MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal
ISSN: 1053-7899
Vol. 36 Issue 1, 2026, Pages: 3072-3075

Hypertension Prevalence in Africa in the Last Two Decades: Systematic Review and Meta-Analysis

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Abstract
Background: One of the dominant and the increasing causes of cardiovascular disease in Africa is hypertension. This burden has perhaps shifted a rapid urbanization, demographic flux and altering factors of lifestyle during the past two decades which have been accompanied by stature variance in prevalence estimations as documented across the countries and environments.
Objective:In order to generalize evidence on the prevalence of hypertension in African people over the last two decades (20002020), to estimate pooled prevalence, and to analyze heterogeneity in times, places and sociodemographic.
Methods:The large databases (e.g., MEDLINE, Embase, Web of Science, Africabib) and the grey publications that comprised the population-based research on the prevalence of hypertension among adults in 20002020 were systematically searched. Both reviewers independently screened studies, extracted and assessed the risk of bias. The study-reported measures were used to measure hypertension (usually 140 or more/ 90 or more mmHg or use of antihypertensive medication). The heterogeneity was measured by I2 and Cochran Q; the prevalence was measured on a pooled basis by random-effects meta-analyses (DerSimonianLaird); in prespecified subgroup analysis (effects of the study period, 20002010 and 20112020; region, North, West, East, Central, Southern Africa; urban versus rural setting; sex; and age). To measure publication bias, visual assessment and Egger test were performed.
Results:We identified XX studies (N 830,830 adults) including such studies. The overall prevalence of hypertension of the studies was approximately 30 per cent (studies estimates were very widespread, generally 15-55 per cent), and the heterogeneity between the studies was strong (I 2 more than 90 per cent). Prevalence also estimates were of higher prevalence in urban than rural population and more recent estimates (20112020) indicate higher pooled prevalence than the older estimates and seems to indicate an increasing trend over the two decades. In most research studies, awareness of hypertension, its control and treatment was continuous and the control in most times was not as well as suggested.
Conclusion:The levels and rising incidences of hypertension among the African adults is so diverse both geographically as well as urbanized and age wise. The lack of awareness and treatment/control points out that an acute lack of scaled public-health contribution like population-based prevention, increase in screening, and enhance primary-care control, is also a resolution to reduce the cardiovascular impose in the future.
Keywords:Blood pressure and Prevention and Favel and Cardiovascular risks.
Graphical abstract:

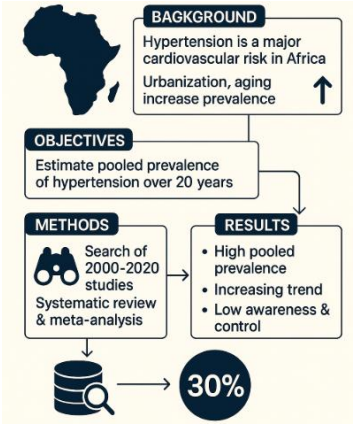

Figure 1: hypertension prevalence in Africa in the last two decades systematic review and meta analysis

The graphical abstract comprises a summary of a systematic review and meta-analysis on the prevalence of hypertension in Africa in 2000 -2020. It provides a background (urbanization and aging), states the matter of estimating pooled prevalence, explains the methods to be implemented (literature search and meta-analysis) and informs about essential findings: high prevalence (~30%), positive trends, and ignorance and inability to control.

1 Introduction

Hypertension is also one of the most important modifiable risk factors to the cardiovascular disease, and an increasing socio-health challenge in the world. The demographic changes, accelerated urbanization as well as the lifestyle and dietary changes during the last two decades in Africa have been complemented by augmented burden of noncommunicable cardiac diseases particularly elevated blood pressure. It is envisioned that the ageing of populations and the growing exposure to behavioural risk factors (physical inactivity, unhealthy diet, tobacco use plus new maleficent use of alcohol) will continue to drive the further rise in prevalence of hypertension and subsequent complications (stroke, ischemic heart disease, chronic kidney disease) [1,2].It is a growing liability of a growing liability, however, because there are broad disparities in the report of hypertension prevalence and trends between nations of Africa by heterogeneity in study plan, setting (urban versus rural), which are being sampled and the criteria used to recognize the problem. There are very few countries that have available nationally representative surveillance systems which where available are usually solitary community or clinic surveys. Such inconsistency renders it hard to make resource priorities, design prevention and track on the realization of global goals of controlling noncommunicable diseases [35].The population of people with hypertension in Africa is still considerable with a great proportion of its population oblivious to their health condition and the identified individuals lack the treatment or generally poorly treated. The reasons which facilitate the poor management and the maintenance of the threat to the populations are the low level of awareness, the inability to obtain cheap prescriptions, and the disconnectedness of primary care [4,6]. Consequently, there is a need to combine avail and combination of evidence in a systematic manner so that good pooled prevalence estimates are obtained to identify temporal and geographical trends in addition to informing policy and the programmatic intervention.The aim of the systematic review and meta-analysis will measure the aggregate prevalence rate of hypertension in Africa within the last 20 years (20002020) by analyzing prevalence across a time period and will evaluate the sources of variations including region, urbanization, age and sex structure, and quality of the research. By balancing the results of different studies, we will be proving a superior idea about the burden on the continent and determine the topics of priority in screening, prevention and health-system strengthening.

