



2023

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Recommended Citation

Alharrasi, Maryam; Isac, Chandrani; and Kamanyire, Joy Kabasindi (2023) "Heart Failure Burden in Oman as A Mid-East Exemplar Versus Global Perspectives: An Integrative Review," *Journal of the Saudi Heart Association*: Vol. 35 : Iss. 3 , Article 3.

Available at: <https://doi.org/10.37616/2212-5043.1345>

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Heart Failure Burden in Oman as a Mid-East Exemplar Versus Global Perspectives: An Integrative Review

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Abstract

Heart failure (HF), a clinical syndrome caused by a structural and functional cardiac abnormality and corroborated by elevated natriuretic peptide levels and pulmonary congestion. This study intends to investigate the state of heart failure (HF) in Oman and assess it in comparison of global trends. Ten published literatures from the past 20 years were included after a thorough search of databases (Arab World Research Source, EBSCOhost, Medline, and Google Scholar). These studies were reviewed considering the global literature. We have observed an increase in HF cases especially in older adults, over the past two decades in Oman. Acute coronary syndrome and non-compliance with medication are two factors that contribute to acute HF, according to recent research. Ischemic heart disease is the leading cause of HF in the Omani population. The mortality rate for HF patients in Oman was reported to be 25% after a one-year follow-up. The younger population that is diagnosed with HF in Oman is significantly worse than in other nations, according to these data, which are consistent with global trends. The lack of published studies and data sets hampered our understanding of heart failure (HF); yet prevalence of HF is rising and is anticipated to surge with the rise in diabetes mellitus and hypertension and other related cardiovascular precursors. Therefore, HF requires more investigation. In terms of worldwide trends, HF in Oman appears to be even worse; additional information is required to grasp the full picture on HF.

Keywords: Cardiovascular, Integrative review, Heart failure, Global, Oman

1. Introduction

Heart failure (HF) is a clinical syndrome with symptoms and or signs caused by a structural and functional cardiac abnormality and corroborated by elevated natriuretic peptide levels and or objective evidence of pulmonary or systemic congestion [1]. This clinical syndrome involves edema, dyspnea, and reduced exercise capability [2]. By 2030, the projected increment in HF is about 46% [3]. The prevalence increases with age, reaching 3% among those aged seventy and above [4]. The current global prevalence of heart failure is 64.34 million cases, with the mortality rate being higher in low-income countries such as Africa (34%)

compared to high-income populations such as South America (9%) [4,5].

1.1. Health disparities in heart failure

Brethett et al. [6], Khariton et al. [7], Kiser et al. [8], Young [9] and Ziaeeian et al. [10,11] found significant health disparities among HF patients based on gender, race/ethnicity, and socioeconomic status. For example, Khariton et al. [7] conducted research to describe the health status of patients with HF by gender, race/ethnicity, and socioeconomic status. The authors discovered that women, Hispanics, Black people, and lowest-income HF patients had poorer health status. Finally, the researchers

Received 21 March 2023; revised 9 August 2023; accepted 11 August 2023.
Available online 6 September 2023

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recommended improved treatment to decrease the observed disparities among such populations [7]. Another current study by Breathett et al. [6] on forty-six healthcare experts found other biases against females compared to males in appearance and societal support, especially in African American women. This disparity can contribute to the postponement of advanced therapies among those women [6].

1.2. HF in developing and developed countries

Globally, HF is the most prevalent disease. Almost 64.3 million people live with HF, which is associated with higher morbidity and mortality rates [12]. Besides that, HF places an enormous economic burden on the healthcare system, which is 1–2% of healthcare costs in Europe and North America [13]. In developed countries, the prevalence of HF is estimated to be 2.2–2.5% of the general adult population [14]. The prevalence of HF in developed countries is 11.8% among those aged 65 years and above [12]. The National Health and Nutritional Examination Survey investigators anticipated HF prevalence in the US to be around 2.5%, while Germany estimated it to be 4% [12]. On the other hand, there is a significant gap in information relating to HF in developing countries. However, the American Heart Association reported that the current prevalence of HF in Asia is between 1.26% and 6.7% [15]. Additionally, Groenewegen et al. [12] indicated that the prevalence of HF in India and Turkey was 0.3% and 2.9%, respectively.

