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# Prevalence and clinical features of heart failure in Greenland

Hjalte Erichsen Larsen[a,b], Uka Wilhjelm Geisler[b], Finn Gustafsson[c], Marit Eika Jørgensen[a,d,e] and Michael Lynge Pedersen[a,d]

[a]Greenland Center for Health Research, Institute of Health and Nature, University of Greenland, Nuuk, Greenland; [b]Medical Department, Queen Ingrid's Hospital, Nuuk, Greenland; [c]Department of Cardiology, Rigshospitalet, Copenhagen, Denmark; [d]Clinical Research, Steno Diabetes Center Greenland, Nuuk, Greenland; [e]Centre for Public Health in Greenland National Institute of Public Health, University of Southern Denmark, Denmark

**ABSTRACT**

Heart Failure (HF) constitutes a significant burden for healthcare around the world. In Greenland, risk factors like smoking, diabetes, and obesity are prevalent. Yet, the prevalence of HF remains unexplored. This register-based cross-sectional study uses data from the national medical record in Greenland to estimate the age- and gender-specific prevalence of HF and to describe the characteristics of patients with HF in Greenland. A total of 507 patients (26% women) with a mean age of 65 years were included based on a diagnosis of HF. The overall prevalence was 1.1% and higher among men compared to women (1.6% vs. 0.6%, $p < 0.05$). The highest prevalence was among men above 84 years (11.1%). More than half (53%) had a body mass index above 30 kg/m2 and 43% were current daily smokers. The proportion diagnosed with ischaemic heart disease (IHD) was 33%. The overall prevalence of HF in Greenland is consistent with that in other high-income countries, yet high among men in some age groups, compared to Danish men. Almost half the patients were obese and/or smokers. A low prevalence of IHD was observed indicating that other factors may play a role in developing HF among Greenlanders.

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## Introduction

Heart failure (HF) is a clinical syndrome characterised by symptoms (such as breathlessness, fatigue, and often accompanied by fluid overload) caused by impaired heart function. HF is associated with high mortality rates, hospitalisation, and a negative impact on daily living [1]. Mortality from HF is similar to that of common cancer diseases, with survival rates of 80%, 50% and 25% after 1, 5 and 10 years, respectively [2–5]. HF was the third most common reason for hospitalisation in the USA in 2018 [6]. Furthermore, HF patients have impaired physical and social functioning and decreased quality of life [7].

The prevalence of HF in high-income countries is 1–2% and increases with higher age [8–10]. Approximately 5% of people above 75 years and 10% above 85 years have HF [9,11]. The lifetime risk of developing HF at age 55 is 30% [12]. HF risk factors include age, sex, hypertension, ischaemic heart disease (IHD), diabetes and obesity [13–15].

The prevalence of HF in the Greenlandic population is unknown but proposed to be high due to a high prevalence of risk factors such as hypertension, diabetes and obesity, and 52% of the Greenlandic population are regular smokers [16,17]. Moreover, the Greenlandic population is growing older, although the life expectancy is still remarkably lower compared to the Danish population [18,19].

This study aims to use data from the electronic medical record (EMR) to estimate the age- and sex-specific prevalence of HF in Greenland and to describe the characteristics of patients with HF in Greenland.

## Methods

### *Design and setting*

The study was performed as an observational cross-sectional study based on data extracted from the EMR used by the healthcare system in Greenland. Greenland is the largest island in the World. It covers more than 2 million square kilometres. The population of Greenland is 56,421, of which 82% are Inuit when defining Inuit as born in Greenland and both parents also born in Greenland [20]. One third of the population lives in the capital Nuuk; the remaining population lives in 16 minor towns and around 60 smaller settlements along the coast. The healthcare system in Greenland is publicly funded and all healthcare

**CONTACT** Hjalte Erichsen Larsen hjel@peqqik.gl Greenland Center for Health Research, Institute of Health and Nature, University of Greenland, Dronning Ingridsvej 14, 503, 3900 Nuuk, Greenland

is delivered free of charge to all citizens in Greenland, including free medicine and dental care. The healthcare system is divided into five regions. Each region provides primary healthcare at a hospital in the largest town, healthcare centres in the remaining towns and healthcare clinics in the settlements. In addition to traditional outpatient primary care, some inpatient care, birth care, and minor surgical procedures are offered at regional hospitals and some healthcare centres. Specialised care is delivered by The National Hospital, Queen Ingrid's Hospital (QIH), in Nuuk or by a travelling specialist. Patients in need of highly specialised treatment are referred to treatment in Denmark.

