Data Article

Data on the epidemiology of heart failure in Sub-Saharan Africa

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Abstract

In Sub-Saharan Africa (SSA), chronic non-communicable diseases and cardiovascular diseases in particular, are progressively taking over infectious diseases as the leading cause of morbidity and mortality. Heart failure is a major public health problem in the region. We summarize here available data on the prevalence, aetiologies, treatment, rates and predictors of mortality due to heart failure in SSA.

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# Specifications Table

| Subject area                        | Medicine            |
|-------------------------------------|---------------------|
| More specific subject area          | Cardiology          |
| Type of data                        | Data presented in tables and figures |
| How data was acquired               | Systematic search of literature |
| Data format                         | Raw and analyzed data |
| Experimental factors                | Not applicable      |
| Data source location                | Not applicable      |
| Data accessibility                  | All data are included in this article |
| Related research article            | Heart failure in sub-Saharan Africa: a contemporaneous systematic review and meta-analysis. International Journal of Cardiology; In Press |

## Value of the data

- This work provides a deeper understanding of the prevalence, etiologies and prognosis of heart failure in SSA.
- The data allow examination of the different medications used for the treatment of heart failure and therefore could help in changing practices for an optimal management of this pathology.
- The data could be used as a baseline for comparison in future studies.

## 1. Data

In SSA, heart failure is a major public health problem, associated with high morbidity and mortality. Due to the shortage of data to distinctly understand the epidemiology of this pathology in this part of the world, we present here a summary of available data on the prevalence, aetiology, treatment, and prognosis of heart failure in SSA.

## 2. Experimental design, materials, and methods

Through a systematic literature search in MEDLINE and EMBASE (search strategies are presented in Tables 1 and 2), we included all published studies from January 1, 1996 to June 23, 2017 with available data on the prevalence, incidence, aetiologies, diagnosis, treatment and outcomes of heart failure in patients aged 12 years and older, living in SSA. We excluded studies conducted exclusively on African populations living outside Africa, commentaries, editorials, letters to the editor, case reports and case-series of less than 30 participants, studies lacking relevant data to compute the prevalence of the different heart failure aetiologies or treatment, and for duplicate studies, the most comprehensive and/or recent study with the largest sample size was considered, studies with inaccessible full-text, even after request from the corresponding author.

The titles and abstracts of articles retrieved from the bibliographic searches were independently screened by two investigators and full-texts of potentially eligible studies were retrieved and assessed for final inclusion. All discrepancies the selection of studies were resolved through discussion or with the arbitrage of a third investigator. A total of 35 studies were included in this review [1–35]. A summary of the selection process is presented in the Fig. 1.
Data were then extracted using a predesigned data extraction form. The extracted data include: the last name of first author and the year of study publication, the country in which the study was conducted, Region (Western, Southern, Central, Eastern), area (urban, semi-urban or rural), study design (cross-sectional, cohort, case control), data collection (prospective versus retrospective), random sampling (yes versus no), study population, male proportion, mean or median age (in years), age range (in years), sample size, criteria used for the diagnosis of heart failure, number of cases of the different aetiologies of heart failure and number of cases of the different medications used for the treatment of heart failure.

The quality and risk of bias of all included studies are presented in Tables 3–7. It was assessed using the risk of bias assessment tool for developed by Hoy et al. [36]. This tool was adapted for the different topics on heart failure covered in this review (prevalence, aetiology, treatment and prognosis of heart failure).

Data were analyzed using the ‘meta’ package of R software. A random-effects meta-analysis model was used to pool prevalence estimates after stabilization of the variance of the study-specific prevalence using the Freeman-Tukey single arc-sine transformation [37]. The Egger’s test was used to
assess publication bias which was considered significant if the p-value < 0.1. Summary statistics from meta-analyses of prevalence studies on the medications used to treat heart failure in sub-Saharan Africa are presented in Table 8.