1.3. Heart failure in Oman

In Oman, HF is one of the significant health challenges, leading to a reduced quality of life and increased healthcare costs, disabilities, and deaths. The Ministry of Health's annual report in 2018 stated that around 25% of all hospital deaths were due to heart diseases and the cardiovascular system [16]. Although there are some recent publications on HF in Oman [13,16–21], the prevalence of HF in Oman is unknown yet. Nevertheless, an old study by Agarwal et al. [22] in the Dakhliya region involved only one secondary hospital. The authors found that the prevalence of HF was 5.17/per one thousand in the general population. The researchers also revealed that the prevalence increased with age and more in males [22].

This integrative literature review aims to synthesize literature about heart failure in Oman as a middle-eastern country example and compare it

Abbreviation list	
AHF	Acute heart failure
ACC	American College of Cardiology
BNP	Brain natriuretic peptide
CHD	Coronary heart disease
EF	Ejection fraction
IHD	Ischemic heart disease
MMAT	Mixed Methods Appraisal Tool
NYHA	New York Heart Association

with the existing global trends. This study builds on previous work describing heart failure in Oman [23].

2. Methods

2.1. Search strategies

Heart failure or congestive cardiac failure, cardiovascular disease, ischemic heart disease, acute coronary syndrome, cardiac surgery, Oman, and the Middle East were the search terms used for this literature review. To identify literature on HF in Oman, interdisciplinary databases [Arab World Research Source, EBSCOhost, and Medline] and [Google Scholar] were searched. We did not limit the search criteria to a specific type of studies, and all study types (RCT, cohort, cross-sectional, commentaries, etc) were included. To identify literature on worldwide heart failure statistics and trends, we also searched PubMed and Google Scholar. We enter the keywords “heart failure” AND “global” or “international” and “Middle East” into the search box. The study on global heart failure statistics and trends only considered recent material published during the last five years. The literature search was done during the period of December 2020–January 2021 and was updated in February 2023.

2.2. Inclusion and exclusion criteria

Peer-reviewed full-text research articles and reviews from the literature on HF in Oman were included if they fulfilled the following requirements: The population of the empirical analysis was patients with HF, and the study/review included Oman-related data, with HF as a variable or outcome. There was no restriction on the amount of time or the standard criteria for HF. Research and reviews on other cardiovascular illnesses or concomitant disorders without precise, exclusive data for HF were omitted, as were studies and reviews from Middle Eastern nations where the data for Oman was not exclusively described for Oman

but merely mixed with the other Gulf countries. The aim of this review is to investigate all existing literature on HF in Oman and therefore, there was no timeline limit for the searched literature. The literature search process is shown in Fig. 1.

For literature related to HF global trends, we included literature comparing HF statistics among several countries and those presenting any Middle Eastern countries. We have excluded any literature not written in English. Our approach was to find literature that could inform us about global HF trends rather than systematically evaluate each piece of literature. Peer-reviewed literature that can help in comparing Oman and global trends was included.

2.3. Appraisal of methodological quality

All duplicates were removed, and abstracts were screened for relevance. The full text of the relevant abstract was evaluated against the inclusion criteria independently by two authors for eligibility. The research methods' quality, rigor, credibility, and trustworthiness were examined using the Mixed Methods Appraisal Tool (MMAT). This method is widely used when reviewing a diverse array of literature on different methods. Two independent reviewers have checked all the included literature about Oman. Based on the criteria set, a score was assigned, which ranged from 25% to 100%. The tool was used to appraise the methodological quality,