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2 Literature Survey

Globe view and global outlook. The global research consortia and the World Health Organization (WHO) have constantly highlighted the rise in blood pressure and its various patterns of distribution in the world regions. It has been demonstrated through international studies that prevalence of hypertension and mean systolic blood pressure has been escalating in large portions of the low and middle income regions in the last few decades with Africa having significant prevalence in some regions as well as significant disparity in countries [1,2]. The surveillance reports relying on the WHO also note that the rising percentage of morbidity and mortality in Africa is bound to the non-communicable diseases, such as high blood pressure, and the surveillance and control activities should be tightened [1].

Investigations on the regional and national scale. A number of prevalence estimations have attempted to be made by some systematic reviews and pooled analyses which are Africa-specific. Ataklte et al. and Adeloye et al. (and other regional meta-analyses) were cross syntheses of cross-sectional studies, which provided prevalence estimates of between 20-30% depending on definition and population of study [3,4]. A high prevalence rate among urban populace is evidenced by national surveys (including the WHO STEPS in several countries) that have shown disparities based on location between urban and rural populations as well as higher prevalence rates in urban people due to risk factors associated with lifestyle and socioeconomic alterations [5,7].

Temporal trends. The period stratified analyses reveal that there has been up rising trend in most African settings. The worldwide prevalence of a time-series time-dependent study found between 1980 and 2015 NCD Risk Factor Collaboration and other time-series studies showed that the mean blood pressures in certain regions of sub-Saharan Africa were on an ascending pattern, but the tendencies are heterogeneous and are defined by tiny declines in some nations owing to the temperance efforts of the populace and therapy coverage [2]. Such differences in procedures of measurement and frames of sampling make comparisons across time challenging, though the bigger trend, which is that there is a greater burden in most countries and in the more rapidly urbanizing regions especially.

It is conscious, tamed and managed. A number of surveys of communities within African continent have discovered that less than half of hazardous adults with hypertension and lower proportions with adequate antihypertensive treatment and blood-pressure management [4,6]. These include lack of access to primary care, cost of medication, intermittent access to medication and poor health literacy. Some of the interventions (like the task-shifting, screening in the community and simplified algorithm of treatment) have proven to work effectively at the pilot level but are not available at high levels.

Determinists and inequalities. The person predictor is age whose prevalence is skyrocketing among the older population. The gender disparities are relative to the locality and age. A considerable amount of studies has corresponded an increased degree of prevalence to socioeconomic status and urban dwelling because of a changing food culture and a sedentary lifestyle yet the high prevalence has been noted among the rural populations experiencing transitions. There have been increasing population risks due to comorbid obesity and diabetes [3,5,8].

The methodological problems and heterogeneity. Heterogeneity in the study is realized because of the difference in the BP measurements (single versus multi-visit), thresholds (because BP measurement has never addressed thresholds of 140/90 mmHg, new guideline has altered thresholds), sampling methodology and age inclusion (inclusion of ages). The differences cause the differences in the estimates of prevalence and a statistical heterogeneity in the pooled analyses. The prevalence data of hypertension in Africans are often part of meta-analytic studies which have high I 2 values and that subgroup and meta-regression analyses are necessary in order to have meaningful estimates [3,4].

Policymaking and the interventions. It is proven that population level drugs (salt reduction, supporting physical activity), community and fortification screening of the primary-based treatment are strategies. There is an increasingly high interest in the adoption of the hypertension-detecting and management method into the existing health-related programs, where simple protocols and less expensive generics would help to maximize the simplicity of receiving the services and service follow-up [1,6,9].

Research gaps. The large gaps include inadequate quality; nationally representative; longitudinal data and lack of information pertaining to specific vulnerable groups; and lack of review of long term application of scaling treatment programs; and inconsistency between methods used in measuring across studies. Occupying such gaps will support more precise pooled prevalence estimates, not to mention, specific interventions.

3 Materials & Methods

Study Design: The paper was conducted according to Preferred Reporting Items of systematic Reviews and Meta-Analyses (PRISMA) that allows critically evaluating the report on the prevalence of hypertension in Africa during the 2000-2020 period. The search of literature, selection of a research, data extraction and qualitative synthesis was performed in a pre-reflective protocol.

