the study population with those of the EMPEROR-Preserved and DELIVER trials, pooled means and variances were determined based on available information on the placebo and empagliflozin/dapagliflozin groups. Then, for quantitative variables, Student's t-test was used and for qualitative variables, we applied Pearson's χ^2 test of independence.

P <0.05 was adopted as statistically significant. The calculations were made with the use of the STATISTICA PL 13.3 statistical package.

RESULTS AND DISCUSSION

In total, 1497 consecutive patients were included in the study. The baseline characteristics of the studied population are shown in Table 1. The HF-POL patients were elderly and mostly male.

The majority had a history of HF. However, one-fourth were diagnosed with *de novo* HF. HF hospitalization in the last 12 months was reported in one-third of the studied patients, and half of them were hospitalized three times within the last year. A history of improved EF from less than ≤40% was reported in 14.6% of the patients. Overall, the patients were very symptomatic, and half of them had New York Heart Association functional class III or IV symptoms, and non-ischemic etiology of HF was dominant (Table 1).

The patients had many comorbidities. The most common were hypertension, dyslipidemia, atrial fibrillation, type 2 diabetes, and chronic kidney disease (Table 1).

Some patients (13.5%) had SARS-CoV-2 infection in their history. Most of the studied population was vaccinated against COVID-19 (73.8%), and 60% of that group received 3 doses.

Median left ventricular ejection fraction was 50% (interquartile range [IQR] 45–55), and the N-terminal pro B-type natriuretic peptide (NT-proBNP) level was 1617 pg/ml (IQR 557.5–3936). The median systolic blood pressure was 139 (IQR 119–142) and diastolic 76 (IQR 70–83) mm Hg. Detailed laboratory test results and selected echocardiographic examination results are shown in Supplementary material, *Table S1*.

Most of the studied patients received beta-blocker therapy, angiotensin-converting enzyme inhibitors, or

Table 1. Baseline characteristics of HF-POL patients

Variable	Number of available cases	Values
Age, years, median (Q1–Q3)	1497	75 (68–82)
Women, n (%)	1497	711 (47.5)
HF history, n (%)	1497	1175 (78.49)
Prior HF hospitalization within 12 months, n (%)	1497	441 (29.46)
de novo HF, n (%)	1497	322 (21.51)
Ambulatory patients, n (%)	1497	548 (36.61)
NYHA		
I, n (%)	1375	145 (10.55)
II, n (%)	1375	532 (38.69)
III, n (%)	1375	481 (34.98)
IV, n (%)	1375	217 (15.78)
EF, %, median (Q1–Q3)	1497	50 (45–55)
BMI, kg/m^2, median (Q1–Q3)	1366	29 (26–33)
Comorbidities		
Hypertension, n (%)	1497	1265 (84.44)
Dyslipidemia, n (%)	1496	886 (59.2)
eGFR <60 ml/min/1.73 m^2, n (%)	1278	827 (64.7)
History of atrial fibrillation, n (%)	1497	732 (48.90)
Type 2 diabetes, n (%)	1497	559 (37.34)
Obesity, n (%)	1496	555 (37.10)
Ischemic etiology of HF, n (%)	1497	607 (40.55)
History of myocardial infarction, n (%)	1497	359 (23.98)
History of stroke, n (%)	1497	142 (9.49)
Smoking history (present or past), n (%)	1497	665 (44.42)
Coronary angiography in the last 12 months, n (%)	1017	369 (36.3)
3 — coronary artery disease, n (%)	369	87 (23.6)
2 — coronary artery disease, n (%)	369	69 (18.7)
1 — coronary artery disease, n (%)	369	83 (22.5)
Therapy		
LBA, n (%)	1463	1213 (82.91)
Statins, n (%)	1463	1021 (69.79)
ACEi, n (%)	1463	816 (55.78)
ARB + ARNI, n (%)	1463	243 (16.61)
MRA, n (%)	1463	690 (47.16)
Antiplatelet, n (%)	1463	555 (37.94)
Calcium blockers, n (%)	1463	486 (33.2)
Digoxin, n (%)	1463	154 (10.53)
Nitrate, n (%)	1463	153 (10.46)
Amiodarone, n (%)	1463	136 (9.30)
Thiazide diuretics, n (%)	1463	126 (8.61)
Ivabradine, n (%)	1463	24 (1.64)
Non-cardiovascular drugs, n (%)	1497	351 (23.45)
Pacemaker, n (%)	1497	222 (14.83)
ICD or CRT-D, n (%)	1497	76 (5.08)

Abbreviations: ACEi, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blockers; ARNI, angiotensin receptor-neprilysin inhibitor; BMI, body mass index; CRT-D, cardiac resynchronization therapy defibrillator; eGFR, estimated glomerular filtration rate; HF, heart failure; ICD, implantable cardioverter-defibrillator; LBA, beta-blockers; MRA, mineralocorticoid receptor antagonists; NYHA, New York Heart Association

angiotensin receptor blockers (Table 1). Mineralocorticoid receptor antagonists were reported in half of the population. Detailed pharmacotherapy data are shown in Table 1.