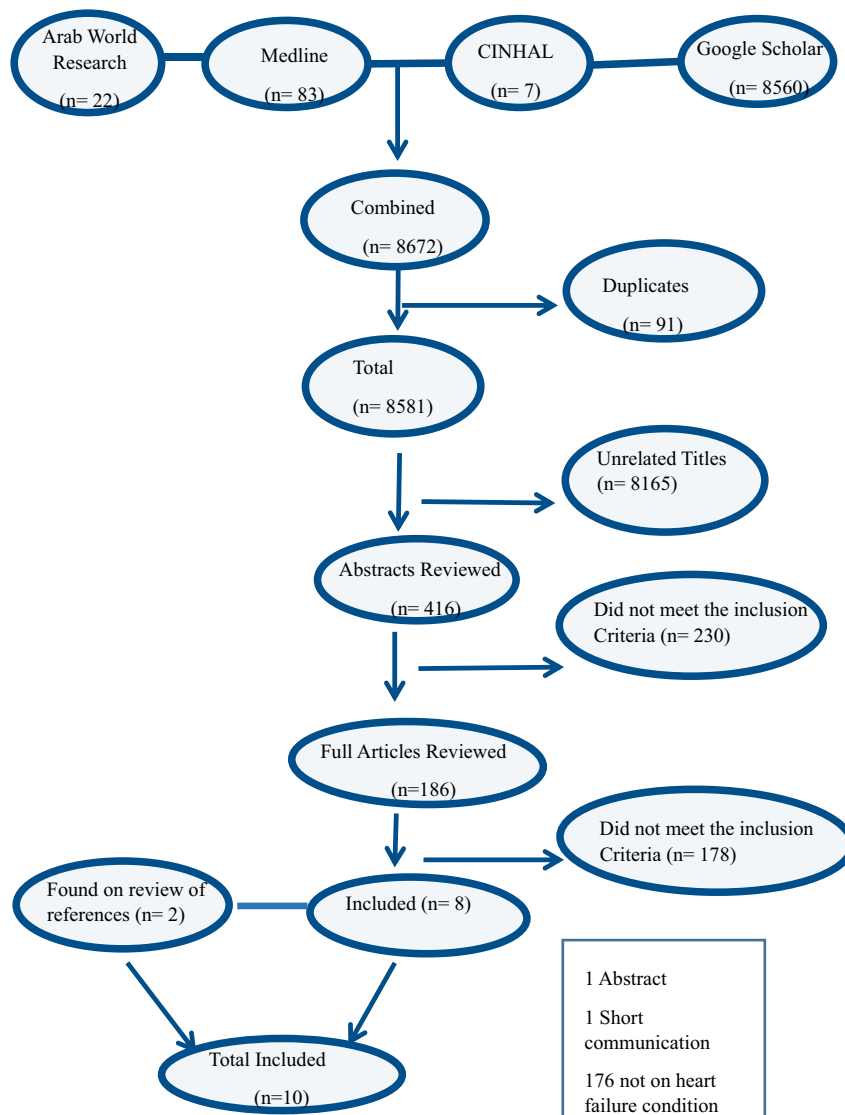


Fig. 1. Flow diagram of extracting process of references.

and no literature was excluded from this review based on the quality score, as there was a lack of studies investigating HF in Oman [24].

2.4. Data extraction and data synthesis

We have constructed a review matrix including author, year, purpose, geographical, methodological, and content-specific variables. All articles that fit the inclusion criteria were extracted, and the data was organized in this matrix.

3. Results

3.1. Search outcomes

The clinical characteristics listed in the collected literature are summarized in [Table 1](#). This review's studies were released within the last two decades (2001–2022). They included prospective, observational, and retrospective investigations. Few of them concentrated on the statistical correlations between HF patients and their length of in-patient hospital stays, outcomes at discharge, and prognosis. Four of the chosen studies used a prospective survey design. Two studies on retrospective analyses of strategic information were. Written, and two reviews were added since they highlighted different aspects of HF in Oman. Patients with HF made up the population in three of the ten studies, but HF was also estimated in populations of patients with the acute coronary syndrome [ACS], metabolic syndrome, and patients needing cardiac surgery. One study amplified the in-patient statistics for patients with HF by estimating the number of hospitalized Omani individuals with circulatory issues.

3.2. Prevalence

The estimated prevalence of HF in Oman in 2001 was 0.5 percent. By 2018, the incidence was reported to have reached one thousand recent cases per year, and the prevalence had doubled [31]. An increase in HF prevalence in Oman from 1164 to 1400 was reported from the year 2000–2010 [23]. According to the most recent data, 1751 cases of HF were admitted to hospitals in Oman in 2018. The estimation of HF with reduced ejection fraction was as high as 56% [25,27]. Over the last two decades, there has been a continuous increase in the reported cases of HF among older people [> 60 years of age]. Of note, all studies presented data on acute HF except

Alharrasi, et., al, 2018 which recruited participants with chronic HF.