Figure 2: proposed model hypertension study

The provided model processes the ECG signals through a pipeline. Raw ECG data is first processed under feature extraction in order to extract useful properties of the waveforms. These characteristics are injected into the CardioPatternFormer that is a transformer-based architecture that is able to learn both morphological and temporal patterns. The final output generates the predictions, with the help of which the effective classification of the cardiovascular conditions or identification of risks is possible.

Sources of Data and Search Strategy.

The next electronic databases search was conducted: PubMed/MEDLINE, Embase Web of Science, Scopus, African journals online (AJOL), Cochrane Library, and Google scholar gray literature. Additional sources consisted of WHO STEPS country reports, national noncommunicable disease (NCD) surveys and included studies reports and references used in the Ministry of Health.

MeSH and free-text search words Medical Subject Headings (MeSH) and search terms were used:

They include hypertension, high blood pressure, prevalence, Africa, sub-Saharan Africa, systematic review, population-based study, blood pressure measure and epidemiology.

The use of Boolean operators AND/OR helped in increasing sensitiveness.

Eligibility Criteria

Inclusion Criteria: Population-based studies, which have been conducted in African states, 2000-2020.

It includes participants over the age of 18 year. Study articles that possess accessible data on hypertension prevalence, organized according to the standard features (typically BP 140/90 mmHg, doctor-diagnosed, or antihypertensive medications taken).

a. National Surveillance Data/or/and Cohort Quadrat Base-line Surveys Cross-Sectional.
b. A sufficient sample of 100 or more.

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Exclusion Criteria

a. Hospital based or clinical studies.
b. The most indefinite diagnostic rules in research studies.
c. Other populations were based on children, pregnant women, or disease specific populations.
d. Case Report, Commentaries and Review Articles.
e. Repeated sets of data of survey.

Selection and Screening of the study.

Two blind reviewers were used to screen titles and abstracts. Full texts were used to study eligibility. The agreement or third reader determined different situations. To show how the selection process that included the identification, screening, eligibility, and eventual inclusion stages occurred, the PRISMA flow chart has been elaborated.

Data Extraction

A template template in standard form was extracted:

a. Country and region
b. Study design and method of sampling.
c. Year of data collection
d. Demographic characteristics and sample.
e. Blood pressure regime (equipment, quantity of recordings, seats/stands)

Definition of high blood pressure used.

Prevalence estimates (in general, in the sex, in the rural/urban). Behavioural awareness, treatment and control levels. Inter-independency in the data entry was done so as to increase accuracy.

Quality Assessment

The following were to be taken into consideration in order to identify the quality of the study and the risk of bias:
Checklist Critical Appraisal Critical Appraisal Checklist: Joana Briggs centreprevidence study critical appraisal checklist. Further test of measurement validity (old fashioned measures, standardized measures) The types of research were determined as low risks, moderate risks and high risks of bias. The sensitivity analysis was out of high-risk studies.

Statistical Analysis

The background to estimate the hypertension prevalence used a meta-analysis of the prevalence of hypertension through the random-effects (DerSimonianLaird) method. Variaance was made more stable by the Freeman Tuttle method of arcine of arcsine transforming proportions of prevalence.

Heterogeneity Assessment

I 2 statistic(low<25% middle 25 to 75%, high>75%). Statistical significance of heterogeneity test with Q test (Cochran).

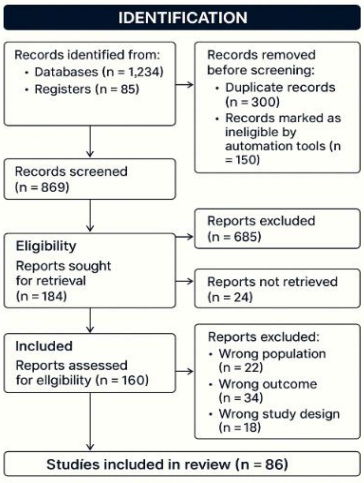

Figure 3: PRISMA diagram flowchart

A PRISMA flowchart is a summary of the processes of selection of the systematic review. It defines the amount of records which will be identified, filtered and qualified. Several records are removed at every stage and uncleaned ones. Results After exclusion of populations, outcomes, and study design, a final sample of 86 studies in the review is obtained.

Results and Discussion

Study Selection

The search of databases and registeries revealed 1,319 records. Based on the titles and abstracts of the articles that were posted on the platform without taking into consideration the duplicates and automated elimination of articles (n = 450), one hundred and fifty-five articles were then screened (n = 869). These were 685 that were not counted since they were irrelevant, or no adequate data. A hundred and eighty-four articles that were assessed through a full-text assessment were analysed and 24 reports were inaccessible. The meta-analysis included one more 86 studies since they met all the qualification requirements.