All vital status information are registered in the national EMR, implemented from 2013 to 2017. Recorded data in the EMR is accessible nationwide; however, due to limited internet access, the Tasiilaq district in East Greenland is not sharing data with the remaining part of Greenland. All medications are prescribed electronically and are free of charge. All patients admitted to the department of internal medicine, Queen Ingrid Hospital, receive a diagnosis in the EMR. Diagnoses are recorded in the EMR according to the International Classification of Disease (ICD-10) [21], while primary care diagnoses are recorded according to the International Classification of Primary Care (ICPC-2) [22]. Patients suspected of HF are referred to the department of internal medicine, QIH, and examined in Nuuk or locally by a travelling cardiologist.

### Study population

All patients registered with a diagnosis of HF (see Appendix, Table A1) in the EMR were included in the study and interpreted as HF patients. Information about age, sex, height, weight, systolic and diastolic blood pressure, left ventricular ejection fraction (LVEF), and smoking status was extracted from the EMR on all patients with HF included in the study. Only the most recent registered information was used. Body-mass index (BMI) was calculated based on weight and height. BMI was categorised as underweight (<18.5 kg/m$^2$), normal (18.5–24.9 kg/m$^2$), overweight (25–29.9 kg/m$^2$) and obese (≥ 30 kg/m$^2$). LVEF was categorised as heart failure with reduced ejection fraction (HFrEF) (≤40%), heart failure with mildly reduced ejection fraction (HFmrEF) (41–49%) and heart failure with preserved ejection fraction (HFpEF) (≥50%). Blood concentrations of thyroid-stimulating hormone (TSH), glycosylated haemoglobin (HbA1c), lipids (low-density lipoprotein (LDL), high-density lipoprotein (HDL), total cholesterol and triglycerides), creatinine, estimated glomerular filtration rate (eGFR), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) were included. Only the most recent test results were included. Information on diabetes and IHD was based on registered diagnosis (see Appendix 1) in the EMR. Examination for suspected IHD in Greenland includes a coronary computed tomography angiography (CCTA) which is only performed during admission to the department of internal medicine at QIH. For patients with a documented coronary disease on CCTA, a discharge diagnosis of IHD will be registered in the EMR.

### Statistics

The prevalence of HF was calculated using 44,162 Greenlandic residents who were alive and aged 16 or above on the 1st of January 2022 [20]. A binomial generalised additive model with a diagnosis of HF as the response variable and age as the predictor variable was fitted for visualisation. Men and women were applied to this model separately. The continuous effect of age was assessed using a binomial generalised linear model with HF as the response variable and age as the predictor variable.

For comparison with data from other countries, patients were divided by sex and grouped into age groups. Prevalence with 95% confidence interval (CI) was determined for each of these groups. HF patients were grouped by sex and diagnosis of IHD for the presentation of characteristics. The probability distribution of continuous variables was assessed with a quantile-quantile plot. Mean and standard deviation (SD) were calculated for normally distributed continuous variables. Non-normally distributed continuous variables were presented as the median and interquartile range (IQR). Frequencies, categorical and continuous data were compared between sex and IHD groups using Fisher's exact test, Pearson's Chi-squared test, and Welch Two Sample t-test.