3.3. Demographic and clinical characteristics

Heart failure patients in Oman were young (55 years and above). More men than women were diagnosed with HF. Ejection fraction [50%], or diastolic dysfunction, ECGs, and chest X-rays were the diagnostic criteria for HF in the chosen studies. The reported median ejection fraction (EF) was 36%. The most frequent etiology mentioned in the literature is ischemic heart disease (IHD). One-tenth of Omani people with HF have idiopathic cardiomyopathy listed as the cause. Acute coronary syndrome, non-compliance with treatment, and delayed presentation with STEMI were the causes of HF in the population surveyed. Patients with HF are reported to have HTN, hyperlipidemia, coronary artery disease, and diabetes as comorbidities.

3.4. Heart failure outcomes

Omani patients with HF had an in-patient death rate that ranged from 4.3% to 6.20%. In the 1-month and 12-month follow-up surveys, the death rate rose to 7.5 percent and 26.4 percent, respectively. The studies that have been evaluated further highlight that HF is a predictor of the length of stay in coronary critical care units and rehospitalization [26]. Poor quality of life has been documented, associated with poor self-care [30]. Serum urea levels above 15 mmol/L, systolic blood pressure below 115 mm Hg, serum creatinine levels above 2.72 mg/dl, N-terminal proBNP levels above 986 pg/mL and left ventricular ejection fraction below 45 percent have all been identified as risk factors for poor outcome and death.

3.5. Management strategies

According to two studies, angiotensin-converting enzyme inhibitors and beta-blockers were prescribed to HF patients [20,27]. Aldosterone antagonists were hardly recommended. In the Oman CARE registry, medication non-compliance was a frequent contributing factor [20]. Furthermore, it was the reason for readmissions [20]. In addition, self-care was found to be poor in Oman among mild-to-moderate HF patients [30]. Specifically, it was found that patients are good at consulting their healthcare providers but are not at recognizing and managing their symptoms. They were also generally

Table 1. Clinical characteristics.

Author, year	Agarwal, 2001	Panduranga, 2010	Al-Rasadi, 2011	Al-Shamiri, 2013	ALZadjali, 2014	Almashrafi, 2016	Pandurnga, 2016	Alharrasi, 2018	Hanbali, 2021	Al-Aghbari, 2022
Data collection period	1992–1994	2006–2007	2006–2007	NA	NA	2009–2013	2012	2016–2018	2016–2019	2016–2021
Sample size	1164	579	1392	Sample from Oman was 1164	15,671 total inpatient admissions	600	988	105	249	171
Prevalence/ incidence	5.17/1000 population	NA	NA	NA	8.9% of in-patients	26.3% of in-patients	NA	NA	NA	71.25% were with HFrEF
Dominant Age mean [SD] or [%]	55–64 years [37.3%]	40 years and above [27%]	NA	>55 years	>60 [34%]	NA	63 years [12.0]	61.58 years [15.54] years	63 years [15]	63 years [15]
Dominant Gender	Men 61.3%	NA	NA	NA	Men: Women ratio is 52:5	NA	Men 57%	Women 52%	Men 61%	Men 59%
Etiology	Ischemic heart disease 51.7% Hypertensive heart disease 24.9% Idiopathic dilated cardiomyopathy 8.3%	NA	NA	Ischemic heart disease 52%, Valvular heart disease: 8.4% Idiopathic dilated cardiomyopathy: 8.3%, Other: 31.3	NA	NA	Ischemic heart disease, idiopathic cardiomyopathy	Ischemic 46 [43.81%] Non- Ischemic 59 [56.19%]	Coronary Artery Disease [48%], Myocardial Infarction [26%]	Ischemic heart diseases
Cardiac Function		NA	NA	HFrEF: 80.1% HFpEF: 19.9%	NA	NA	EF = 36% median	EF = 41.11 [13.72%]	7% of the patients had HFrEF while 29% had HFmrEF	EF = 28 ± 8
Concurrent Comorbidities	NA	Hyperlipidemia Diabetes Miletus Hypertension	Diabetes Miletus Hypertension	Diabetes Miletus Hypertension	NA	NA	Hypertension [72%] Coronary artery disease [55%] Diabetes mellitus [53%]	Diabetes Miletus Hypertension	Chronic kidney disease 63%, hypertension 61%; diabetes mellitus 54%	65% chronic kidney disease hypertension 58%, diabetes mellitus [51%, CAD 46%, 27% atrial fibrillation.