These data are attached to a systematic review and meta-analysis published in the International Journal of Cardiology [38].
| First name of author, publication year | Country | Region | Area | Study design | Study setting | Data collection | Study population | Random sampling | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Criteria for diagnosis of HF |
|---------------------------------------|---------|--------|------|--------------|---------------|----------------|------------------|----------------|----------|-------------------|-------------------|-------------|------------------------------|
| Oyoo, 1999 [1]                        | Kenya   | Eastern | Urban | Cross-sectional | Hospital-based | Prospective  | Patients ≥ 13 years admitted for congestive heart failure | No              | 48.4     | NR                 | ≥ 13              | 91          | NR                           |
| Thiam, 2003 [2]                       | Senegal | Western | Urban | Cross-sectional | Hospital-based | Prospective  | Patients suffering from heart failure | No              | NR        | 50.0               | 12–91             | 170         | NR                           |
| Kingue, 2005 [3]                      | Cameroon | Central | Urban | Cross-sectional | Hospital-based | Retrospective and prospective  | Patients presenting with clinical and echocardiographic signs of heart failure | No              | 59.3     | 57.3               | ≥ 16              | 167         | NR                           |
| Familoni, 2007 [4]                    | Nigeria | Western | Urban | Cross-sectional | Hospital-based | Prospective  | Patients presenting with acute heart failure | No              | 61.7     | 57.6               | NR                | 82          | NR                           |
| Owusu, 2007 [5]                       | Ghana   | Western | Urban | Cross-sectional | Hospital-based | Prospective  | Patients above 12 years admitted with diagnosis of heart failure | No              | 51.5     | 51.1               | 13–90             | 167         | Framingham’s criteria       |
| Stewart, 2008 [6]                     | South Africa | Southern | Urban | Cross-sectional | Hospital-based | Prospective  | Novo presentations in patients with heart failure and related cardiomyopathies | No              | 43        | 55.0               | NR                | 884         | European Society of Cardiology (ESC) guidelines on HF |
| Ogah, 2008 [7]                        | Nigeria | Western | Urban | Cross-sectional | Hospital-based | Retrospective | All cases of echocardiography done in the department of medicine between September 2005 and February 2007 | No              | 51.6     | 54.0               | 15–90             | 1441        | NR                           |
| Onwuchekwa et al., 2009 [8]           | Nigeria | Western | NR    | Cross-sectional | Hospital-based | Retrospective | Congestive cardiac failure cases admitted and/or discharged from the medical wards | No              | 57.2     | 54.4               | 18–100            | 423         | Framingham’s criteria       |
| Maro, 2009 [9]                        | Tanzania | Eastern | Urban | Cohort        | Hospital-based | Prospective  | Patients admitted for congestive heart failure | No              | 55.0     | NR                 | NR                | 390         | Framingham’s criteria       |
| Damasceno, 2012 [10]                  | SSA     | Eastern | Urban | Cohort        | Hospital-based | Prospective  | Patients admitted with acute heart failure | No              | 49.2     | 52.3               | ’12               | 1006        | European Society of Cardiology (ESC) guidelines on HF |
|                                       | Zambia  | Southern | Urban | Cohort        |             | Prospective  |                                 | No              | 41        | 50                 | ≥ 18              | 390         |                 |
| Study                | Location      | Region    | Study Type       | Hospital-Based | Admissions Criteria                                                                 | Age Median (Range) |
|---------------------|---------------|-----------|------------------|----------------|-------------------------------------------------------------------------------------|--------------------|
| Chansa, 2012        | Rwanda        | Eastern Rural | Cross-sectional  | Hospital-Based | Adult patients (≥18 years) admitted for acute heart failure                         | No 30.0 NR NR 138  |
| Kwan, 2013          | Djibouti      | Eastern NR Cohort | Cross-sectional  | Hospital-Based Based | Heart failure patients treated between November 2006 and March 2011                | No 84.0 55.8 27–75 45 |
| Massouré, 2013      | Nigeria       | Western Urban | Cross-sectional  | Hospital-Based | Djiboutian adults hospitalized for heart failure Subjects of African descent        | No 49.3 49.0 NR 1515 |
| Sliwa, 2013         | SSA           | Cohort     | Hospital-based   |                | Patients presenting with acute heart failure                                       | No 49.1 52.3 ≥12 1006 |
| Makubi, 2014        | Tanzania      | Eastern Urban Cohort | Hospital-Based |                | Patients ≥ 18 years of age with heart failure defined by the Framingham criteria     | No 49.0 55.0 ≥18 427 |
| Ogah, 2014          | Nigeria       | Western Urban | Cross-sectional  | Hospital-Based | Patients presenting with acute heart failure                                        | No 54.9 56.4 NR 452 |
| Pio, 2014           | Togo          | Western Urban | Cross-sectional  | Hospital-Based | Hospitalized patients with heart failure                                            | No 48.2 52.2 18–106 297 |
| Pio, 2014           | Togo          | Western Urban | Cross-sectional  | Hospital-Based | Files of patients hospitalized with heart failure All medical admission             | No NR 36.5 18–45 376 |
| Osuji, 2014         | Nigeria       | Western NR  | Cross-sectional  | Hospital-Based | Patients admitted for acute heart failure Ambulatory and hospitalized adult patients with heart failure | No 50.5 60.7 18–110 NR 537 |
| Okello, 2014        | Uganda        | Eastern NR  | Cross-sectional  | Hospital-Based | Retrospective medical record review                                               | No 30.3 52 NR 274  |
| Dokainish, 2015     | SSA           | Cohort     | Hospital-based   |                | Yes 51.8 53.4 ≥18 1294                                                               |                    |
| Adeoti, 2015        | Nigeria       | Western Urban | Cross-sectional  | Hospital-Based | Retrospective All medical admissions                                               | No 55.0 50.9 16–102 3750 |
| Ansa, 2016          | Nigeria       | Western NR  | Cross-sectional  | Hospital-Based | Retrospective medical record review                                               | No NR NR ≥18 144  |
| Abebe 2016          | Ethiopia      | Eastern Urban | Chart review Cohort | Hospital-Based | Medical records of patients admitted for heart failure Adult patients (≥18 years) admitted for heart failure | No 30.2 53.6 NR 311 |
| Ali, 2016           | Ethiopia      | Eastern Urban | Chart review Cohort | Hospital-Based | Retrospective All cardiovascular admissions to the medical wards                   | No NR NR ≥18 144  |

