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Epidemiology of depressive disorders in people living with hypertension in Africa: a systematic review and meta-analysis

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ABSTRACT

Objectives Better knowledge of epidemiology of depressive disorders in people living with hypertension can help to implement pertinent strategies to address its burden. The objective was to estimate the prevalence of depressive disorders and symptoms in people living with hypertension in Africa.

Design Systematic review and meta-analysis.

Data sources PubMed, EMBASE, African Index Medicus, African Journals OnLine were searched up to 31 January 2020, regardless of the language of publication.

Eligibility criteria We included studies conducted among adult patients with hypertension (≥18 years) living in Africa and reporting the prevalence of depressive disorders and symptoms.

Data extraction and synthesis Two independent investigators selected studies, extracted data and assessed the methodological quality of included studies by using the tools developed by Joanna Briggs Institute. Multivariate random-effects meta-analysis served to pool data by considering the variability between diagnostic tools used to identify patients with depressive disorders or symptoms.

Results We included 11 studies with 5299 adults with hypertension. Data were collected between 2002 and 2017, from South Africa, Nigeria, Ghana, Ethiopia and Burkina Faso. The mean age varied between 50.3 years and 59.6 years. The proportion of men ranged from 28% to 54%. The adjusted prevalence of depressive disorders taking into account the variance between diagnostic tools was 17.9% (95% CI 13.0% to 23.4%). The prevalence of depressive symptoms and major depressive symptoms was 33.3% (95% CI 9.9% to 61.6%) and 7.8% (95% CI 3.0% to 14.5%), respectively. There was heterogeneity attributable to the diagnostic tools for depressive disorders and symptoms. There was no publication bias.

Conclusion Notwithstanding the representativeness lack of some (sub) regions of Africa, weakening the generalisability of findings to the entire region; depressive disorders and symptoms are prevalent in people living with hypertension in Africa, indicating that strategies from clinicians, researchers and public health makers are needed to reduce its burden in the region.

Strengths and limitations of this study

► Not all subregions of Africa were represented in this review.
► This is the first review performed among people living with hypertension in Africa to investigate the epidemiology of depressive disorders and symptoms.
► We found a huge heterogeneity between studies explained by the difference between diagnostic tools for depressive disorders.
► We were not able to explore all sources of heterogeneity due to scarcity of epidemiological data.

INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of deaths worldwide with approximately 18 million deaths per year.[1] Hypertension is involved in approximately 50% of CVDs.[2–4] According to the WHO, the number of people living with hypertension worldwide is estimated at 1.13 billion, and Africa has the highest prevalence of people with hypertension (27%).[4] In addition to high morbidity and mortality, hypertension is also associated with high socioeconomic burden related to its management and complications.[5–7] Detrimental outcomes related to chronic high blood pressure encompass target organ damage involving cerebrovascular, heart and kidney diseases,[4 5] and mental health repercussions including anxiety, stress and depression.[8–10]

Depressive disorder is the most common mental health disease and the second cause of disability worldwide after CVDs.[11 12] It accounts for 3% of the global disability adjusted life years.[12] According to the WHO, depressive disorder affects more than 300 million people (4.4% of the global population), and its prevalence in the African continent is estimated at 9% (29.9 million cases) in the general population.[13] Some subpopulations have been identified as at higher risk of

depression, including patients with chronic CVDs such as hypertension.[9 14] A wide range of previously published studies addressed the interaction between hypertension and depression.[8 10 15 16] Most of these studies concluded that hypertension and depressive disorder share bidirectional interplay where patients with hypertension were more likely to develop depression and conversely, those with depression have an increased risk to develop hypertension.[8 17] As examples for evidence, a meta-analysis of 41 studies (including 31 studies from China and 3 from Africa) which included 30 796 patients with hypertension found that 26.8% have depression, and another one which included 22 367 participants found that depression significantly increases the risk of hypertension incidence.[10 15] Additionally, it has been reported that patients living with hypertension with comorbid depression are at higher risk of suboptimal medication adherence with uncontrolled blood pressure, complicated by chronic vascular complications and CVD-related mortality.[8 10 15 16 18] The burden of depression-hypertension co-occurrence is worsened by the fact that approximately 1 patient with hypertension in 10 has untreated depression.[10 19]

Considering up-to-date scientific literature, depression in patients with hypertension is common in western contexts.[10 20] Hypertension and depression are commonly encountered among African populations,[2 4 13] but data summarising and focusing on the burden of depression among hypertensive Africans are not yet available. Hence, we conducted this systematic review and meta-analysis with the aim to explore the prevalence of depressive disorders/symptoms and major depression in people living with hypertension in Africa.

