International Journal of Cardiology 257 (2018) 207–215

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Heart failure in sub-Saharan Africa: A contemporaneous systematic review and meta-analysis

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ARTICLE INFO

Article history:
Received 25 August 2017
Received in revised form 4 December 2017
Accepted 13 December 2017

Keywords:
Heart failure
Epidemiology
Aetiologies
Treatment
Prognosis
Cost
Sub-Saharan Africa

ABSTRACT

Objective: To summarise available data on the prevalence, aetiology, treatment and prognosis of heart failure (HF) in sub-Saharan Africa (SSA).
Setting: This systematic review and meta-analysis included data from individuals recruited in primary to tertiary health facilities in SSA.
Participants: All published and unpublished literatures between January 1, 1996 and June 23, 2017, of individuals aged 12 years and older and residing in sub-Saharan Africa. They must be of African descent.
Outcome: Number of heart failure admissions into general wards or HF clinics; number of cases of the different aetiologies of HF; number of participants on the different medications for HF; number of cases of all-cause mortality in participants with HF, and the predictors of all-cause mortality. Due to a limited word count, only results on the aetiologies of HF will be presented in the abstract.
Results: Thirty five full text articles were selected after screening of an initial 3785 titles and abstract. Hypertensive heart disease (HHD) (39.2% [95% CI = 32.6–45.9]) was the commonest cause of HF in SSA, followed by cardiomyopathies (CMO) (21.4% [95% CI = 16.0–27.2]) and rheumatic heart disease (RHD) (14.1% [95% CI = 10.0–18.8]). Ischaemic heart disease (7.2% [95% CI = 4.1–11.0]) was rare.
Conclusion: HHD, CMO and RHD are the most common causes of HF in SSA, with HHD and CMO responsible for over 50% of the cases. Also, the last two decades have witnessed a relative reduction in the prevalence of RHD below 15.0%.

1. Introduction

Epidemiological transition is causing a rapid shift from communicable to chronic non-communicable diseases (NCDs) in sub-Saharan Africa (SSA) [1–3] as a consequence of increasing prevalence of hypertension, diabetes mellitus and obesity owing to westernisation and urbanisation, which are associated with unhealthy dietary and behavioural habits including diets high in salt and fat and sedentary lifestyle [2,4,5]. The Global Burden of Disease study conducted in 2015 ranked NCDs as the leading cause of mortality worldwide, and the second commonest cause of mortality after the human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) in SSA [6]. NCDs are predicted to surpass HIV/AIDS as the biggest killer in SSA over the next decade. Heart failure (HF) is an important NCD in SSA [2].

In SSA, HF is one of the major public health concerns and is associated with high morbidity and mortality, high rates of recurrent hospitalisation, poor quality of life and loss of economic productivity, as it affects mostly young and economically active adults [7]. Consequently, HF remains a major barrier to attaining the sustainable development goals 1, 2 and 3 in SSA [8]. In a comprehensive review, HF was found to be associated with a hospital case-fatality rate of 9–12.5% in SSA [9]. However, the precise burden and the profile of HF remain to be ascertained in this part of the world. Contrary to developed countries [10], the causes of HF in SSA are predominantly non-ischaemic. Over the years, the commonest causes of HF in SSA have witnessed a transition from infectious causes like rheumatic heart disease (RHD), to non-infectious causes such as hypertensive heart disease (HHD) and cardiomyopathy (CMO) [11–14]. Ischaemic heart disease

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https://doi.org/10.1016/j.ijcard.2017.12.048
0167-5273/

(IHD) as a cause of HF, remains a rarity in SSA [15]. The interest of researchers on HF in SSA is evident by the fact that at least 10 reviews have been done on the subject within the last decade [9,15–23]. Hitherto, no review has provided precise estimates on the major aetiologies and pharmacological treatment of HF in SSA. Furthermore, summarised data on the prevalence and predictors of mortality in HF are lacking. Via a systematic approach, the aim of the present review was to provide a critical summary on the prevalence, aetiology, treatment and prognosis of HF in SSA.

2. Methodology

This systematic review and meta-analysis has been reported according to the Preferred Reporting Items for Systematic review and Meta-analysis (PRISMA) guidelines [24]; Appendix (page 3). No review protocol was published. Due to a limited word count, the methods herein have been detailed in the linked Data in brief article.

Briefly, the MEDLINE and EMBASE databases were searched from January 1, 1996 to June 23, 2017 (search strategies are presented in Supplementary Tables 1 and 2 in the Appendix), and studies with available data on the prevalence, aetiologies, diagnosis, treatment and outcomes of HF in patients aged 12 years and older, living in SSA were included after screening of titles and abstract, and full text articles. Screening was done by two authors (VNA and UFN) and discrepancies were handled by discussion and consensus. The study screening and inclusion process is displayed in Appendix: page 5. Arbitration was done by a third author (JJN) in case of disagreements. We excluded studies conducted exclusively on African populations living outside Africa, commentaries, editorials, letters to the editor, case reports and case-series of <30 participants; studies lacking relevant data to compute the prevalence of the different heart failure aetiologies or treatment; studies with inaccessible full-text, even after request from the corresponding author; and for duplicate studies, the most comprehensive and/or recent article with the largest sample size was considered.

Two authors (VNA and UFN) extracted relevant data on pre-structured data extraction forms. Only data on the pharmacological treatment and aetiologies of HF were summarised using meta-analysis. All other data were summarised narratively. The data extraction process has been detailed under the Data in brief: Methods section; data extraction and synthesis.