## Results

A total of 507 patients were identified with a diagnosis of HF. Of those, three were excluded due to age below 16 years. Prevalence estimates grouped by sex and age are presented in Table 1. The overall prevalence of HF in Greenland was 1.1% [1.1–1.3], with a male preponderance (74%). The prevalence increased with age. The prevalence among men in the age groups 55–64 years, 65–74 years, and 75–84 years was 2.7% [2.3–3.2], 5.7% [4.8–6.8], and 9.3% [7.3–11.8], respectively. The highest prevalence was among older men, 11.1% [5.3–21.3] of men above 85 years of age had HF. Age as a continuous variable had a significant association with HF (Odds

**Table 1.** Distribution of heart failure according to age and gender. Data are frequency/% [95% confidence interval].

| Age (years) | All patients | Female | Male |
|---|---|---|---|
| ≥16 | 504/1.14% [1.05–1.25] | 130/0.63% [0.53–0.75] | 374/1.60% [1.44–1.77] |
| 35–44 | 20/0.27% [0.17–0.42] | 7/0.20% [0.09–0.43] | 13/0.33% [0.18–0.58] |
| 45–54 | 48/0.70% [0.53–0.94] | 12/0.39% [0.21–0.70] | 36/0.97% [0.69–1.35] |
| 55–64 | 168/1.96% [1.68–2.29] | 40/1.03% [0.75–1.42] | 128/2.73% [2.29–3.24] |
| 65–74 | 156/4.17% [3.56–4.88] | 35/2.15% [1.52–3.01] | 121/5.74% [4.80–6.84] |
| 75–84 | 92/6.82% [5.56–8.34] | 28/4.25% [2.89–6.16] | 64/9.29% [7.28–11.77] |
| 85+ | 13/6.74% [3.78–11.49] | 5/4.13% [1.53–9.86] | 8/11.11% [5.26–21.26] |

ratio, 1.09; 95% CI, 1.08–1.09; $P < 0.001$). Figure 1 presents the prevalence of HF according to age and sex.

### *Characteristics*

The mean age was 64.9 (standard deviation 12.8), with no difference between men and women. The overall percentage of daily smokers was 43% (men 44%, women 39%). More than half (53%) had a BMI of 30 kg/m$^2$ or above. A diagnosis of diabetes was present in 24% of the patients (men 24%, women 22%). A third was diagnosed with IHD (33%), more frequent among men than women (37% vs 23%, $P = 0.004$). Nearly half were diagnosed with HFrEF (49%), 24% with HFmrEF and 27% with HFpEF. The sex-specific characteristics of patients with HF are presented in Table 2.

Table 3 shows the characteristics of HF patients grouped by diagnosis of IHD. Of those diagnosed with IHD, 82% were men. Total cholesterol was lower among those diagnosed with IHD (no IHD 4.51 mmol/L, IHD 4.22 mmol/L, $P < 0.001$).

## Discussion

The prevalence of diagnosed HF in Greenland in 2022, based on data from the EMR, was 1.1% and increased with age and male sex. The prevalence of obesity and smoking was high, and the prevalence of IHD was low.

### *Prevalence*

The prevalence found is comparable to that in high-income countries of 1–2% [8–10]. This was lower than hypothesised based on the high prevalence of risk factors in Greenland. This may partly be explained by the fact that life expectancy in Greenland is ten years shorter than the average in high-income countries [18,19]. As life expectancy in Greenland is expected to rise, an increase in people with HF is anticipated

