GLOBAL HEART

Risk Factors and Prevalence of Dilated Cardiomyopathy in Sub-Saharan Africa: A Systematic Review

REVIEW

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HIGHLIGHTS

- Prevalence of DCM varies widely in SSA.
- Cardiovascular risk factors are important in patients with DCM.
- The role of genetics in idiopathic DCM is not studied in major part of SSA.

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EXCLUSION CRITERIA

This review excluded case reports, editorials, comments or expert opinions, as well as letters of study subjects due to lack of peer review. In addition, articles published in a language other than English were excluded. Qualitative studies were also excluded. Protocol for this systematic review was previously published [17].

SEARCH STRATEGY

A limited search of PubMed was performed to identify relevant keywords contained in the title, abstract, and subject descriptors. The initial search terms were 'heart failure,' 'cardiomyopathy,' and 'sub-Saharan Africa'; these search terms and their synonyms were then used in an extensive search in PubMed. This search was applied to answer question 1 on prevalence. Thereafter, a search was performed to answer question 2 using the terms 'heart failure,' 'cardiomyopathy,' and the risk factors of interest, which are age, gender, ethnicity, family history, hypertension, diabetes, tobacco use, physical inactivity, poor nutrition, excessive alcohol consumption, high cholesterol, and obesity, in 'sub-Saharan Africa.' Filters were added to narrow down to articles published from 2000 on, and in the English language. Indexed articles in PubMed and Embase were included. Taking into account that some journals in Africa may not be indexed in PubMed, searches in Google Scholar was also performed, and the first 300 articles were included. The detailed search terms followed the PICO (Patient/Population/Problem, Intervention/Prognostic Factor, Comparison, Outcome) as per published protocol.

RISK OF BIAS AND STUDY QUALITY

Identified studies that met the inclusion criteria were assessed independently for methodological validity by two reviewers prior to inclusion in the final analysis using Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies found at https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools.

DATA COLLECTION

Full copies of articles identified by the search that met the inclusion criteria based on their title, abstract, and subject descriptors were obtained for data synthesis. The collected data was organized in Endnote reference manager and subsequently uploaded to the Rayyan web app for systematic reviews to allow for adequate sorting. Two reviewers independently selected articles against the inclusion criteria. Discrepancies in reviewer selections were resolved by a third author (arbitrator) prior to the selected articles being retrieved. A data extraction tool was developed specifically for quantitative research data extraction based on the work of the Cochrane Collaboration and the Centre for Reviews and Dissemination, as seen published protocol. Two reviewers independently performed data extraction. In cases of missing data, the corresponding authors of the study were approached once by email. Data sorting flow is shown in Annex 1.

DATA SYNTHESIS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for reporting systematic reviews were applied [18]. A flow diagram is provided to illustrate the literature search and article selection process (annex 1). Furthermore, a map of sub-Saharan Africa with colors to show idiopathic DCM prevalence in each country is included (annex 2). For categorical and continuous variables, mean,median and interquartile range were used to summarise data.

RESULTS

We included 24 articles with data from 16 SSA countries. All articles were from hospital-based studies, and the majority were prospective studies (10, 41.7%); retrospective and cross sectional studies were each at 7 (29.2%), seen in Table 1. The majority of the studies were graded as fair 14 (58.3%), followed by good quality 10 (41.7%); one article was graded as poor quality (Table 1).

VARIABLE	NUMBER OF STUDIES	VALUE
Mean Age, mean(SD)	21	52.5(6.2)
Male sex, median(IQR)	21	44.2(33.2–49.5)
DCM prevalence, median(IQR)	14	20.5(9.7–31.7)
Idiopathic DCM prevalence, median(IQR)	11	13.8(11.0–19.6)
Study type, n (%)	24	
Cross sectional		7(29.2%)
Prospective		10(41.7%)
Retrospective		7(29.2%)
Country, n (%)	24	
Nigeria		6(25%)
Tanzania		4(16.7%)
Uganda		2(8.3%)
Ghana		2(8.3%)
Others		9(37.8%)
SSA*		1(4.2%)
Quality assessment of studies, n (%)	24	
Good		8(33.3)
Fair		15(62.5)
Poor		1(4.2)

Table 1 General aspects of the studies on HF patients in SSA.

* This study involved 9 countries in SAA namely Sudan, Ethiopia, Kenya, Uganda, Mozambique, South Africa, Cameroon, Nigeria and Senegal.