European Society of Cardiology guidelines on HF
Framingham’s criteria
Framingham’s criteria and ESC
European Society of Cardiology guidelines on HF
Framingham’s criteria
Framingham’s criteria
Boston criteria of HF
| First name of author, publication year | Country | Region | Area | Study design | Study setting | Data collection | Study population | Random sampling | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Criteria for diagnosis of HF |
|--------------------------------------|---------|--------|------|--------------|---------------|----------------|------------------|----------------|----------|---------------------|---------------------|-------------|----------------------------|
| Kingery, 2017 [27]                   | Tanzania | Eastern | Urban | Cohort       | Hospital-based | Prospective     | Medical inpatients admitted for heart failure | No             | 44.1     | 52.0                | ≥ 18                | 145         | Framingham’s criteria       |
| Boombhi, 2017 [28]                   | Cameroon | Central | Urban | Cross-sectional | Hospital-based | Retrospective   | Patients hospitalized for acute heart failure diagnosed on clinical and/or ultrasound evidence | No             | 42.7     | 61.5                | 16–95              | 148         | NR                        |
| Traore, 2017 [29]                    | Ivory Coast | Western | Urban | Cross-sectional | Hospital-based | Retrospective   | Patients hospitalized for heart failure Individuals aged ≥ 18 years discharged from first heart failure admission | No             | 51.0     | NR                  | NR                 | 257         | NR                        |
| Bonsu, 2017 [30]                     | Ghana    | Western | Urban | Cohort       | Hospital-based | Retrospective   | Patients admitted with acute heart failure Adult patients (≥ 18 years) admitted for heart failure Patients presenting with acute heart failure | No             | 45.6     | 60.3                | ≥ 18               | 1488        | NR                        |
| Mwita, 2017 [31]                     | Botswana | Southern | Urban | Cohort       | Hospital-based | Prospective     | No | 53.9     | 54.2                | 20–89              | 193         | NR                        |
| Pallangyo, 2017 [32]                 | Tanzania | Eastern | Urban | Cohort       | Hospital-based | Prospective     | No | 43.5     | 46.4                | ≥ 18               | 463         | Framingham’s criteria       |
| Sani, 2017 [33]                      | SSA – The THE-SUS-HF registry | SSA – The THE-SUS-HF registry | SSA – The THE-SUS-HF registry | SSA – The THE-SUS-HF registry | SSA – The THE-SUS-HF registry | Prospective     | No | 49.2     | 52.3                | ≥ 12               | 954         | European Society of Cardiology guidelines on HF diagnosis |
| Ogah, 2014 [34]                      | Nigeria  | Western | Urban | Cohort       | Hospital-based | Prospective     | Patients followed up for heart failure Health facilities with available diagnostic technologies for HF diagnosis | No             | 53.1     | 58.0                | NR                 | 239         | NR                        |
| Carlson, 2017 [35]                   | Kenya; Uganda | Eastern | NR | Cross-sectional | Hospital-based | Prospective     | No | NA       | NA                  | NA                 | 340 health facilities (197 in Uganda and 143 in Kenya) | NA |

HF=Heart failure; THESUS-HF=sub-Saharan Africa Survey for Heart Failure; INTER-CHF=INTERnational Congestive Heart Failure; NR=Not reported; NA=Not applicable; SSA=Sub-Saharan Africa.
| First name of author, publication year | Country | Region | Area | Study design | Study setting | Data collection | Random sampling | Population | Male (%) | Mean age | Age range (in years) | Sample size | HF diagnostic tool | Prevalence of HF (%) | Study quality |
|--------------------------------------|---------|--------|------|--------------|---------------|----------------|----------------|------------|----------|----------|------------------|------------|------------------|---------------------|--------------|
| Osuji, 2014 [20]                     | Nigeria | Western | NR   | Cross-sectional | Hospital-based | Retrospective | No           | Patients admitted to the medical ward | 50.5      | 60.7     | 18–110             | 537        | NR               | 30.9                | Moderate     |
| Kingue, 2005 [3]                     | Cameroon | Central | Urban | Chart review   | Hospital-based | Retrospective | No           | Patient ≥ 16 years admitted for cardiac pathologies | 59.3      | 57.3     | NR                  | 144        | Echocardiography | 30                  | Moderate     |
| Ansa, 2016 [24]                      | Nigeria | Western | Urban | Cross-sectional | Hospital-based | Retrospective | No           | All cases of medical admissions | 38.9      | 55       | 47–65               | 339        | NR               | 42.5                | Low          |
| Pio, 2014 [18]                       | Togo    | Western | Urban | Cross-sectional | Hospital-based | Retrospective | No           | Patients admitted to the cardiology unit | NR        | 52.2     | 18–106             | 297        | Echocardiography | 25.6                | High         |
| Pio, 2014 [19]                       | Togo    | Western | Urban | Cross-sectional | Hospital-based | Retrospective | No           | Patients admitted to the cardiology unit | NR        | 36.5     | 18–45              | 376        | Echocardiography | 28.6                | Low          |
| Ogah, 2014 [17]                      | Nigeria | Western | Urban | Cohort        | Hospital-based | Prospective | No           | All medical admission             | 54.9      | 56.4     | NR                  | 452        | Echocardiography | 9.4                 | High         |
| Adeoti, 2015 [23]                    | Nigeria | Western | Urban | Cross-sectional | Hospital-based | Retrospective | No           | All medical admissions             | 55.0      | 50.9     | 16–102             | 3750       | NR               | 11.0                | Moderate     |