METHODS
Design
This systematic review and meta-analysis was conducted according to the Joanna Briggs Institute guidelines.[21] This study was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.[22] The protocol of this review was registered in the International Register of Systematic Reviews (PROSPERO) with the following registration number: CRD42020168979.

Eligibility criteria
Condition
We considered studies reporting the prevalence (or enough data to compute this estimate) of depressive disorders and symptoms. We considered depressive disorders (and major depressive disorders) diagnosed according to the Diagnostic and Statistical Manual of Mental Health Disorders IV or V,[23 24] or International Statistical Classification of Diseases and Related Health Problems-10.[25] In the studies where depressive disorders were not defined using the aforementioned criteria, we considered the definition used by authors, especially including diagnostic scores such as the Patient Health Questionnaire-9.

Major depressive symptoms notably included depressive mood and anhedonia.

Context
We considered studies conducted in people living in Africa. Studies conducted in Africans living outside Africa were not considered.

Population
We considered studies conducted in adults (≥18 years) living with hypertension regardless of the diagnosis criteria, the therapeutic regimen and the control status for the hypertensive disease.

Study design
Cross-sectional, case-control and cohort studies.

Data sources
We searched PubMed, Excerpta Medica Database (EMBASE), African Index Medicus and African Journals OnLine to identify all relevant records published up to 31 January 2020, without any language restriction. The search strategy in EMBASE is available in online supplemental table 1. To supplement the bibliographical database searches and identify potential additional data sources, we scrutinised the reference lists of all relevant original and review papers.

Study selection
Titles and abstracts of articles retrieved from literature search were independently screened by two investigators (FTE and JJB), and the full texts of those potentially eligible articles were obtained and further assessed for final inclusion. Disagreements were resolved through consensus.

Data collection and management
A preconceived and standardised data extraction form was used to collect information on the first author's name, study country, year of publication, period of participants' recruitment, study design, setting, sampling method, timing of data collection, response rate, mean or median age of the population, age range, proportion of men, number of participants with hypertension, and number of participants with depressive disorders. In case of multinational studies, data were separated to show the estimate within individual countries. Two investigators (FTE and JJB) independently extracted the data from individual studies, with disagreements being resolved through consensus.

Two investigators (FTE and JJB) independently assessed the methodological quality of the included studies with tools developed by the Joanna Briggs Institute,[21] with disagreements being resolved through discussion and consensus. Risk of bias was considered low for each criterion if studies used probabilistic sampling, prospectively collected data, had an adequate sample size (required sample size attained), had a response rate >80% and used the same method for collection of data of participants.

Studies with low risk of bias had to have four or more criteria, two or three for moderate risk of bias, and no or one for low risk of bias.

Data synthesis and analysis

Meta-analyses were performed with the '*meta*', '*metafor*' and '*dmetar*' packages of the statistical software *R* (V.3.6.2). Prevalence estimates were reported with 95% CI. Prevalence pooling was done with Freeman-Tukey double arcsine transformation using the random-effects meta-analysis model.[26] We adjusted the prevalence in a multivariate meta-analysis to take into account the variance between tools used to identify patients with depressive disorders/symptoms. Egger's test served for detecting the presence of publication bias.[27] A value of p<0.10 on Egger's test was considered indicative of statistically significant publication bias. Heterogeneity was evaluated by the χ^2 test on Cochran's Q statistic,[28] which was quantified by I^2 values. The I^2 statistic estimates the percentage of total variation across studies due to true between-study differences rather than chance. In general, I^2 values greater than 60%–70% indicate the presence of substantial heterogeneity.[29] Inter-rater agreements between investigators for study inclusion and methodological quality assessment were assessed using Cohen's κ coefficient.[30]

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination of our research.