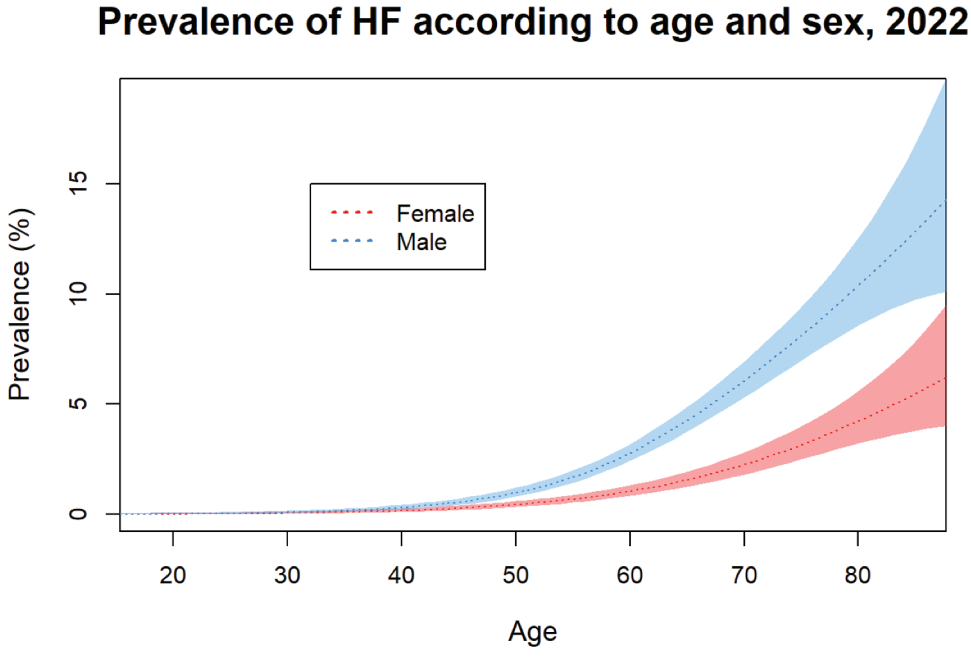


**Figure 1.** Estimated prevalence of HF in Greenland, 2022, based on registered ICD-2 code and ICPC-2 code for heart failure in the EMR. Shaded area shows 95% confidence interval.