NR = Not reported.
## Table 5
Aetiology of heart failure across sub-Saharan Africa (1996–2017).

| First name of author, publication year | Country | Region | Area | Study design | Study setting | Data collection | Study population | Random sampling | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Criteria for diagnosis of HF | Aetiology of heart failure | Diagnostic criteria of IHD | Study quality |
|---------------------------------------|---------|--------|------|--------------|---------------|----------------|------------------|----------------|---------|---------------------|---------------------|-------------|--------------------------------|-----------------------------|--------------------------|--------------|
| Oyoo, 1999 [1]                        | Kenya   | Eastern| Urban| Cross-sectional | Hospital-based | Prospective | Patients ≥ 13 years admitted for congestive heart failure | No              | 48.4    | NR                  | ≥ 13                | 91           | NR                                            | Rheumatic heart disease (32%); Cardiomyopathy (25.2%); Hypertensive heart disease (17.6%); Pericardial disease (13.2%); Cor pulmonale (7.7%); Ischaemic heart disease (2.2%); Congenital heart disease (2.2%). | ECG and 2D Doppler Echo-cardiography | Moderate            |
| Thiam, 2003 [2]                       | Senegal | Western| Urban| Cross-sectional | Hospital-based | Prospective | Patients suffering from heart failure | No              | NR      | 50.0                | 12–91               | 170          | NR                                            | Hypertension heart disease (34%); Valvular heart diseases (45%); Chronic renal failure (14.5%); Ischaemic heart disease (18.9%); Pulmonary embolism with Right heart failure (3.5%); Aetiology unspecified (6%). | Clinical presentation ECG and Echo-cardiography | High                 |
| Kingue, 2005 [3]                      | Cameroon| Central| Urban| Cross-sectional | Hospital-based | Retrospective and prospective | Patients presenting with clinical and echocardiographic signs of heart failure | No              | 59.3    | 57.3                | ≥ 16                | 167          | NR                                            | Hypertensive heart disease (54.5%); Cardiomyopathies (26.3%); Rheumatic heart disease (24.6%); Valvular heart diseases (24.6%); Ischaemic heart disease (2.4%). | 12-lead ECG and Echo-cardiography | Moderate            |
| Familoni, 2007 [4]                    | Nigeria | Western| Semi-urban| Cross-sectional | Hospital-based | Prospective | Patients presenting with acute heart failure | No              | 61.7    | 57.6                | NR                  | 82           | NR                                            | Hypertensive heart disease (43.4%); Dilated cardiomyopathy (28%); Rheumatic heart disease (9.8%); Endomyocardial fibrosis (2.2%); Cor pulmonale (3.7%). | NR                      | Moderate            |
| Study | Country | Region | Study Type | Design | Participants | Diagnosis | Methods |
|-------|---------|--------|------------|--------|--------------|-----------|---------|
| Owusu, 2007 | Ghana Western | Cross-sectional | Prospective | No | 51.5 | Ischaemic heart disease (8.5%); others (3.5%) | 12-lead ECG and Echo-cardiography |
| Stewart, 2008 | South Africa Southern | Cross-sectional | Prospective | No | 43 | Dilated cardiomyopathy (35%); Hypertensive heart disease (33%); Right heart failure (27%); Ischaemic heart disease (9%) and Valvular heart disease (8%) | 12-lead ECG; echo-cardiography; stress test; cardiac nuclear imaging and cardiac catheterization |
| Ogah, 2008 | Nigeria Western | Cross-sectional | Retrospective | All cases of echocardiography done in the department of medicine between September 2005 and February 2007 | 51.6 | Hypertensive heart disease (56.7%); Rheumatic heart disease (3.7%); Dilated cardiomyopathy (3.0%); Pericardial disease (1.8%); Cor pulmonale (1.6%); Ischaemic heart disease (0.6%); Congenital heart disease (0.4%); Diabetic heart disease (0.4%); Thyroid heart disease (0.1%); Sickle cell cardiopathy (0.1%). | 12-lead ECG; echo-cardiography; stress test; cardiac nuclear imaging and cardiac catheterization |
| Onwu-zechewa, 2009 | Nigeria Western NR | Cross-sectional | Retrospective | Congestive cardiac failure cases admitted and/or discharged from the | 57.2 | Hypertensive heart disease (56.3%); Cardiomyopathies (12.2%); Chronic renal failure (7.80%); Severe anemia (4.72%); Rheumatic heart diseases (4.26%); Cor pulmonale (2.13%); | 12-lead ECG; echo-cardiography |
| First name of author, publication year | Country | Region | Area | Study design | Study setting | Data collection | Study population | Random sampling | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Criteria for diagnosis of HF | Aetiology of heart failure | Diagnostic criteria of IHD | Study quality |
|--------------------------------------|---------|--------|------|--------------|---------------|----------------|------------------|----------------|----------|-------------------|---------------------|--------------|--------------------------------|--------------------------------|--------------------------|--------------|
| Damasceno, 2012 [10]                | SSA     | –      | Cohort | Hospital-based | Prospective   | Patients admitted with acute heart failure | No              | 49.2       | 52.3               | ˃12                 | 1006         | European Society of Cardiology (ESC) guidelines on HF | Congenital valvular heart disease (0.24%); Ischemic heart disease (0.24%); Missing (11.11%) | 12-lead ECG; echocardiography; stress test | Moderate |
| Kwan, 2013 [12]                     | Rwanda  | Eastern | Rural | Cross-sectional | Hospital-based| Heart failure patients treated between November 2006 and March 2011 | No              | 30.0       | NR                 | NR                  | 138          | NR                             | Dilated cardiomyopathy (54%), Rheumatic heart disease (25%), hypertensive heart disease (8%) and ischaemic heart disease (0%) | NR                       | Moderate |
| Massouré, 2013 [13]                 | Djibouti| Eastern | NR    | Cohort | Hospital-based | Prospective | Adults hospitalized for heart failure | No              | 84.0       | 55.8               | 27–75               | 45           | Framingham criteria                 | Coronary artery disease (62%); hypertensive heart disease (18%); rheumatic valvular disease (13%) and primary dilated cardiomyopathy (7%) | 12-lead ECG; echocardiography; stress test | Moderate |
| Ojji, 2013 [14]                     | Nigeria | Western | Urban | Cross-sectional | Hospital-based | Patients with novo presentations of | No              | 49.3       | 49.0               | NR                  | 1515         | European Society of Cardiology (ESC) | Hypertensive heart disease (60.6%); Idiopathic dilated cardiomyopathy (12.0%); Valvular rheumatic | ECG; Cardiac enzymes; | High       |
| Study                  | Country     | Region     | Study Type                  | Patients Age | Patients | Heart Failure Criteria | Heart Disease Percentage | Other Causes (%) | Tests Used |
|-----------------------|-------------|------------|-----------------------------|--------------|----------|------------------------|-------------------------|------------------|------------|
| Makubi, 2014          | Tanzania    | Eastern    | Hospital-based Prospective  | 18-55        | 427      | Framingham criteria    | 8.6%                     | Alcoholic cardiomyopathy (4.2%); Thyrotoxic heart disease (2.9%); right heart failure (2.5%); Ischaemic heart disease (0.4%) | Echocardiography |
| Ogah, 2014            | Nigeria     | Western    | Hospital-based Prospective  | 18-42        | 452      | Framingham criteria and ESC | 78.5% (Hypertensive heart disease); 7.5% (Dilated cardiomyopathy); 4.4% (Cor pulmonale); 3.3% (Rheumatic heart disease); 2.4% (Ischaemic heart disease); 0.4% (Valvulopathies) | Echocardiography, 12-lead ECG, and Echo-cardiography |
| Pio, 2014             | Togo        | Western    | Hospital-based Prospective  | 18-55        | 297      | European Society of Cardiology (ESC) guidelines on HF | 43.1% (Hypertensive heart disease); 19.2% (Ischaemic heart disease); 11.8% (Peripartum cardiomyopathy); 2.2% (Valvulopathies); 1.8% (HIV-related cardiopathy); 3.4% (Thyrotoxic heart disease); 2.7% (Congenital cardiopathies); 2% (Chronic alcoholism) and 5.9% (idiopathic) | ECG, Cardiac enzymes; Echocardiography |
| Pio, 2014             | Togo        | Western    | Retrospective Files of patients | NR          | 376      | Hypertensive heart disease (42.8%); Valvulopathies (18.1%); | ECG, Cardiac enzymes; Low |