Nigeria had the largest number of studies 6 (26.1%), followed by Tanzania 4 (17.4%), Uganda and Ghana with two studies each at 8.7%. However, THESUS-HF study was the biggest heart failure study in SSA with data from 9 countries (Table 1).

We recorded the prevalence of DCM in patients with HF from 14 studies of 20.5% (9.7–31.7). In patients with HF due to various causes, including DCM, hypertension was noted as the most common cardiovascular risk factor at 53.4% (35.9–59.0), and males constituted 44.2% (33.2–49.5). Other important risk factors were obesity 20.65% (11.2–33.5), tobacco use 6.6% (2.5–19.1), and excessive alcohol intake 10% (2.1–16.0). Black ethnicity and positive family history were only recorded in 3 studies each at 97.3% and 4.0%, respectively. Physical inactivity was only recorded in one study done in Kenya, seen in 73% of the study population. In the reviewed articles, no information was available on nutrition status (Table 3).

Prevalence of idiopathic DCM in HF patients was recorded at 13.8% (11.0–19.6) from 11 studies, seen in Table 1. Only one study done in Chad provided value for DCM (22%) and proportion of idiopathic DCM within the studied population of HF patients at 8%. The criteria for diagnosis of idiopathic DCM in each study were provided as in Table 2.

Table 2 DCM prevalence in patients with heart failure in Sub-Saharan Africa.

NR = Not recorded.

FIRST NAME AUTHOR, YEAR PUBLISHED	COUNTRY	STUDY DESIGN	STUDY SETTING	SAMPLE SIZE	MALE (%)	MEAN AGE (YEARS)	DCM PREVAL-ENCE %	IDIOPATHIC DCM PRE-VALENCE %	CRITERIA FOR IDIOPATHIC DCM DIAGNOSIS
A G B Amoah, 2000 [37]	Ghana	Cross sectional	Hospital based	572	NR	42.3	NR	16.8	Stated as idiopathic DCM in the article
K Sliwa et al, 2008 [38]	South Africa	Prospect-ive	Hospital based	844	NR	NR	NR	35.0	ESC guidelines
K Karaye, 2008 [39]	Nigeria	Cross sectional	Hospital based	76	55.7	46.9	10.1	NR	

(Contd.)

FIRST NAME AUTHOR, YEAR PUBLISHED	COUNTRY	STUDY DESIGN	STUDY SETTING	SAMPLE SIZE	MALE (%)	MEAN AGE (YEARS)	DCM PREVAL-ENCE %	IDIOPATHIC DCM PRE-VALENCE %	CRITERIA FOR IDIOPATHIC DCM DIAGNOSIS
D B Ojji, 2009 [40]	Nigeria	Cross sectional	Hospital based	340	50.9	50.6	NR	13.8	Idiopathic DCM the left ventricle was dilated (with or without dilatation of the other three cardiac chambers) with global systolic and diastolic dysfunctions in subjects with no known cause of heart failure
O Onwuchewka, 2009 [41]	Nigeria	Cross sectional	Hospital based	423	57.2	54.4	7.3	NR	
A Damasceno, 2012 [8]	SSA	Cross sectional	Hospital based	1006	49.2	52.3	NR	18.8	ESC guidelines
GF Kwan, 2013 [42]	Rwanda	Retro-spective	Hospital based	138	27.0	35.0	54.0	NR	
D B Ojji, 2013 [43]	Nigeria	Prospect-ive	Hospital based	1515	49.3	49.0	NR	12.0	The diagnosis was that of exclu-sion in subjects presenting with features of heart failure without any obvious etiological factor
S Okello, 2014 [44]	Uganda	Retro-spective	Hospital based	274	30.3	52.0	31.4	NR	
A Makubi, 2014 [45]	Tanzania	Prospect-ive	Hospital based	427	45.0	55.0	21.1	NR	
O S Ogah, 2014 [28]	Nigeria	Prospect-ive	Hospital based	452	54.9	56.6	7.5	NR	
T B Abebe, 2016 [46]	Ethiopia	Retro-spective	Hospital based	311	23.8	53.5	NR	12.5	Idiopathic DCM when there was no other known cardiac cause and had LVEF <50%
G S Bloomfield, 2016 [47]	Kenya	Prospect-ive case-con-trol study	Hospital based	118	49.0	61.0	19.5	NR	
K O Bonsu, 2017 [48]	Ghana	Retro-spective	Hospital based	1488	46.6	60.3	19.9	NR	
J T Hertz, 2017 [49]	Tanzania	Retro-spective	Hospital based	294	44.2	62.4	8.5	NR	
J C Mwita, 2017 [29]	Botswana	Cross sectional	Hospital based	193	53.9	54.2	NR	19.6	ESC and study of Soweto Guidelines
S Mmbali, 2017 [50]	Tanzania	Prospect-ive	Hospital based	131	43.5	45.3	32.8	NR	
S Okello, 2018 [51]	Uganda	Prospect-ive	Hospital and com-munity	195	32.0	52.0	20.0	NR	
D Malamba-Les, 2018 [23]	DRC	Retro-spective	Hospital based	231	47.0	56	47.6	NR	
M M Baba, 2018 [52]	Nigeria	Prospect-ive	Hospital based	354	36.6	46.9	NR	11.0	Stated as idiopathic DCM in the article