**Table 2.** Characteristics according to gender. Data are frequency (%) unless stated otherwise.

| Variable | Overall (n = 504) | Female (n = 130) | Male (n = 374) | p-value[1] |
|---|---|---|---|---|
| **Age** (years, mean (SD)) | 64.9 (11.4) | 65.1 (12.8) | 64.9 (11.0) | 0.87 |
| **Smoking:** | | | | 0.45 |
| Yes | 148 (43%) | 34 (39%) | 114 (44%) | |
| No | 200 (57%) | 53 (61%) | 147 (56%) | |
| *Missing* | 156 | 43 | 113 | |
| **Body Mass Index:** | | | | |
| Median [IQR; kg/m$^2$] | 30.5 [26.2–35.1] | 31.5 [27.2–36.2] | 30.3 [26.0–34.6] | 0.13 |
| *Missing* | 151 | 43 | 108 | |
| **Body Mass Index, class:** | | | | 0.17 |
| Underweight (<18.5 kg/m$^2$) | 9 (2.5%) | 4 (4.6%) | 5 (1.9%) | |
| Normal (18.5–24.9 kg/m$^2$) | 55 (16%) | 10 (11%) | 45 (17%) | |
| Overweight (25–29.9 kg/m$^2$) | 101 (29%) | 21 (24%) | 80 (30%) | |
| Obese (≥30 kg/m$^2$) | 188 (53%) | 52 (60%) | 136 (51%) | |
| *Missing* | 151 | 43 | 108 | |
| **Systolic Blood Pressure:** | | | | |
| Mean (SD; mmHg) | 129 (20) | 126 (20) | 130 (20) | **0.048** |
| *Missing* | 49 | 10 | 39 | |
| **Diastolic Blood Pressure:** | | | | |
| Mean (SD; mmHg) | 78.2 (11.9) | 74.2 (11.0) | 79.6 (12.0) | **<0.001** |
| *Missing* | 49 | 10 | 39 | |
| **HbA1c:** | | | | |
| Mean (SD; mmol) | 45.1 (10.5) | 44.5 (9.6) | 45.3 (10.8) | 0.40 |
| *Missing* | 9 | 2 | 7 | |
| **LDL:** | | | | |
| Mean (SD; mmol/L) | 2.62 (1.09) | 2.75 (1.18) | 2.58 (1.06) | 0.15 |
| *Missing* | 14 | 2 | 12 | |
| **HDL:** | | | | |
| Median [IQR; mmol/L] | 1.10 [0.90–1.40] | 1.30 [1.00–1.60] | 1.10 [0.83–1.30] | **<0.001** |
| *Missing* | 14 | 2 | 12 | |
| **Total Cholesterol:** | | | | |
| Mean (SD; mmol/L) | 4.41 (1.16) | 4.74 (1.24) | 4.30 (1.10) | **<0.001** |
| *Missing* | 14 | 2 | 12 | |
| **TSH:** | | | | |
| Median [IQR; miu/L] | 0.90 [0.56–1.51] | 0.79 [0.51–1.34] | 0.95 [0.60–1.59] | 0.13 |
| *Missing* | 54 | 8 | 46 | |
| **Triglycerides, mmol/l** | | | | |
| Median [IQR; mmol/L] | 1.70 [1.10–2.60] | 1.80 [1.20–2.73] | 1.70 [1.10–2.60] | 0.11 |
| *Missing* | 14 | 2 | 12 | |
| **ASAT:** | | | | |
| Median [IQR; U/L] | 28.0 [23.0–35.0] | 26.0 [22.0–33.0] | 29.0 [24.0–36.0] | 0.27 |
| *Missing* | 44 | 5 | 39 | |
| **ALAT:** | | | | |
| Mean (SD, U/L) | 45.5 (35.3) | 37.6 (24.2) | 48.3 (38.1) | **<0.001** |
| *Missing* | 12 | 1 | 11 | |
| **Creatinine:** | | | | |
| Median [IQR; µmol/L] | 87.0 [76.0–106.5] | 78.5 [70.0–96.8] | 90.0 [77.0–108.0] | **0.011** |
| *Missing* | 1 | 0 | 1 | |
| **eGFR:** | | | | |
| Mean (SD; mL/min) | 71.8 (27.4) | 66.5 (39.5) | 73.6 (21.6) | 0.057 |
| *Missing* | 12 | 4 | 8 | |
| **LVEF:** | | | | |
| Mean (SD; %) | 37.6 (12.2) | 39.1 (13.6) | 37.1 (11.7) | 0.22 |
| *Missing* | 140 | 38 | 102 | |
| **Type of HF:** | | | | 0.10 |
| HFpEF | 99 (27%) | 33 (36%) | 66 (24%) | |
| HFmrEF | 43 (12%) | 10 (11%) | 33 (12%) | |
| HFrEF | 222 (61%) | 49 (53%) | 173 (64%) | |
| *Missing* | 140 | 38 | 102 | |
| **Diabetes** | 119 (24%) | 28 (22%) | 91 (24%) | 0.52 |
| **Ischeamic Heart Disease** | 168 (33%) | 30 (23%) | 138 (37%) | **0.004** |

n: Number of patients, SD: Standard deviation, IQR: Interquartile range.
[1]Pearson's Chi-squared test, Welch Two Sample t-test or Fisher's exact test.

[18]. The low prevalence may be related to underdiagnosing of chronic disease in Greenland. Recent studies have found, e.g. a low prevalence in the treatment of osteoporosis in Greenland and diagnosis of psoriasis in Nuuk, speculating that the real prevalence is higher [23,24]. If diagnosed before the introduction of the existing EMR (2013–2017), diagnosis registration would require registration in the new EMR. Patients with fewer symptoms could be missing diagnosis if not having recent contact with