The risk of bias assessment tool developed by Hoy et al. [25] was used to assess the quality of included studies. Data in brief: Tables 3–7 portray the study quality of the individual studies included in the review.

The '*meta*' package of the R software was used for meta-analysis. A random-effect meta-analysis model was used to pool prevalence estimates after stabilisation of the variance of the study-specific prevalence using the Freeman–Tukey single arc-sine transformation [26]. Egger's test [27] was used to assess publication bias which was considered significant if the P-value <0.1.

3. Results

3.1. The review process

Supplementary Fig. 1 in the Appendix summarises the process of study selection. After removal of duplicates from 3785 records identified from our database searches and screening of titles and abstracts, 173 full-text articles were assessed for final inclusion. Thirty five studies were included for the review [7,28–60], 24 of which were included in the meta-analyses [7,29–33,35–51,60].

3.2. Characteristics of the included studies

The characteristics of studies included in this review are summarised in Data in brief: Table 3. Briefly, all the SSA regions were represented by the included studies, majority of which were conducted in the western region (15/35) [28,30–34,36–39,43,49,50,60,61] closely followed by the eastern region (11/35) [35,41,42,44,46,47,52,55–57,59]. Studies published by the investigators of the two major inter-regional HF registries on the continent: The Sub-Saharan Africa Survey of Heart Failure (THESUS-HF) [40,54,58] and INTERnational Congestive Heart Failure (INTER-CHF) [45], were included in this review. All of the studies were hospital-based. The mean ages ranged from 36.5 to 61.5 years. The Framingham criteria and ESC guidelines were used to define HF in 28.6% and 20.0% of the studies, respectively. Almost half of the studies did not report the diagnostic criteria used for the diagnosis of HF.

3.3. Prevalence of HF in SSA

We found seven studies reporting on the prevalence of HF in SSA [28–34], with study qualities ranging from low [29,30], to moderate [28,32,34], and high [31,33]. These studies have been summarised in Data in brief: Table 4. The included studies revealed that HF (mostly acute HF) represented about 9.4–42.5% and 25.6–30.0% of all medical admissions [28,30,33,34], and admissions into cardiology units [29,31,32], respectively.

3.4. Aetiologies of HF in SSA

Overall, data on the aetiologies of HF from 22 studies [7,29–33,35–49,60] were included in the meta-analysis. The study quality was low, moderate and high in four [30,32,48,49], nine [29,35,37,39–42,45,46] and nine studies [7,31,33,36,38,43,44,47,60], respectively; Data in brief (Table 5). About 50% of the studies included in the meta-analysis were from West Africa. The distribution of HF aetiologies varied widely, and meta-analysis ranked HHD as the major cause of HF in SSA with a pooled prevalence of 39.2% (95% CI = 32.6–45.9; Fig. 1: panel A) in a sample of 10,098 individuals, ensued by endemic CMO (Fig. 1: panel B) and RHD (Fig. 2: panel A), respectively. The three aforementioned causes of HF represented about 75% of the causes of HF in SSA. Meanwhile, the pooled prevalence of ischaemic heart disease (IHD) was 7.2% (95% CI = 4.1–11.0), Fig. 2: panel B. A publication bias was only found for the overall reporting of HHD and CMO, Table 1. The different aetiologies of HF in SSA are presented in Data in brief: Table 5.

3.5. Diagnosis of heart failure in SSA

The diagnosis of HF in SSA centres basically on the clinical presentation of the patient, supported by investigations such as the electrocardiography (ECG), chest X-ray and echocardiography [33,40,44]. Less than 50% of facilities in SSA are equipped with basic technologies (functional and staffed radiography, electrocardiogram and ultrasound) to diagnose HF [59]. Specifically, <10% of the ambulatory health facilities have a functional and staffed radiography and ultrasound service [59].

3.6. Pharmacologic treatment of heart failure in SSA

Nine studies with a total of 5692 individuals were included in the meta-analysis [7,29,40,44,45,48,50,51,60]. The study quality was high, moderate and low in three [7,33,44], four [29,40,45,51], and two studies [48,50], respectively. The studies are summarised in Data in brief: Tables 6 and 8. The lead treatment used for HF in SSA was loop diuretics with a pooled prevalence of 81.6% (95% CI = 72.7–89.11; I^2 = 98.4%; Fig. 3) closely followed by angiotensin converting enzyme [ACE] inhibitors/angiotensin receptor blockers [ARBs] (75.5%, 95% CI = 64.4–85.1; I^2 = 98.8%) and aldosterone antagonists (51.5%; 95% CI = 32.4–70; I^2 = 99.4%). Contrarily, digoxin and β-blockers were the least used in the management of HF in SSA, Fig. 3.

3.7. Prognosis of HF in SSA

All thirteen studies reporting on the mortality rate and predictors of mortality among HF patients in SSA [37,42,44,46,47,50–57] are summarised in Data in brief: Table 7. The study quality was high, moderate and low in five [44,47,50,54,57], six [37,42,46,51–53] and two studies [38,40], respectively. The all-cause mortality rates ranged from 3.9 to 25.2% [47,51,53,55,56], and 14.7 to 35.0% [51,53], 15.0 to 57.8% [51,54,57] and 21.9 to 57.9% [47,52] in hospitalised patients, and at 30, 60, 180 and 360 days following discharge, respectively, see Data in brief: Table 7.

The predictors of mortality in patients with HF in SSA are highlighted in Data in brief: Table 7. Of note, HF patients from Western Africa are