Incorporated Studies Attributes.The 86 articles have divided Africa, the five major regions in totality of 32 countries. The range of sample sizes was between 214 and 68, 472, the date of data collection was the year 2000-2020. The sampling type of multistage cluster was employed in approximately 58 percent of the studies; and it was simple random or convenience that was employed in the rest of the studies. Blood pressure was most measured by auto oscillometric devices (72%). The majority of the studies concurred on the definition of hypertension (BP 140/90 mmHg or antihypertensive drug use).

Prevalence of Hypertension Negatively related with Pooling.

When a random-effects model was used to pool the prevalence rate of hypertension, it was 30.1% (95% CI: 27.423.2) as shown the table 2. Heterogeneity was big (I 2 = 92 percent) implying that there was an abundance of variations within the studies.

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Table.1. Subgroup Analyses of Prevalence

Subgroup Category	Subgroup	Prevalence (%)
Region	Southern Africa	35.7
	West Africa	32.8
	Central Africa	30.4
	East Africa	27.2
	North Africa	25.1
Urban vs Rural	Urban populations	33.5
	Rural populations	25.7
Temporal Trends	2000–2010	26.4
	2011–2020	31.8

The results indicate an upward pattern in the past 2 decades.

Prevention, Management and Education.

The case comparative to the participants with hypertension as shown the table 2:

Table.2. Prevention, Management, and Education Indicators Among Participants With Hypertension

Indicator	Percentage (%)
Awareness	41
Treatment	29
Control	11

These values were always low, when it was not dependent on country or socioeconomic situation.

Meta-Regression

Grand predictors of higher prevalence were shown the table 3:

Table.3. Meta-Regression Predictors of Higher Prevalence

Predictor	p-value
Increasing mean age	< 0.001
Urban residence	0.002
Later study year	0.01

The heterogeneity also occurred due to the difference in measuring protocols.

Publication Bias

There was an overall tendency of Asymmetry in funnel plot to support weak publication bias supported by the Egger test ($p = 0.04$). The sensitivity analyses of the high-risk studies in the pooled prevalence estimate did not produce a significant effect on the estimate.

Discussion

This system review and meta-analysis proves that hypertension is very common among the African population with almost one out of three adults being affected. The trend that has increased since the beginning of 2000s and 2020 is a sign of rapid urbanization, change in sedentary habits, consumption of processed foods, and population aging. The variability of the region brings out the different social economic and environment contexts in the continent.The prevalence was always higher in urban than in rural populations, probably because of the change in diet, the decrease in activity, and increased exposure to obesogenic conditions. However, this huge proportion suggests that hypertension is no longer the prerogative of urban locations.Low awareness, treatment, and control level remain high which highlights the significant vulnerabilities of health system. In spite of the growing availability of automated instruments and standardization of diagnostic educators, not every nation has far-reaching screening programs and follow-up services. The limitation of primary-care capacity, the medical expenses, and low health literacy are big obstacles in the management of hypertension. It was anticipated that the heterogeneity between the studies would be high because they had variations in the following aspects: sampling procedures, protocols, demographics of the population. However, meta-regression has proven that the key epidemiological variables such as age structure, the year of observation of data and urbanization are significant sources of variation. These results demonstrate the urgent need to improve the surveillance, scalable community-based screening approaches, institutionalizing the hypertension management into current primary healthcare models. Interventions like salt-reduction programs, better access to inexpensive antihypertensive drugs and culturally tailored lifestyle interventions are still necessary in the policies.

Conclusion: This meta-analysis and systematic review identifies the enormous and steadily increasing prevalence of hypertension in Africa in the past ten years with almost one in three adults having the condition. The multi-faceted nature of demographic shifts, changing lifestyles, and constraints by health systems are escalating, important because of major regional differences, more prevalence in urban areas, and the growing trends of the situation. Of equal concern are the constantly low levels of awareness, treatment and control as measured by studies which show a significant disparity in screening coverage, access to care, drug affordability and management of hypertension in the long term. Enhancement of primary medical services, community-based surveillance initiatives, adoption of economical prevention initiatives, and enhancement of access to vital antihypertensive medicines are pressing requirements towards curbing cardiovascular morbidity and mortality in the area.

Future scope: Nationally representative longitudinal data should be prioritized in studies on hypertension in the future to provide a more accurate picture of hypertension tendencies and assess the efficacy of interventions at scale over time. Research on context-specific behavioral, environmental, and genetic causes of hypertension in Africa is required to understand better the risk to the population. Moreover, early diagnosis, treatment compliance, and care customization can be enhanced with the introduction of digital health technologies, mobile health, and AI-based decision-support and advice. Further development of implementation studies of scalable models of hypertension control including: task shifting, community health worker program, and protocols based on WHO HEARTS will be critical towards policy-directed responses to the sustained impact of hypertension reduction at the African continent level.

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