RESULTS
The review process and study characteristics

We initially identified 890 records and finally retained 11 full texts (13 prevalence data) in the meta-analysis (online supplemental figure 1).[31–41] Agreement between investigators on selection based on title and abstract was κ=0.88 and κ=1.0 for final inclusion.

Of the 11 included studies, 8 studies used non-probabilistic sampling while 3 used probabilistic sampling. All studies prospectively collected and analysed data and used the same method to identify patients with depressive disorders. Sample size was adequate in nine studies and response rate in two studies (online supplemental table 2). Three studies had low risk of bias and eight moderate risk. None of the studies had high risk of bias.

The characteristics of included studies are presented in the table 1. All studies were cross-sectional. Patient Health Questionnaire-9 was the most used tool, n=4. The mean age varied between 50.3 and 59.6 years. The proportion of men varied between 28% and 54%. Data on depressive disorders/symptoms were collected between 2002 and 2017. Four studies were conducted in South Africa, three studies in Nigeria, one study in Ghana, one study in both Ghana and Nigeria, one study in Ethiopia, and one study in Burkina Faso. None of the studies was conducted in Central Africa and North Africa. Talking about the language of the tool used to assess depressive status, four studies indicated that they used native/local languages back translated in English for reporting.[32 33 35 36]

Prevalence of depressive disorders/symptoms in people with hypertension in Africa

In total, 5299 participants with hypertension were included. There was substantial heterogeneity for all analyses, all I^2>75% (figure 1). The prevalence of depressive disorders was 18.6% (95% CI 13.8% to 23.9%; five studies) (figure 1). The adjusted prevalence taking into account the variance between diagnostic tools was 17.9% (95% CI 13.0% to 23.4%) with 52.7% of variance due to difference between tools. There was no publication bias (p=0.789). There were no data on major depressive disorders.

The prevalence of depressive symptoms was 37.3% (95% CI 19.3% to 57.3%; six studies). The adjusted prevalence taking into account the variance between diagnostic tools was 33.3% (95% CI 9.9% to 61.6%) with 74.1% of variance due to difference between tools. There was no publication bias (p=0.115).

The prevalence of major depressive symptoms was 7.9% (95% CI 1.7% to 17.9%; two studies). The adjusted prevalence taking into account the variance between diagnostic tools was 7.8% (95% CI 3.0% to 14.5%) with 43.3% of variance due to difference between tools. The *p* value on Egger's test was 0.789.

In subgroup analysis, there was no difference between population-based and hospital-based studies for all outcomes except for major depressive disorders where the prevalence was higher in population-based studies (12.6%; 95% CI 8.8% to 17.0%; one study) compared with hospital-based studies (4.2%; 95% CI 2.5% to 6.5%; one study), p=0.0001 (online supplemental figures 2, 3 and 4). However, there was a low number of studies in the groups compared. The prevalence of depressive disorders was higher among women (23.8%; 95% CI 18.7% to 29.3%; one study) compared with men (14.5%; 95% CI 9.3% to 20.6%; one study), p=0.0227 (online supplemental figure 5). There was no difference in depressive symptoms (online supplemental figure 6).

DISCUSSION

This meta-analysis of data from 5299 adults with hypertension living in five countries in Africa revealed that depressive disorders and symptoms are prevalent in this population with substantial heterogeneity according to the diagnostic tools. This systematic review suggests that approximately one of five and a third of patients with hypertension have, respectively, depression and depressive symptoms.