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| First name of author, publication year | Country | Region | Area | Study design | Study setting | Data collection | Study population | Random sampling | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Criteria for diagnosis of HF | Aetiology of heart failure | Diagnostic criteria of IHD | Study quality |
|--------------------------------------|---------|--------|------|--------------|---------------|----------------|------------------|----------------|----------|-------------------|---------------------|-------------|----------------------------|----------------------------|------------------------|-------------|
| Dokainish, 2015 [22]                 | SSA     | –      | Cohort | Hospital-based | Prospective, international, multicenter | Ambulatory Yes and hospitalized adult patients with heart failure |   | 51.8 | 53.4 | ≥ 18 | 1294 | Boston criteria of HF | Peripartum cardiomyopathy (15.4%); Idiopathic dilated cardiomyopathy (5.8%); Alcoholic cardiomyopathy (3.2%); IHD (2.7%); Congenital cardiopathy (2.7%); Cor pulmonale (2.1%); thyrotoxic heart failure (1.8%); Pericardial tamponade (1.1%) and HIV-associated myocarditis (1.1%) | Echo-cardiography |
| Ansa, 2016 [24]                      | Nigeria | Western | NR | Cross-sectional | Hospital-based | Retrospective medical record review | All cardiovascular admissions to the medical wards | NR | NR | ≥ 18 | 144 | NR | Hypertensive heart disease (35%); Ischaemic cardiomyopathy (20%); Idiopathic dilated cardiomyopathy (14.5%); Valvular rheumatic heart disease (7.2%); Endocrine/metabolic heart disease (5.3%); Valvular non-rheumatic heart disease (2.3%); Alcohol/drug induced cardiopathy (0.7%); HIV cardiomyopathy (0.7%) | NR | Moderate |
| Abebe 2016 [25]                      | Ethiopia | Eastern | Urban | Chart review | Hospital-based | Retrospective | Medical records of | NR | 30.2 | 53.6 | NR | 311 | NR | Hypertensive heart disease (48.6%); dilated cardiomyopathy (35.4%); Anaemia (14.6%) and Rheumatic heart disease (14.6%) | Valvular heart disease (40.8%); Hypertensive | NR | Moderate |
| Study          | Country          | Region       | Cohort Type     | Study Design       | No | Median Age | Range | Gender | Diagnosis                                      |
|---------------|-----------------|--------------|-----------------|--------------------|----|------------|-------|--------|------------------------------------------------|
| Kingery, 2017 | Tanzania Eastern Urban Cohort | Hospital-based Prospective | Medical inpatients admitted for heart failure | No | 44.1 | 52.0 | ≥ 18 | 145 | Framingham criteria of HF  
  Hypertensive heart disease (16.1%); Ischaemic heart disease (15.8%); Dilated cardiomyopathy (12.5%); Cor pulmonale (4.5%); Others (10.3%) |
| Boombhi, 2017 | Cameroon Central Urban Cross-sectional | Hospital-based Retrospective | Patients hospitalized for acute heart failure, diagnosed on clinical and/or ultrasound evidence | No | 42.7 | 61.5 | 16–95 | 148 | NR  
  Hypertensive heart disease (30.16%); Dilated cardiomyopathy (28.57%); Valvular heart disease (11.90%); Chronic cor pulmonale (8.73%); Ischemic heart disease (6.35%); Pericardial diseases (3.96%); Peripartum cardiomyopathy (3.18%) |
| Traore, 2017  | Ivory Coast Western Urban Cross-sectional | Hospital-based Retrospective | Patients hospitalized for heart failure | No | 51.0 | NR | NR | 257 | NR  
  Hypertensive heart disease (22.9%); Dilated cardiomyopathy (55.57%); Valvular heart disease (6.76%); Ischemic heart disease (11.23%); Other (9.9%) |