(continued on next page)

Table 1 (continued)

Standard treatments	NA	NA	NA	ACEI/ARBS [86%) Beta-blocker [95%) Aldosterone antagonist [53%)	NA	NA	ACEI, beta-blockers, aldosterone agonists under prescribed	a total of 100% [96/96), 56% [121/216) and 42% [64/153) of the patients were prescribed ≥50% of target dose for spironolactone, β-blockers and ACEIs/ARBs, respectively, while 96% [92/96), 19% [40/216) and 2.6% [4/153) of the patients were prescribed 100% of target dose for spironolactone, β-blockers and ACEIs/ARBs, respectively	89% [149/168), 77% [128/167), and 47% [78/166) of the patients were on beta blockers, RAS blockers/HYD-ISDN combination, or MRAs, respectively	
Outcomes	NA	In-hospital mortality was 4.3% among patients aged ≥40 years	MetS was associated with increased risk of HF	In-hospital mortality: 5.3% 30-day mortality: 7.5%	6.2% with circulatory problems died in the hospital	HF at admission was a significant predictor of the length of CICU stay	At 12-month follow-up: re-hospitalized Mortality: 26.4%	Health-related quality of life reported being high [65.02 ± 20.31)	NA	Those on the triple ACEI/ARB/ARNI, beta blocker and MRA combination were associated with significantly lower ER visits [75% vs 88%, p = 0.03), hospital admissions [70% vs 88%; p = 0.005), LOS [6 vs 12.5 days; p = 0.012), and overall major adverse events [81% vs 95%; p = 0.005).

Notes: NA: Not Available, HF: Heart failure, HFREF: Heart Failure with Reduced Ejection Fraction, HFpEF: Heart Failure with preserved ejection fraction, HFmrEF: Heart Failure with mild reduced ejection fraction SD: Standard deviation, EF: Ejection Fraction, CAD: Coronary Artery Disease, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, MetS: Metabolic Syndrome, IHD: Ischemic Heart Disease, HTN: Hypertension, ACEI: Angiotensin-Converting Enzyme Inhibitors, ARBS: Angiotensin II Receptor Blockers, MRAs: Mineralocorticoid Receptor Antagonists, HYD-ISDN: hydralazine-isosorbide dinitrate combination, CICU: Cardiac Intensive Care Unit.

poor at adhering to health behaviors, such as exercise and reducing salt intake [30].

4. Discussion

4.1. Summary of findings

This integrative literature review details the status of HF literature and practice in Oman. Oman is in a medical emergency, and the number of cases is rising. Compared to other nations, HF was diagnosed in patients younger 55 years and older than in industrialized nations (65 years and older), with rising rehospitalization and mortality at one-year follow-up and poor rehospitalization and mortality at one-year follow-up, and poor self-care. However, these findings remain inconclusive because of the scarce data and literature.

4.2. Demographic and clinical characteristics compared to regional and global HF trends

Coronary artery disease, HTN, and DM were the three main comorbid conditions [32–34]. In Oman, as in other Gulf nations, ischemic heart disease, idiopathic cardiomyopathy, and hypertensive heart disease were the most frequent etiologies of acute heart failure (AHF) [20,33–36]. Heart failure with reduced ejection fraction was reported to be in 80% of patients.

Globally, the etiology of HF varies by country but is consistent by type according to the heart federation roadmap for heart failure. Ischemic heart disease was the cause of HF in more than half of the patients in combined HF registries from North America and Europe [37]. In Africa, 35% of people have hypertension, 20% have cardiomyopathy, 14.2% have valve disease, and 11% have both as etiological factors for heart failure [37]. Similar trends were observed in India and China. In India out 858 HF patients, 46% have IHD, 14% have hypertension, 12.7% have cardiomyopathy, and 12% have valve disease. In China, out 991 HF patients, 45% have ischemic heart disease, 16.6% have cardiomyopathy, 14% have hypertension, and 11% have valve disease. Consistent with countries in the east, in Middle Eastern countries out of 1000 HF patients, 50% have IHD, 18.6% have cardiomyopathy, 10% have hypertension, and 8% have valve disease [37]. Global epidemics of HF are shown in Fig. 2.

In Oman, 68–72% of deaths are attributed to non-communicable diseases [38–40], due to aging and rapid changes in diet and lifestyle [41]. In both cases, increased body mass index (BMI) was associated with decreased knowledge of coronary heart disease

(CHD) risk factors [42,43]. Globally, there is a significant increase in composite cardiovascular events in HF patients with metabolic syndrome compared to those without [44].