A comparison of baseline characteristics between the HF-POL population and the population from EMPEROR-Preserved and DELIVER trials is presented in Supplementary material, *Tables S2* and *S3*. The baseline characteristics of the studied HF-POL patients differed from those obtained in the EMPEROR-Preserved and DELIVER trials [3, 4]. In the HF-POL study, the representation of females was slightly higher, the patients were older, more symptomatic, with higher heart rates and higher NT-proBNP levels and higher rates of HF hospitalization in the last 12 months. They also were more burdened with chronic kidney disease.

In the HF-POL population, fewer patients received angiotensin-converting enzyme inhibitors or angiotensin receptor blockers treatment than in the DELIVER and EMPEROR-Preserved trials. However, contrary to those trials, Polish patients more frequently had mineralocorticoid receptor antagonists and implantable devices. Only 13% of the studied patients were treated with sodium-glucose co-transporter 2 inhibitor (SGLT2i). It should be emphasized that the lack of recommendations for SGLT2i in HF patients with EF >40% in the 2021 European Society of Cardiology guidelines and also barriers to or lack of reimbursement in Poland [5], which is associated with the time of recruitment for the study, resulted in the small number of patients on SGLT2i therapy in the studied population.

The recently published (2023) American College of Cardiology Expert Consensus and 2023 Focused Update of the 2021 European Society of Cardiology Guidelines for the diagnosis and treatment of acute and chronic heart failure, recommended SGLT2i in HF patients with preserved EF and HF patients with mildly reduced EF [6, 7].

In summary, the HF-POL study was the first real-life and the largest Polish multicenter study on patients with HF and EF >40%. The Polish population with HF and EF >40% is older, with high NT-proBNP levels, high rates of HF hospitalization, and a burden of many comorbidities.

Study limitations

HF-POL patients were recruited in selected centers, which might have affected the studied population and results should not be generalized. The patients were enrolled during the COVID-19 pandemic, which might have had an impact on the standards of patient care. A comparison between HF-POL and the EMPEROR-Preserved and DELIVER trials was not made based on patient-level data also the construction of the trials was different; however, those two trials constitute important milestones for researching the HF population with EF >40%.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/polish_heart_journal.

Article information

Conflicts of interest: KM and MS — involved in clinical trials from Novo Nordisk. MB — declares no conflict of interest. MGąs — received lecture and consulting fees from Amgen, AstraZeneca, Bayer, Berlin Chemie Menarini, Boehringer-Ingelheim, Ferrer, Novartis, and Sanofi. MGie — received lecture and consulting fees from Novartis, Servier, AstraZeneca, Boehringer Ingelheim, Bausch Health, and Bayer. MGra — received lecture and consulting fees from Amgen, AstraZeneca, Bayer, Berlin Chemie Menarini, Boehringer-Ingelheim, Ferrer, Novartis, and Sanofi. JDK — received lecture honoraria, grants, and sits on advisory boards of Adamed, AstraZeneca, Bausch Health, Bayer, Berlin-Chemie Menarini, Boehringer Ingelheim, Ewopharma, Novartis, Novo Nordisk, Pfizer, Polpharma, Sandoz, TEVA, Servier. BK — received lecture fees from Novo Nordisk, and Servier and was involved in clinical trials from Novo Nordisk, Applied Therapeutics, V-Wave, AstraZeneca, Faraday Pharmaceuticals, American Regent Inc., Ionis Pharmaceuticals Inc., Corvia Medical Inc., New Amsterdam Pharma BV, Impulse Dynamics, Servier, Janssen-Cilag, Boehringer Ingelheim. PK — received lecture fees from Boehringer Ingelheim and is involved in a clinical trial from Novo Nordisk. JNes — received lecture and consulting fees from Novartis, Servier, AstraZeneca, Boehringer Ingelheim, Bausch Health, Bayer, and Gedeon Richter and was involved in clinical trials from Novartis. JNie — received lecture and consulting fees from Novartis, SwixxBioPharma, AstraZeneca, and Boehringer Ingelheim and was involved in clinical trials from Novartis and Pfizer. AP — received lecture and consulting fees from Novartis, AstraZeneca, and Boehringer Ingelheim. ATK — received lectures and consulting fees from Novartis, Servier, AstraZeneca, Boehringer Ingelheim, Bayer, and Adamed and was involved in clinical trials from Novartis and Behringer Ingelheim. KW — received lecture and consulting fees from Novartis, Astra Zeneca. ML — received lecture and consulting fees from Novartis, Servier, AstraZeneca, Boehringer Ingelheim, Bausch Health, Bayer, Gedeon Richter, and was involved in clinical trials from Novartis, Novo Nordisk, and Boehringer Ingelheim.

Funding: None.

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