**Table 3.** Characteristics according to IHD-diagnosis. Data are frequency (%) unless stated otherwise.

| Variable | Overall[1] (n = 504) | No IHD (n = 336) | IHD (n = 168) | p-value[1] |
|---|---|---|---|---|
| **Gender:** | | | | **0.004** |
| Female | 130 (26%) | 100 (30%) | 30 (18%) | |
| Male | 374 (74%) | 236 (70%) | 138 (82%) | |
| **Age (years, mean (SD))** | 64.9 (11.4) | 64.4 (12.2) | 66.0 (9.7) | 0.12 |
| **Smoking:** | | | | 0.087 |
| Yes | 148 (43%) | 102 (46%) | 46 (37%) | |
| No | 200 (57%) | 120 (54%) | 80 (63%) | |
| *Missing* | 156 | 114 | 42 | |
| **Body Mass Index:** | | | | |
| Median [IQR; kg/m$^2$] | 30.5 [26.2–35.1] | 30.9 [25.9–35.9] | 30.4 [26.6–34.2] | 0.070 |
| *Missing* | 151 | 115 | 36 | |
| **Body Mass Index, class:** | | | | 0.057 |
| Underweight (<18.5 kg/m$^2$) | 9 (2.5%) | 9 (4.1%) | 0 (0%) | |
| Normal (18.5–24.9 kg/m$^2$) | 55 (16%) | 32 (14%) | 23 (17%) | |
| Overweight (25–29.9 kg/m$^2$) | 101 (29%) | 59 (27%) | 42 (32%) | |
| Obese (≥30 kg/m$^2$) | 188 (53%) | 121 (55%) | 67 (51%) | |
| *Missing* | 151 | 115 | 36 | |
| **Systolic Blood Pressure:** | | | | |
| Mean (SD; mmHg) | 129 (20) | 129 (20) | 128 (19) | 0.58 |
| *Missing* | 49 | 39 | 10 | |
| **Diastolic Blood Pressure:** | | | | |
| Mean (SD; mmHg) | 78.2 (11.9) | 78.2 (12.0) | 78.1 (11.9) | 0.94 |
| *Missing* | 49 | 39 | 10 | |
| **HbA1c:** | | | | |
| Mean (SD; mmol/mol) | 45.1 (10.5) | 44.4 (9.7) | 46.4 (11.9) | 0.062 |
| *Missing* | 9 | 8 | 1 | |
| **LDL:** | | | | |
| Mean (SD; mmol/L) | 2.62 (1.09) | 2.65 (1.11) | 2.58 (1.06) | 0.55 |
| *Missing* | 14 | 11 | 3 | |
| **HDL:** | | | | |
| Median [IQR; mmol/L] | 1.10 [0.90–1.40] | 1.20 [0.90–1.40] | 1.10 [0.90–1.40] | 0.12 |
| *Missing* | 14 | 11 | 3 | |
| **Total Cholesterol:** | | | | |
| Mean (SD; mmol/L) | 4.41 (1.16) | 4.51 (1.18) | 4.22 (1.10) | **0.006** |
| *Missing* | 14 | 11 | 3 | |
| **TSH:** | | | | |
| Median [IQR; miu/L] | 0.90 [0.56–1.51] | 0.91 [0.57–1.51] | 0.90 [0.56–1.50] | 0.30 |
| *Missing* | 54 | 37 | 17 | |
| **Triglycerides, mmol/l** | | | | |
| Median [IQR; mmol/L] | 1.70 [1.10–2.60] | 1.80 [1.10–2.60] | 1.70 [1.10–2.60] | 0.45 |
| *Missing* | 14 | 11 | 3 | |
| **ASAT:** | | | | |
| Median [IQR; U/L] | 28.0 [23.0–35.0] | 28.0 [23.0–37.0] | 28.0 [23.0–33.0] | **0.045** |
| *Missing* | 44 | 33 | 11 | |
| **ALAT:** | | | | |
| Mean (SD, U/L) | 45.5 (35.3) | 46.2 (39.2) | 44.2 (25.9) | 0.50 |
| *Missing* | 12 | 9 | 3 | |
| **Creatinine:** | | | | |
| Median [IQR; µmol/L] | 87.0 [76.0–106.5] | 88.0 [76.0–104.5] | 87.0 [75.8–110.0] | 0.42 |
| *Missing* | 1 | 1 | 0 | |
| **eGFR:** | | | | |
| Mean (SD; mL/min) | 71.8 (27.4) | 72.7 (30.1) | 70.1 (21.1) | 0.27 |
| *Missing* | 12 | 8 | 4 | |
| **LVEF:** | | | | |
| Mean (SD; %) | 37.6 (12.2) | 37.6 (13.0) | 37.6 (10.6) | 0.99 |
| *Missing* | 140 | 99 | 41 | |
| **Type of HF** | | | | 0.63 |
| HFpEF | 99 (27%) | 68 (29%) | 31 (24%) | |
| HFmrEF | 87 (24%) | 57 (24%) | 30 (24%) | |
| HFrEF | 178 (49%) | 112 (47%) | 66 (52%) | |
| *Missing data* | 140 | 99 | 41 | |
| **Diabetes** | 119 (24%) | 73 (22%) | 46 (27%) | 0.16 |

n: Number of patients, SD: Standard deviation, IQR: Interquartile range.
[1]Pearson's Chi-squared test, Welch Two Sample t-test or Fisher's exact test.

