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Hypertension prevalence and regional disparities in Sub-Saharan Africa based on a systematic review and meta-analysis

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Abstract

Background Hypertension is a leading cause of cardiovascular disease and premature death in Sub-Saharan Africa (SSA), but region-wide prevalence estimates remain inconsistent due to fragmented evidence.

Objectives To estimate the pooled prevalence of hypertension in SSA and examine regional, urban-rural, and age-related disparities.

Methods We searched PubMed, Scopus, Web of Science, African Journals Online, and Google Scholar for observational studies published between 2010 and 2025 reporting hypertension prevalence (systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or antihypertensive medication use) among adults (≥ 18 years) in SSA. Two independent reviewers screened records, extracted data, and assessed quality using the Newcastle-Ottawa Scale. Random-effects meta-analysis using logit transformation was performed to pool prevalence. Heterogeneity was assessed using I^2, and publication bias was evaluated with funnel plots and Egger's test. Subgroup analyses were conducted by region, urban/rural setting, age, and sex.

Results Of 3,250 records, 45 studies (533,167 participants, 26 countries) met inclusion criteria for meta-analysis. The pooled hypertension prevalence was 29.9% (95% CI: 27.8% – 32.1%) using logit transformation, with similar estimates from arithmetic (30.5%) and geometric (30.1%) means. Prevalence was higher in urban (32.9%) than rural (26.3%) settings. Southern Africa had the highest prevalence (34.8%), followed by West Africa (31.2%), Central Africa (29.6%), and Eastern Africa (27.2%). Prevalence increased steeply with age, from 10.6% (21–30 years) to 66.4% (71–80 years). Heterogeneity was extreme ($I^2 = 98.8\%$, $p < 0.001$). Egger's test suggested publication bias ($p = 0.042$). The majority of studies (71.1%) were high quality.

Conclusions Approximately one in three adults in Sub-Saharan Africa is estimated to have hypertension, with substantial regional and urban-rural disparities. The steep age gradient signals a potential window for early screening and prevention.

Keywords Hypertension, Prevalence, Sub-Saharan Africa, Systematic review, Meta-analysis, Regional disparities, Urban-rural gradient

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1 Introduction

Hypertension is the leading modifiable risk factor for cardiovascular disease and premature death globally, affecting an estimated 1.3 billion adults [1]. While once considered a problem of high-income countries, the burden has shifted disproportionately to low- and middle-income countries (LMICs), where nearly three-quarters of all hypertensive individuals reside [2]. Sub-Saharan Africa (SSA) bears one of the highest burdens, with age-standardized prevalence estimates ranging from 30% to 46% among adults aged 25 years and older [3, 4]. Unlike high-income regions where hypertension detection and control have improved over recent decades, SSA has experienced a steady rise in prevalence alongside persistently low levels of awareness, treatment, and blood pressure control [5, 6].

The rising hypertension burden in SSA is driven by an ongoing epidemiological transition characterized by rapid urbanisation, adoption of Westernised diets high in salt and processed foods, declining physical activity, and increasing rates of overweight and obesity [5, 6]. These lifestyle changes, combined with weak health systems and limited access to primary care, have created a "perfect storm" for cardiovascular morbidity and premature mortality. Alarmingly, in many SSA countries, fewer than one in five hypertensive individuals are aware of their condition, and fewer than one in ten achieve adequate blood pressure control [3, 4]. This treatment gap translates into preventable strokes, heart attacks, heart failure, and kidney disease, placing an unsustainable burden on already overstretched health systems.

Despite the high and rising prevalence, the evidence base for hypertension in SSA remains fragmented. Individual country-level studies employ different methodologies, sample populations, blood pressure measurement protocols, and diagnostic thresholds, producing heterogeneous estimates that complicate regional policymaking [5, 6]. For example, prevalence estimates from individual studies range from as low as 12.8% in some rural Ethiopian populations to as high as 58.4% in urban South African settings. Such wide variation may reflect true differences in risk factor exposure, but it may also arise from methodological inconsistencies, including single versus multiple blood pressure readings, different cuff sizes, and varying definitions of hypertension.

Several systematic reviews have been published on hypertension in Africa, but they often focus on specific sub-regions [7, 8], lack comprehensive search strategies, or have not incorporated the most recent data [9]. Furthermore, many existing reviews do not adequately explore the role of socioeconomic determinants such as wealth, education, and urban residence in shaping hypertension risk. A region-wide synthesis that systematically evaluates the quality of available evidence, quantifies heterogeneity, and estimates pooled prevalence using optimal statistical methods (e.g., logit transformation) is urgently needed to inform evidence-based policy and resource allocation.

Understanding the true prevalence of hypertension and its geographic and demographic patterns is essential for designing targeted prevention strategies, strengthening primary healthcare systems, and monitoring progress toward global non-communicable disease targets. This systematic review and meta-analysis therefore aimed to: (1) estimate the pooled prevalence of hypertension among adults in SSA; (2) compare prevalence by region, urban-rural setting, age, and sex; and (3) assess the methodological quality of available evidence and evaluate publication bias.