4.3. HF outcomes in comparison to regional and global trends

Most of the research on HF outcomes was conducted in industrialized countries, i.e., the USA, Australia, Canada, and Europe, and only a few studies were conducted in other parts of the world. Overall, health outcomes such as admission, rehospitalization, and mortality are poor in HF patients and can be improved through various pharmacological and non-pharmacological interventions. Within a 12-month follow-up, one in two patients was re-hospitalized for AHF [20]. This rate is considered low in comparison to other countries. However, this also could be because of a lack of accuracy and updated data related to rehospitalization in Oman. HF admissions represent around 1%–2% of all hospital admissions [15]. In the US, the hospitalization rates decreased by 14.4% (from 1122064 HF patients in 2002–960,124 in 2013) [10]. The Medicare Payment Advisory Commission reported a decrease in readmission rates among American HF patients from 25.1% in 2009 to 23.5% in 2013 [45]. The reduction in the USA rates was attributed to better HF management, especially using left ventricular assistive devices and other treatment modalities. In addition, 43.1% of HF patients were hospitalized in the UK between 2000 and 2007 [46]. While no national records were found in Spain about HF admission trends over a specific period, Santas et al. [47] conducted a prospective cohort study on 2961 HF patients admitted to a tertiary teaching hospital in Spain from 2004 to 2017. The authors reported that 72.3% of hospitalized patients got readmitted again [47]. According to Jiang et al. [48], more than 50% of HF patients will be re-hospitalized due to HF-associated illnesses within six months following discharge. HF-related hospitalization rates are estimated to increase further because of elevated survival rates from initial cardiac events and aging populations [48]. Therefore, suitable measures should be taken to reduce the anticipated increase. These measures may include using left ventricular assistive devices, maximizing pharmacological treatments, and enhancing non-pharmacological modalities, such as early symptom recognition. If patient self-care management is not investigated and improved, there will inevitably be an increase in the number of HF cases requiring frequent hospital readmission.