Others: *Tuberculosis; HIV-related cardiomyopathy; endomyocardial fibrosis; obstructive pulmonary disease; IHD = Ischaemic heart disease; ECG = Electrocardiography; HF = Heart failure; THE-SUS-HF = sub-Saharan Africa Survey for Heart Failure; INTER-CHF = INTERnational Congestive Heart Failure; ESC = European Society of Cardiology; NR = not reported.*
| First name of author, publication year | Country | Region | Area | Study design | Study setting | Data collection | Random sampling | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Criteria for diagnosis of HF | Treatment of heart failure | Study quality |
|--------------------------------------|---------|--------|------|--------------|---------------|----------------|----------------|---------|---------------------|-------------------|-------------|----------------------------|----------------------------|--------------|
| Kingue, 2005 [10]                   | Cameroon | Central | Urban | Cross-sectional | Hospital-based | Retrospective and prospective | No               | 59.3    | 57.3                | ≥ 16               | 167         | NR                         | Loop diuretics (90%); angiotensin-converting enzyme inhibitor (ACEI) (64.7%); beta-blockers (19.8%); digoxin (30.5%); aldosterone antagonists (25.5%) | Moderate         |
| Stewart, 2008 [7]                   | South Africa | Southern | Urban | Cross-sectional | Hospital-based | Prospective | No               | 43.0    | 55.0                | NR                | 844         | ESC                        | Loop or thiazide diuretic (68%); ACEI (57.7%); beta-blocker (45.6%); digoxin (19%); aldosterone antagonist (42%); calcium channel blocker (18%) | High            |
| Ogah, 2014 [26]                     | Nigeria | Western | Urban | Cohort | Hospital-based | Prospective | No               | 54.9    | 56.4                | NR                | 452         | Framingham criteria and ESC | Loop diuretic (88.1%); ACEI (99.1%); beta-blockers (9.1%) digoxin (72.3%); long-acting calcium-channel blockers (26.8%); combined hydralazine and isosorbide dinitrate (14.4%) | High            |
| Damasceno, 2012 [17]                | THESUS-HF Registry | SSA | NR | Cohort | Hospital-based | Prospective | No               | 49.2    | 52.3                | ≥ 12               | 1006        | ESC                        | Loop diuretic (79%); ACEI/angiotensin receptor blocker (ARB) (82%); beta-blockers (30%); Digoxin (60%); Aldosterone antagonist (75%); Loop diuretics (88%); ACEI/ARB (92%); β-Blockers (42%); Digoxin (39%); Aldosterone antagonist (72%); Calcium channel blockers (19%); Nitrites (64%); Hydralazine (4%) | Moderate         |
| Makubi, 2014 [18]                  | Tanzania | Eastern | Urban | Cohort | Hospital-based | Prospective | No               | 49.0    | 55.0                | ≥ 18               | 427         | Framingham criteria         | Loop diuretics (88%); ACEI/ARB (92%); β-Blockers (42%); Digoxin (39%); Aldosterone antagonist (72%); Calcium channel blockers (19%); Nitrites (64%); Hydralazine (4%) | High            |
| Dokainish, 2016 [19]                | SSA | Both | Cohort | Hospital-based | No               | No               | 51.8    | 53.4                | ≥ 18               | 1294        | Boston criteria of HF | Loop diuretics (93.7%); ACEI/ARB (77.1%); β-Blockers | Moderate         |
| Study | Country | Region | Study Type | Setting | Sample Size | Age (years) | Gender | HF Etiology | Treatments |
|-------|---------|--------|------------|---------|-------------|-------------|--------|-------------|------------|
| Boombhi, 2017 [29] | Cameroon | Central | Cross-sectional | Hospital-based | Prospective, international, multicenter | No | 42.7 | 61.5 | 16–96 | 148 | NR | Low |
| Bonsu, 2017 [30] | Ghana | Western | Urban Cohort | Hospital-based | Retrospective | No | 45.6 | 60.3 | ≥ 18 | 1488 | Framingham criteria of HF | Low |
| Mwita, 2017 [31] | Botswana | Southern | Urban Cohort | Hospital-based | Prospective | No | 53.9 | 54.2 | 20–89 | 193 | NR | Moderate |
| First name of author, publication year | Country | Region | Area | Study setting | Data collection | Random sampling | Study Population | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Duration of follow-up | Mortality rate | Predictor(s) of mortality (HR or OR) | Study quality |
|--------------------------------------|---------|--------|------|---------------|----------------|----------------|-----------------|---------|-------------------|-------------------|------------|---------------------|---------------|----------------------------------|--------------|
| Familoni, 2007 [4]                  | Nigeria | Western | Semi-Urban | Hospital-based | Prospective | No | Adult patients (≥ 18 years) admitted for acute heart failure | 67.1 | 57.6 | NR | 82 | 3 years | 3-year mortality rate = 67.1% | Age (HR = 0.997); Systolic blood pressure (HR = 1.002); Congestion score (HR = 1.007) | Moderate |
| Maro, 2009 [9]                      | Tanzania | Eastern | Urban | Hospital-based | Prospective | No | Patients admitted for congestive heart failure | 55.0 | NR | NR | 360 | 12 months | 360-day mortality rate = 21.9% | NR | Moderate |
| Chansa, 2012 [11]                   | Zambia | Southern | Urban | Hospital-based | Prospective | No | Adult patients (≥ 18 years) admitted for acute heart failure | 41 | 50 | NR | 390 | 30 days | In-hospital mortality rate = 24.1% 30-day mortality rate = 35% | Left ventricular ejection fraction < 40% (HR = 1.93); NYHA class IV (HR = 1.92); Serum urea nitrogen > 15 mmol/L (HR = 2.10); Hemoglobin levels < 12 g/dL (HR = 1.34); Systolic blood pressure < 115 mmHg (HR = 1.92) | Moderate |
| Sliwa, 2013 [15]                    | The THE-SUS-HF registry | SSA | – | Hospital-based | Prospective | No | Patients presenting with acute heart failure | 49.1 | 52.3 | NR | 1006 | Six months | 60-day mortality rate = 9.5% 180-day mortality rate = 15.0% | Malignancy (HR = 5.04); History of cor pulmonale (HR = 2.50); Serum urea nitrogen (HR = 1.39); Systolic blood pressure | High |
| Study | Country | Region | Setting | Study Design | Eligible Population | Sample Size | Age Range | Follow-up | Mortality Rate | Risk Factors |
|-------|---------|--------|---------|--------------|---------------------|-------------|-----------|------------|----------------|--------------|
| Massouré, 2013 | Djibouti | Eastern Urban | Hospital-based | Prospective | No Adult patients (<18 years) admitted for heart failure | 84 | 55.8 | 27–75 | 45 months | 14.4% | Mortality rate = 18.0% |
| Okello, 2014 | Uganda | Eastern NR | Hospital-based | Retrospective | No Patients admitted for acute heart failure | 30.3 | 52 | NR | 274 | 13 months | In-hospital mortality rate = 18.3% |
| Makubi, 2014 | Tanzania | Eastern Urban | Hospital-based | Prospective | No Adult patients (<18 years) with heart failure | 49.0 | 55 | ≥18 | 427 | 7 months | 22.4 per 100 person-years |
| Ali, 2016 | Ethiopia | Eastern Urban | Hospital-based | Prospective | No Adult patients (<18 years) admitted for heart failure | 50.7 | 50.9 | ≥18 | 152 | 9 months | In-hospital mortality rate = 3.9% |
| Abebe, 2016 | Ethiopia | Eastern Urban | Hospital-based | Retrospective | NR Adult patients admitted for HF | 30.2 | 53.8 | ≥18 | 311 | 25 months | Mortality rate = 14.1% |