Globally, there are dissimilarities between our findings and previous studies on depression among adults with hypertension. For instance, in China, a meta-analysis of 41 studies on the prevalence of depression in patients with hypertension found a higher rate of depression with a pooled prevalence of 26.9% (95% CI 21.7% to 32.3%).[10] Our review revealed a higher prevalence of depression

Table 1 Characteristics of included studies

| Author	Year	Design, setting	Diagnosis of conditions	Validity of the tool used	Language of the tool used	Inclusion criteria	Population	Period of inclusion	Country	Sample
Ademola[37]	2019	Cross-sectional, hospital	Patient Health Questionnaire 9 (PHQ-9)	Validated	NR	Age ≥18 years, diagnosis of hypertension, treatment with an antihypertensive medication for at least 12 months	%Male: 41.7; mean age: 57 years	2013	Ghana, Nigeria	357
Bhana[32]	2015	Cross-sectional, population	Depression module of the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV (SCID)	NR	English, Tswana	Age ≥18 years, clinic attendance for routine chronic disease services (eg, HIV, hypertension, diabetes) and ability to comprehend and complete study components in Tswana or English.	NR	2014	South Africa	345
Geldsetzer[36]	2019	Cross-sectional, population	Centre for Epidemiological Studies Depression (CES-D) screening tool	NR	English, Shangaan	Age ≥40 years and continuously living in the area during the 12 months prior to study enrolment	%Male: 37.4 mean age: NR	2014–2015	South Africa	1822
Grimsrud[40]	2009	Cross-sectional, population	Composite International Diagnostic Interview V.3.0 (CIDI-3.0)	NR	NR	South Africans ≥18 years who lived in households and hostels during the field period of the study	%Male: 28.0; mean age: 50.3 years	2002–2004	South Africa	767
Hamer[35]	2012	Cross-sectional, population	Patient Health Questionnaire 9 (PHQ-9)	Validated	English and local language	Age: 25–60 years with hypertension	NR	2008–2009	South Africa	254
Igwe[31]	2013	Cross-sectional, hospital	Mini International Neuro-psychiatric Interview (MINI)	NR	NR	Age: 18–64 years. Hypertension for at least 1 year and stable without need for hospital admission for 3 months prior to assessment	%Male: 53.7; mean age: 50.4 years	2010–2011	Nigeria	270
Iloh[38]	2018	Cross-sectional, hospital	Patient Health Questionnaire 9 (PHQ-9)	Validated	NR	Age ≥18 years with hypertension	%Male: 40.7; mean age: NR	2017	Nigeria	142
Kretchy[34]	2014	Cross-sectional, hospital	Depression Anxiety Stress Scale (DASS) – 21	NR	NR	Age ≥18 years, a diagnosis of hypertension, reporting prescription of at least one antihypertensive medication for a minimum of 2 months	%Male: 37.3; mean age: NR	2012	Ghana	400
Okurinboye[39]	2019	Cross-sectional, hospital	Mini International Neuro-psychiatric Interview (MINI)	NR	Yoruba, English	Age: 18 years and 64 years who were diagnosed by a consultant physician at the centre as suffering from hypertension and have been on antihypertensive medication for at least 6 months, spoke Yoruba or English language fluently	%Male: 38.0; mean age: 59.6 years	2012	Nigeria	400
Umer[33]	2019	Cross-sectional, hospital	Patient Health Questionnaire 9 (PHQ-9)	Validated	English, Afan Oromo, Amharic	Age ≥18 years, follow-up for hypertension	%Male: 52.8; mean age: NR	2014	Ethiopia	128
Yaméogo[41]	2015	Cross-sectional, hospital	Hospital Anxiety and Depression Scale (HADS)	NR	NR	Hypertensive consenting adult outpatients	%Male: 40.1; mean age: 54.6 years	2010–2011	Burkina Faso	414