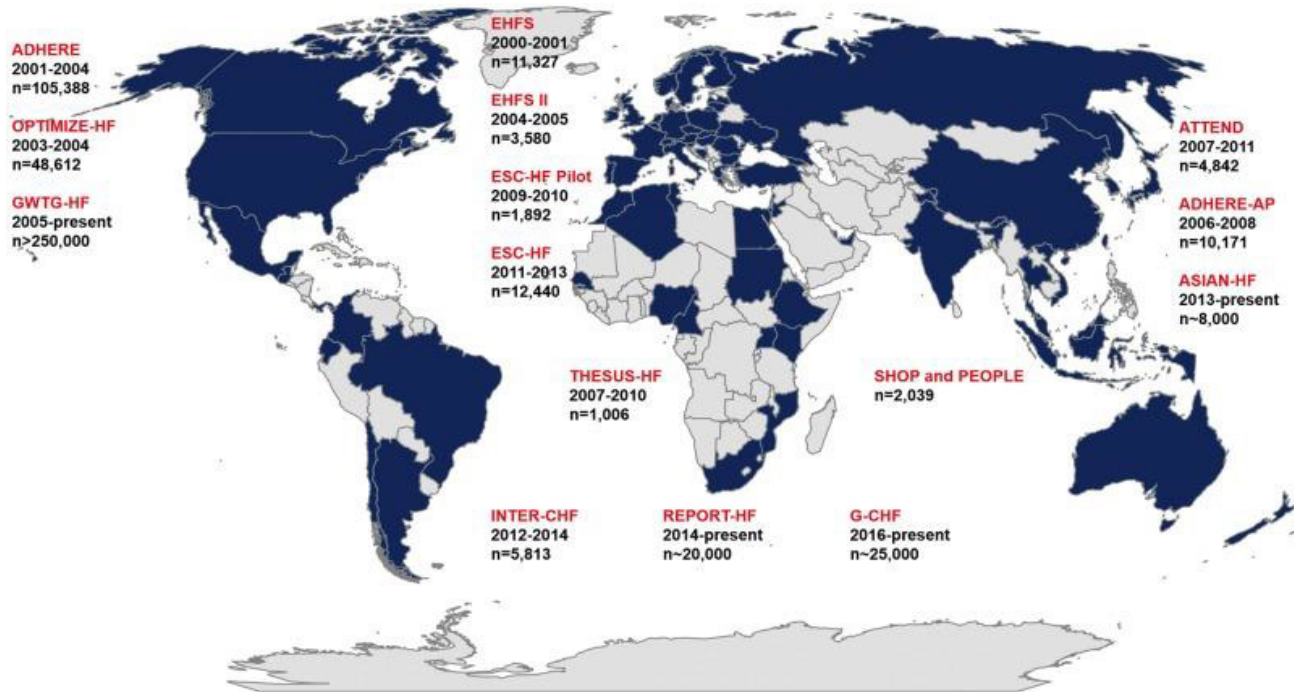


Fig. 2. Global Burden of Heart Failure. Note: Completed or active global epidemiological studies of heart failure encompassing >500 000 patients across >75 countries. ADHERE = Acute Decompensated Heart Failure National Registry; ADHERE-AP = Acute Decompensated Heart Failure National Registry International—Asia Pacific; ASIAN-HF = Asian Sudden Cardiac Death in Heart Failure; ATTEND = Acute Decompensated Heart Failure Syndromes; EHFS = European Heart Failure Survey; ESC-HF = European Society of Cardiology-Heart Failure; G-CHF = Global Congestive Heart Failure; GWTG-HF = Get With The Guidelines-Heart Failure; INTER-CHF = International Congestive Heart Failure Study; OPTIMIZE-HF = Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure; PEOPLE = Prospective Evaluation of Outcome in Patients With Heart Failure With Preserved Left Ventricular Ejection Fraction; REPORT-HF = International Registry to assess medical Practice with Longitudinal Observation for Treatment of Heart Failure; SHOP = Singapore Heart Failure Outcomes and Phenotypes; THESUS-HF = The Sub-Saharan Africa Survey of Heart Failure.

Further research highlights the requirement for “health promotion and sickness prevention” programs [20]. These programs shall concur with the American College of Cardiology (ACC) and American Heart Association’s current guidelines on the primary prevention of cardiovascular diseases. HF is also difficult to treat since it frequently coexists with other medical disorders, contributing to its high mortality rate [32,34]. The rapid progression of HF with age has been identified as another aspect of the morbidity pattern. AlZadjali also noted a tenfold increase in the prevalence of HF patients during their fourth and sixth decades of life [28]. All these elements increase the occurrence of HF, which has a significant morbidity and mortality rate.

Estimates of HF mortality may vary significantly depending on the studied population’s baseline risks, study design, HF criteria, LVEF scores, and introduction bias by excluding patients with missing LVEF values [12]. According to Groenewegen et al., observational studies’ high mortality rates with those in clinical trials, which typically enrol stable outpatients, younger age groups, and those with

fewer medical comorbidities, have a lower mortality rate. For example, a recent study conducted in the UK by Taylor et al. [46] to recognize gender differences in the prognosis of HF, mortality, and cause of death among 26,725 women and 29,234 men over the age of 45 years with HF over 17 years. Taylor and colleagues found that 15,084 [49%] women and 15,822 [51%] men [with a total of 30,906 deaths] with heart failure died, thus indicating the need for improved management practices to reduce the mortality rate. In Japan, however, the HF mortality rate ranged from 20% to 25% [15]. Around 17%–45% of admitted HF patients globally die within a year of hospitalization [49], which necessitates the prompt application of effective interventions to reduce the burden of HF.

4.4. HF management status in comparison to regional and global reports

Most of the studies evaluated overstated the importance of lipid-lowering, antihypertensive, antiplatelet, and blood glucose management