(Contd.)

FIRST NAME AUTHOR, YEAR PUBLISHED	COUNTRY	STUDY DESIGN	STUDY SETTING	SAMPLE SIZE	MALE (%)	MEAN AGE (YEARS)	DCM PREVAL-ENCE %	IDIOPATHIC DCM PRE-VALENCE %	CRITERIA FOR IDIOPATHIC DCM DIAGNOSIS
C Nkoke, 2019 [53]	Cameroon	Cross sectional	Hospital based	86	44.5	59.4	NR	9.3	Stated as idiopathic DCM in the article
N Madjirangar, 2019 [54]	Chad	Retro-spective	Hospital based	100	52.0	40.2	22.0	8.0	Stated as idiopathic DCM in the article
P Pallangyo, 2020 [55]	Tanzania	Prospect-ive	Hospital based	419	43.4	46.4	27.0	NR	

VARIABLE	NUMBER OF STUDIES	VALUE
Age in years, mean (SD)	21	52.5(6.2)
Hypertension %, median(IQR)	23	53.4(35.9–59.0)
Male sex %, median(IQR)	21	44.2(33.2–49.5)
Diabetes Mellitus %, median(IQR)	17	11(1.9–12.8)
Tobacco use %, median(IQR)	10	6.6(2.5–19.1)
Physical inactivity %	1	73%
Poor Nutrition %	0	0
Excessive alcohol intake %, median(IQR)	7	10(2.1–16.0)
High cholesterol/Dyslipidemia %; median(IQR)	4	6.6(2.5–9.1)
Obesity %, median (IQR)	6	20.6(11.2–33.5)
Family history %, mean (SD)	2	4.0(0.9)
Ethnicity(blacks),median(IQR)	3	98.4(94.3–99.6)
BMI, median (IQR)	5	25.1(22.7–26.8)
Low level of education %, median(IQR)	6	34.9(3.1–38)

Table 3 Cardiovascular risk factors in HF patients studied in SSA.

DISCUSSION

In this systematic review we summarised data from 24 studies in 16 countries in SSA to determine the prevalence of DCM and associated risk factors in acquired form of the condition. We also looked into idiopathic form of DCM and its contribution to heart failure in SSA.

PREVALENCE OF DILATED CARDIOMYOPATHY IN SSA

We observed that DCM was an important cause of HF in SSA population, with varied weight across the region observed while comparing a study from Nigeria at (7.3%) and another study in Rwanda at 54% [19, 20]. However, our findings differ slightly with a retrospective study done in Morroco in 120 patients previously admitted for HF, which showed a prevalence of 33.3% [21]. This difference could be attributed to the methodology used and the small sample size of the later study.

Furthermore, previous studies in SSA have reported on DCM in HF patients in SSA and attributed it to diverse etiologies [9]. The role of infections, such as the HIV pandemic, in its etiology could not be overlooked; this may set SSA apart from other parts of the world and calls for a customized approach [22].

CARDIOVASCULAR RISK FACTORS IN HF PATIENTS INCLUDING DCM IN SSA

In our population, we noted female predominance in HF patients including DCM, this finding differs from a study done in Democratic Republic of Congo by Malamba-Les et al., which observed male predominance (59%; n = 65; P < .01) [23]. The female predominance in our review may be partly explained by the disproportionately high prevalence of HIV in women in SSA which is known to trigger myocardial insult leading to cardiomyopathy [24].