NR, not reported.
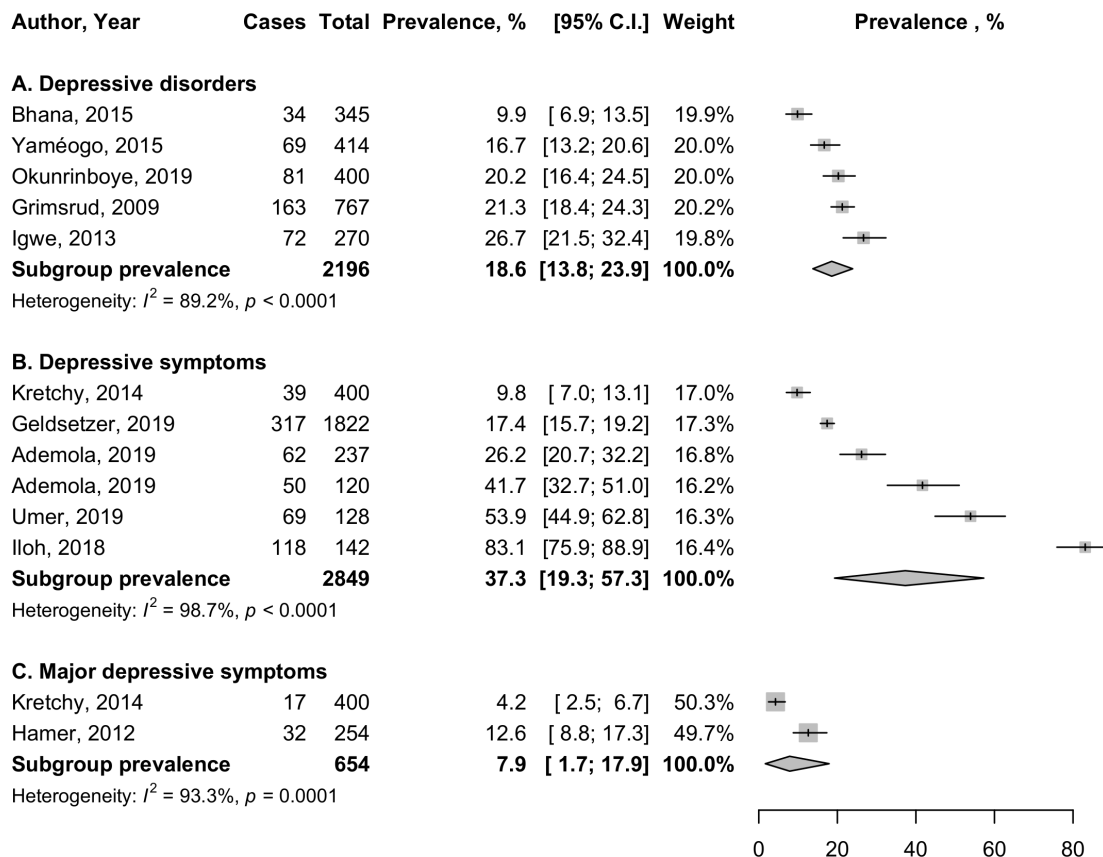
Figure 1 Crude prevalence of depressive disorders/symptoms in people living with hypertension in Africa.

among patients with hypertension compared with occidental studies. For instance, considering data from the US Multi-Disciplinary Group Practice Observational Study which included 4362 adult patients with hypertension, 13% had anxiety and/or depression.[42] A cross-sectional study in Spain among 5954 patients with hypertension with high cardiovascular risk factors found that 15.6% of them had depression.[19] These differences across regions can be explained by the changeability pertaining to the criteria and/or diagnostic tools used to screen depressive disorder.[43 44] Noteworthily, Li and colleagues who studied depressive disorder among patients with hypertension in a meta-analysis of 41 studies suggested that self-assessed screening tools of depression or depressive symptoms might overestimate the prevalence of depression.[10] Indeed, they found 30% prevalence of depression using self-administered diagnostic scales versus 21% prevalence using clinical interview tools.[10] This could be linked to patients' confusion about symptoms possibly encountered in both depression and hypertension such as poor appetite, fatigue and sleep disturbances.[10] In our review, the most used diagnostic tool was the Patient Health Questionnaire 9 (PHQ-9). Another fact to highlight is that differences in prevalence can also be explained by the cut-off points used for the same tool to define positive screening for depression.[32 45 46] Mahmood and colleagues, while assessing depression among 411 outpatients with hypertension in a hospital in Pakistan, using PHQ-9 with a score of 10 or above as the cut-off

point, found a prevalence of 40.1%[47] which is twofold higher compared with our findings. In our study, we had substantial heterogeneity for all analyses which can also be related to the variance between diagnostic tools used for assessment of depression. The previously cited meta-analysis by Li and colleagues also showed evidence of high-level heterogeneity due to diagnostic tools considered in original studies.[10]