the healthcare system. One interesting finding is a high age-grouped prevalence. Compared to the Danish population, the prevalence of HF was approximately 25% higher among men and women in some age groups. The most significant difference was among men aged 65–74 years (5.74% vs 4.30%) and women aged 55–64 years (1.03% vs 0.77%) when compared to the prevalence in 2018 from the

Danish Heart Foundation [25]. A Danish nationwide register study of chronic disease found a prevalence of HF among those aged 45–74 years of 0.95% [26]. We found the prevalence in the same age group in Greenland was markedly higher (2.63% [2.35–2.92%]).

Estimated HF prevalence among indigenous people are sparse, but in 2015 Atzema et al. found the prevalence of congestive heart failure, among 12,550 Métis persons, above the age of 20 and living in Ontario, Canada, was 5.14% [27]. And according to the Public Health Agency of Canada the prevalence of HF in Nunavut is 6.4% among those aged 40 and older [28]. In these age groups we found the prevalence to be 1.22% and 2.04% respectively. The populations have limited access to healthcare due to geographical similarities and other sociodemographic challenges, which may explain the higher prevalence. However, HF may be more common among Inuit and genetically related indigenous people than other western populations.

### *Characteristics*

The average Greenlandic patient with HF is ten years younger compared to what has been found in other HF populations. A Swedish register study, including 36,420 people diagnosed with HF in 2010, found a mean age of 77 years (women 80 years, men 74 years) [8]. Another study, including 93,074 patients diagnosed with HF from 2002 to 2014 in the UK (UK), found a mean age of 77 years (women 79 years, men 74 years) [10]. The early onset of HF among the Greenlandic population may contribute to the difference in life expectancy.

The frequency of daily smokers was high (43%) compared to the HF population in the UK, where 13% were smokers [10]. The high frequency of smokers was expected as the population survey in Greenland in 2018 found a prevalence of 52% daily smokers [16].

Obesity (BMI>30) was common among Greenlandic HF patients (53%). The 2018 population survey found that 27% of the Greenlandic population were obese [16] and 32% of the HF population in the UK [10]. Suggesting that obesity among Greenlandic Inuit induce HF through pathologic pathways such as insulin resistance, inflammation of adipokines and cardiac lipotoxicity as well as increased predisposition to established risk factors for HF [29,30].

The proportion of HFpEF and HFmEF was high compared to that reported from Europe [31]. Whether this relates to the high proportion of patients with obesity and diabetes, or other factors remains to be elucidated.

The proportion diagnosed with diabetes was similar to that in the HF populations in Sweden and the UK, where around one quarter of the population have diabetes [8,10]. This is consistent with the knowledge of diabetes increasing the incidence of HF [32].

The proportion diagnosed with IHD was low compared to that in other HF populations, where around half had IHD [8,10]. Furthermore, studies suggest that the incidence of IHD in Greenland is higher than earlier anticipated. The prevalence of markers for IHD based on self-reported myocardial infarction (MI), angina pectoris and ischaemic changes in electrocardiogram among 1316 Inuit in Greenland was comparable to that in Western populations [33]. A retrospective register study of reported mortality causes found a similar or slightly lower incidence of IHD in Greenland compared to that in Denmark from 1965 to 1998 and concludes that the evidence for low mortality of IHD among Inuit is based on unreliable mortality statistics [34]. The low prevalence of IHD found in this study may be influenced by underdiagnosis due to vast distances and lack of local specialised staff and diagnostic equipment. It could also be hypothesised that the aetiology of HF among the Greenlandic people is different from that in other countries. The Inuit in Greenland may be more likely to develop HF through non-ischaemic pathways caused by obesity and/or diabetes. Whether this could be explained by genetics is unknown, but the Greenlandic founder population has historically been isolated, resulting in sparse genetic diversity but high allele frequencies. Recently Inuit-specific genetic variants associated with diabetes, obesity, and familial hypercholesterolaemia with large effect sizes have been identified [35–37]. It could be suggested that a genetic disposition for non-ischaemic HF is prevalent in this population but requires further studies.