medications for the high-risk group. The OMAN CARE registry's description of pharmacological care for HF [20] revealed that most in-hospital patients received the indicated treatment; nevertheless, the exact dosages were continued after one year. Although in-hospital mortality was the same [7%] as in other nations, the 3-month mortality doubled, and the one-year mortality was high [25%]. In the Oman CARE registry, medication non-compliance was a frequent contributing factor, nevertheless. Except for one study that described self-care among HF patients in Oman and found it inadequate, non-pharmacological therapy is not well published [30]. According to the study, there are many subgroups of HF patients, and all of them are poor at identifying and treating their symptoms. To reduce the likelihood of hospital readmissions, a comprehensive treatment strategy incorporating medication and behavioral change [non-pharmacological methods] is necessary [19,48]. Self-care is one of the non-pharmacological approaches in which HF patients actively take charge of their health obligations while healthcare professionals shift to a supporting position by empowering their patients at discharge and outpatient follow-ups [50]. According to multiple studies, HF patients who used self-care as their primary method of treating their condition after being discharged from the hospital had lower rates of readmission and mortality than those who did not [49,51,52]. Although there is a clear relationship between positive health outcomes and optimal self-care, many HF patients face difficulty following self-care suggestions, which could be due to a lack of understanding or motivation, the complexity of the whole self-care process, or patient-associated factors such as age [49]. Besides that, Jiang et al. reported that HF patients who received motivational interviewing intervention in Singapore significantly improved their self-care behavior and self-confidence over three months, with an effect size of 0.86 [48]. Hence, incorporating such intervention may enhance patients' confidence, compliance, and adherence to the planned treatment. For patients with HF, care transitional intervention has effectively bridged the gap between hospital and home care services [29]. It equips people to take control of their health in four areas: self-care for medications, patient-centred records, follow-up, and early detection of issues [53]. The fast decline in HF patient conditions in Oman and the rise in HF prevalence indicates the demand for such services besides insuring optimal medical therapy [54].

4.5. Implications and recommendations

4.5.1. Implications for other Middle Eastern countries in the region

The remarkable contributions of this study will add several values to the cardiology field of the Middle East region because there are the same shared concepts between such countries: for example, culture, religion, and growing risk factors [such as sedentary lifestyles, hypertension, diabetes mellitus, and obesity]. The experience of another population and culture on how HF patients manage their condition is also helpful in developing preventive programs to combat the rising prevalence of HF in young people.

4.5.2. Implications for research

There is a need for empirical endeavors built on gold-standard standards. For example, the New York Heart Association (NYHA) functional classification is the gold standard for HF classification. Hence, there is a need to incorporate it in future research. For the evaluation of HF patients, structural and functional assessment using echocardiography and HF-specific laboratory testing, including brain natriuretic peptide (BNP), are also encouraged. To establish standardized techniques, we recommend longitudinal designs with follow-up investigations and randomized control trials. In addition, non-pharmacological therapy of HF in Oman and its impact on clinical outcomes, such as morbidity and death, should also be the subject of future research.

4.6. Limitations

This is the first literature review that has attempted to compile information regarding heart failure problems in Oman and contrast them with current global trends. HF research in Oman remains sparse. The collected literature is evident in its absence of specific inclusion criteria, HF diagnostic criteria, more robust empirical designs, and indicators of subpar results. Because there were so few high-quality publications, we could not conduct a systematic review or meta-analysis. Additionally, because the data in this review comes from studies with various designs and geographical contexts, the prevalence, incidence, and outcome rates are not entirely comparable. We were unable to identify proportions of patients who received the guideline-directed medical therapies from those studies. Similarly, medication non-compliance has been identified as a major problem, but no rates were

reported. Future studies shall consider reporting these data to help clinicians and policy makers to manage HF condition effectively.

5. Conclusion

There have only been a handful of HF research studies conducted in Oman. Besides the raw data released on the Ministry of Health website, numerous epidemiological or clinical statistics are unavailable. The prevalence of HF has been rising over the past 20 years. Patients are an average of 10 years younger than those in Western nations. Higher rates of rehospitalization and HF-related deaths were observed compared to global trends. More epidemiological and clinical research is required on this subpopulation of patients to carry out effective pharmacological and non-pharmacological management of HF, prompt diagnosis, and preventative interventions for risk factors.

5.1. Relevance to clinical practice

To reverse the high rates of rehospitalization and poor outcomes observed in Oman among all AHF registries, intensive health promotion and lifestyle behavioral modification of the Omani population are needed. This step can be achieved partly by raising public knowledge of the risk factors. Social media, newspapers, intensive mass education, and free health screenings may enhance public awareness. In addition, this should go along with early diagnosis and prompt treatment of acute HF and other underlying comorbidities.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

None declared.

Author contribution

Conception and design of Study: MA, CI. Literature review: MA, CI, JKK. Acquisition of data: MA, CI, JKK. Analysis and interpretation of data: MA, CI, JKK. Research investigation and analysis: MA, CI, JKK. Data collection: MA, CI, JKK. Drafting of manuscript: MA, CI, JKK. Revising and editing the manuscript critically for important intellectual contents: MA. Data preparation and presentation: MA,

CI, JKK. Supervision of the research: MA. Research coordination and management: MA.

Acknowledgements

None.

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