Risk Factors: Hypotension on admission (adjusted OR = 4.6); Reduced left ventricular ejection fraction (adjusted OR = 7.6); Creatinine clearance (HR = 0.98); Pulmonary hypertension (HR = 2.11); Anaemia (HR = 2.27); No formal education (HR = 2.34); Inpatient (HR = 3.23); Atrial fibrillation (HR = 3.37).
| First name of author, publication year | Country | Region | Area | Study setting | Data collection | Random sampling | Study Population | Male (%) | Mean age (in years) | Age range (in years) | Sample size | Duration of follow-up | Mortality rate | Predictor(s) of mortality (HR or OR*) | Study quality |
|--------------------------------------|---------|--------|------|--------------|----------------|----------------|-----------------|---------|-------------------|-------------------|------------|---------------------|---------------|---------------------------------------|--------------|
| Kingery, 2017 [27]                  | Tanzania| Eastern| Urban| Hospital-based | Prospective     | No              | Adult patients (≥ 18 years) admitted for heart failure | 38.3    | 50.8              | 18               | 145        | 12 months           | In-hospital mortality rate = 25.2% | Low eGFR (HR = 2.94); Proteinuria (HR = 2.03). | High         |
| Bonsu, 2017 [30]                   | Ghana   | Western| Urban| Hospital-based | Retrospective   | No              | Adult patients (≥ 18 years) admitted for heart failure | 45.6    | 60.3              | 18               | 1488       | 5 years              | 5-year mortality rate = 31.7%   | Age (HR = 1.01); NYHA IV (HR = 1.96); Ejection fraction (HR = 0.99); LDLC-C (HR = 1.1); Chronic kidney disease (HR = 1.74); Atrial fibrillation (HR = 1.26); Anaemia (HR = 1.40); Diabetes mellitus (HR = 1.50); Statin (HR = 0.70); Aldosterone antagonists (HR = 0.81) | High         |
| Mwita, 2017 [31]                   | Botswana| Southern| Urban| Hospital-based | Prospective     | No              | Adult patients (≥ 18 years) admitted for acute heart failure | 53.9    | 54.2              | 20–89            | 193        | 1 year              | In-hospital mortality rate = 10.9% | Advanced age; Lower haemoglobin level; Lower eGFR; Lower serum sodium levels; Higher length of hospital stay; Higher serum creatinine levels; Higher serum urea levels; Higher serum NT-proBNP levels | Moderate     |
| Pallangyo, 2017 [32]                | Tanzania| Eastern| Urban| Hospital-based | Prospective     | No              | Adult patients (≥ 18 years) admitted                      | 43.5    | 46.4              | 18               | 463        | 180 days             | 180-day mortality rate = 57.8% | Renal dysfunction (HR = 1.9); Severe anaemia (HR = 1.8); Hyponatraemia (HR = 2.2); | High         |
| Study | Registry/Study | Sampling | Design | No | Follow-up | Mortality | Predictors of mortality | HR* | OR** | Notes |
|-------|---------------|----------|--------|----|-----------|-----------|------------------------|------|------|-------|
| Sani, 2017 | The THE-SUS-HF registry | Hospital-based Prospective | No Patients presenting with acute heart failure | 49.2 | 52.3 | ≥ 12 | 954 | 180 days | NR | Low | Predictors of mortality within 60 days: Heart rate (HR = 1.07); left atrial size (HR = 1.00) Predictors of mortality within 180 days: Heart rate > 80 bpm (HR = 1.25); left ventricular posterior wall thickness in diastole > 9 mm (HR = 1.32); Presence of aortic stenosis (HR = 3.60) |