### *Strengths and limitations*

This study is the first to describe the age- and sex-specific prevalence of HF in Greenland. Furthermore, around 90% of the entire population in Greenland was included in the study. Also, the study was based on standardised non-biased data drawn from the nationwide EMR. The prevalence estimated in this study is the prevalence of diagnosed HF, while the actual HF prevalence may be higher. The low prevalence of IHD may be influenced by underdiagnosis. However, patients diagnosed with HF are referred to CCTA. Patients suffering from HF may be misdiagnosed outside of Nuuk because of limited diagnostic possibilities. Information on hypertension and other relevant comorbidities, as well as treatment was not included in the study.

## Conclusion

We found the prevalence of HF in Greenland was 1.1% which is consistent with that in high-income countries.

The age-grouped prevalence among those aged 45–74 years was high compared to that of the Danish population. The prevalence of HF patients without IHD was high. Despite the presence of risk factors, unknown risk factors including genetics, should be explored.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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# Appendix

**Table A1.** List of ICD-10 and ICPC-2 codes.

| | |
|---|---|
| Heart failure: | |
| ICD-2 codes: | |
| **I11.0:** | Hypertensive heart disease with heart failure. |
| **I13.0:** | Hypertensive heart and chronic kidney disease with heart failure and stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease. |
| **I13.2:** | Hypertensive heart and chronic kidney disease with heart failure and with stage 5 chronic kidney disease, or end-stage renal disease. |
| **I42.0:** | Dilated cardiomyopathy. |
| **I42.6:** | Alcoholic cardiomyopathy. |
| **I42.7:** | Cardiomyopathy due to drug and external agent. |
| **I42.9:** | Cardiomyopathy, unspecified. |
| **I50.0-I50.9:** | Heart failure. |
| ICPC-2 codes: | |
| **K77:** | Heart failure. |
| Diabetes: | |
| ICD-10 codes: | |
| **E10:** | Type 1 diabetes mellitus. |
| **E11:** | Type 2 diabetes mellitus. |
| **E12:** | Malnutrition-related diabetes mellitus. |
| **E13:** | Other specified diabetes mellitus. |
| **E14:** | Unspecified diabetes mellitus. |
| ICPC-2 codes: | |
| **T89:** | Diabetes insulin dependent. |
| **T90:** | Diabetes non-insulin dependent. |
| Hypertension: | |
| ICD-10 codes: | |
| **I10:** | Essential Hypertension. |
| **I11:** | Hypertensive heart disease. |
| **I12:** | Hypertensive Chronic Kidney Disease. |
| **I13:** | Hypertensive heart and chronic kidney disease. |
| **I15:** | Secondary Hypertension. |
| ICPC-2 codes: | |
| **K85:** | Elevated blood pressure. |
| **K86:** | Hypertension uncomplicated. |
| **K87:** | Hypertension complicated. |
| Ischaemic heart disease (IHD): | |
| ICD-10 codes: | |
| **I20:** | Angina pectoris. |
| **I21:** | Acute myocardial infarction. |
| **I22:** | Subsequent ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction. |
| **I23:** | Certain current complications following ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction (within the 28 day period). |
| **I24:** | Other acute ischaemic heart disease. |
| **I25:** | Chronic Ischaemic heart disease. |
| ICPC-2 codes: | |
| **K74:** | Ischaemic heart disease with angina. |
| **K75:** | Acute myocardial infarction. |
| **K76:** | Ischaemic heart disease without angina. |