In our subgroup analysis, we found that there was no difference between population-based and hospital-based studies for all outcomes except for major depressive disorders, for which the prevalence was higher in population-based studies. This result has to be cautiously interpreted since only two studies that used different tools in two distinct populations were compared. We also found that the prevalence of depressive disorders was higher among women compared with men. This finding is in accordance with what is known about gender differences in depression.[48–50] This can be linked to hormonal differences between the two genders, and the fact that women experience periods of physiological changes such as menstruation, pregnancy and perimenopause.[49 51 52] There is growing evidence of the potential positive role of hormone replacement therapy on postmenopausal depression.[51 52] The higher prevalence of depression and depressive symptoms in women compared to men in sub-Saharan African context can also be explained by cultural habits where men lesser express their psychological distress.[53–55]

This meta-analysis highlights the fact that depressive disorder is more frequently encountered among patients with hypertension compared with the general population. This review might substantiate the need to conduct further studies with an aim to investigate the tool for a better diagnosis of depression among patients with hypertension in order to reduce heterogeneity of results. Moreover, our review could justify carrying out epidemiological studies on relationship between depression and hypertension in other African regions in order to have a more representative regional picture of the evidence. Since we have been able to identify only 11 studies in the last 20 years, our study calls for more primary research on the relationship between hypertension and mental health in the continent, by using homogeneous diagnostic tools. Researchers, clinicians and public health policy makers can also explore implementation of registries to better measure the burden of mental health disorders in the continent.[56–58] All this might help to establish the adapted policies pertaining to the management of patients with hypertension with depression, notably for a tailored pharmacological treatment.[18 59 60] Nevertheless, our study highlights that clinicians should be aware of the necessity to screen patients with hypertension for symptoms of depression, especially since previously published works have found that comorbid depression contributes to more deleterious cardiovascular outcomes.[8 10 15 16 18] A meta-analysis of prospective cohort studies has suggested that people with depressive disorders had a higher risk of hypertension.[15] Therefore, implementing strategies to reduce the burden of depressive disorders could help to reduce the prevalence of hypertension. Although pharmacological interventions can help to reduce the burden of depressive disorders,[61] cost-effective non-pharmacological interventions should be explored first in the context of resource-limited settings like most of the countries in Africa.[62 63]

This study should however be interpreted considering some limitations. First we found a huge heterogeneity between studies for which we undertook a subgroup analysis to investigate sources of heterogeneity and adjusted analysis to take into account the variance due to diagnostic tools. However, some characteristics that may further explain heterogeneity were not reported or there were not enough studies to conduct such analysis including subregions and age groups. Second, there was substantial variability regarding the representativeness of regions and countries, with some less represented or not represented. This may weaken the generalisability of our findings and call for more epidemiological studies in this region. Not all studies had low risk of bias, especially, most of the studies used non-probabilistic sampling. However, due to the low number of studies included in this meta-analysis, we were not able to perform sensitivity analysis to assess the robustness of our findings based on methodological quality.

Despite these limitations, this first systematic review and meta-analysis on depressive disorders/symptoms in people living with hypertension in Africa provided a clear summary of the existing knowledge. This systematic review is the starting point for understanding the epidemiology of and relationship between mental health and hypertension in African countries where it is challenging to collect such data. A protocol had been registered before, and we used rigorous methodological and statistical procedures to obtain and pool data. Furthermore, we have taken into account the variability due to diagnostic tools. There was no publication bias.

CONCLUSIONS

Overall, our review found that depressive disorders and symptoms are prevalent in people living with hypertension in selected African countries. Including an assessment of mental health in patients with hypertension seems prudent, with the potential for intervention. However, since our analysis has limitations pertaining to consistency of diagnostic tools within studies and also to the unrepresentative geographical distribution, further studies would be relevant in order to reinforce our findings. All this could be a support for personalised management of patients with hypertension and depression.

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