HR* = Hazard ratio; OR** = Odd's ratio; NYHA = New York Heart Association; bpm = Beats per minute; NR = Not reported; eGFR = Estimated glomerular filtration rate.
Table 8
Summary statistics from meta-analyses of prevalence studies on the medications used to treat heart failure in sub-Saharan Africa.

| Treatment              | N studies | N participants | % (95% confidence interval) | I² (95% confidence interval) | H (95% confidence interval) | P heterogeneity | P Egger test |
|------------------------|-----------|----------------|----------------------------|------------------------------|----------------------------|-----------------|--------------|
| ACEI/ARB               | 9         | 5692           | 75.5 (64.4–85.1)           | 98.8 (98.4–99.0)             | 8.9 (7.8–10.2)             | < 0.0001        | 0.879        |
| Aldosterone antagonists| 6         | 4925           | 51.5 (32.4–70.3)           | 99.4 (99.3–99.6)             | 13.4 (11.8–15.2)           | < 0.0001        | 0.807        |
| Digoxin                | 7         | 5027           | 31.5 (19.4–45.0)           | 98.9 (98.6–99.2)             | 9.6 (8.3–11.2)             | < 0.0001        | 0.924        |
| loop diuretics         | 9         | 5692           | 31.6 (22.6–41.0)           | 98.1 (97.4–98.6)             | 7.3 (6.3–8.5)              | < 0.0001        | 0.549        |
| β-Blockers             | 9         | 5692           | 31.4 (22.6–41.0)           | 98.1 (97.4–98.6)             | 7.3 (6.3–8.5)              | < 0.0001        | 0.549        |

ACEI = Angiotensin II enzyme inhibitor; ARB = Angiotensin receptor blocker; N = frequency; CI = confidence interval.

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Transparency document. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.dib.2018.01.100.

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