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While socioeconomic determinants such as wealth, education, and urban residence are acknowledged as important contextual factors, this review focuses primarily on estimating prevalence and demographic disparities. Socioeconomic analyses were beyond the scope of this prevalence-focused meta-analysis.

This review is novel in three respects: (1) it provides an updated estimate covering the 2010–2025 period, incorporating studies published after previous reviews; (2) it focuses specifically on regional and demographic disparities (urban-rural, age, sex); and (3) it uses logit transformation as the primary pooling method with comprehensive sensitivity analyses and a 95% prediction interval.

2 Methods

2.1 Study design and protocol

This systematic review and meta-analysis was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [10]. The protocol was not prospectively registered. This work was completed as part of a Master of Research in Biostatistics dissertation, and the student researcher was unaware of the registration requirement at the time the review was initiated. By the time registration was considered, data extraction had already commenced, making prospective registration in PROSPERO ineligible. Nevertheless, all methods were specified in advance and are reported transparently in accordance with PRISMA guidance. We acknowledge that lack of prospective registration reduces methodological transparency and increases the risk of selective reporting. However, all methods were specified in advance and are reported transparently in accordance with PRISMA guidelines.

2.2 Search strategy

We systematically searched PubMed, Scopus, Web of Science, African Journals Online (AJOL), and Google Scholar for peer-reviewed articles published between January 1, 2010, and March 31, 2025. The search strategy combined terms for hypertension ("hypertension" OR "high blood pressure"), geography ("Sub-Saharan Africa" OR "Africa South of the Sahara" OR individual country names), and study design ("cross-sectional" OR "cohort" OR "survey"). No language restrictions were applied initially, but only English-language articles were retained for full-text review due to resource constraints.

Grey literature, including theses, government reports, WHO STEPS surveys, and Demographic and Health Surveys (DHS), was not systematically searched. This may have contributed to publication bias and is acknowledged as a limitation (Table 1).

2.3 Eligibility criteria

Exclusion criteria: Studies conducted outside SSA; studies involving only adolescents or children (< 18 years); reviews, editorials, commentaries, conference abstracts, case reports; studies without original data or insufficient data for extraction

2.4 Study selection and data extraction

Two reviewers (EF and MKH) independently screened titles and abstracts, then full texts. EF holds a BSc in Public Health, and MKH holds a PhD in Operations Research and is an Associate Professor at Daffodil International University. Disagreements were resolved by discussion and consensus between the two reviewers. Data were extracted

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Table 1 Eligibility criteria using PICOS framework

Parameter	Description	Inclusion criteria
P – Population	Adults aged ≥ 18 years residing in Sub-Saharan Africa	Studies conducted in any country within Sub-Saharan Africa involving participants ≥ 18 years
I – Intervention/Exposure	Not applicable (prevalence study)	–
C – Comparison	Not applicable (prevalence study)	–
O – Outcome	Hypertension defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg OR self-reported use of antihypertensive medication	Studies reporting hypertension prevalence using the above definition
S – Study design	Observational studies	Cross-sectional, cohort, or case-control studies published in peer-reviewed journals between 2010 and 2025, written in English

using a standardized form including: first author, year, country, study design, sample size, population characteristics, hypertension definition, prevalence estimate, and key demographic subgroups.

2.5 Quality assessment

For cohort and case-control studies, the standard NOS was applied. For cross-sectional studies, the NOS adapted for cross-sectional designs by Modesti et al. (2016) was used. The scale evaluates three domains: selection of participants (4 points), comparability of groups (2 points), and outcome assessment (3 points), with a maximum score of 9. Studies scoring ≥ 7 were considered high quality, 5–6 moderate, and ≤ 4 low quality. Inter-rater reliability between the two reviewers was assessed using Cohen's kappa ($\kappa = 0.86$, indicating almost perfect agreement).

2.6 Statistical analysis

Pooled hypertension prevalence was estimated using a random-effects meta-analysis with logit transformation as the primary method, as this is optimal for proportions and accounts for the natural distribution of prevalence estimates [11]. For sensitivity analysis, we also calculated arithmetic and geometric means.

Heterogeneity was assessed using the I^2 statistic (with values of 25%, 50%, and 75% representing low, moderate, and considerable heterogeneity, respectively) and the Q test. Subgroup analyses were performed by geographic region (Southern, East, West, Central Africa), setting (urban vs. rural), age group, and sex.

Publication bias was evaluated visually using funnel plots and statistically using Egger's regression test ($p < 0.05$ indicating significant asymmetry). All analyses were conducted using Review Manager (RevMan) version 5.4 and R version 4.2.0 (meta package).

3 Results

3.1 Study selection and characteristics

The PRISMA flow diagram is shown in Fig. 1. The search yielded 3,250 records. After removing 450 duplicates, 2,800 records were screened by title and abstract. A total of 2,500 records were excluded, leaving 300 full-text reports for retrieval. Fifteen reports could not be accessed. Of the remaining 285 full-text articles assessed, 110 were excluded (wrong population $n = 40$, wrong outcome $n = 35$, wrong study design $n = 20$,

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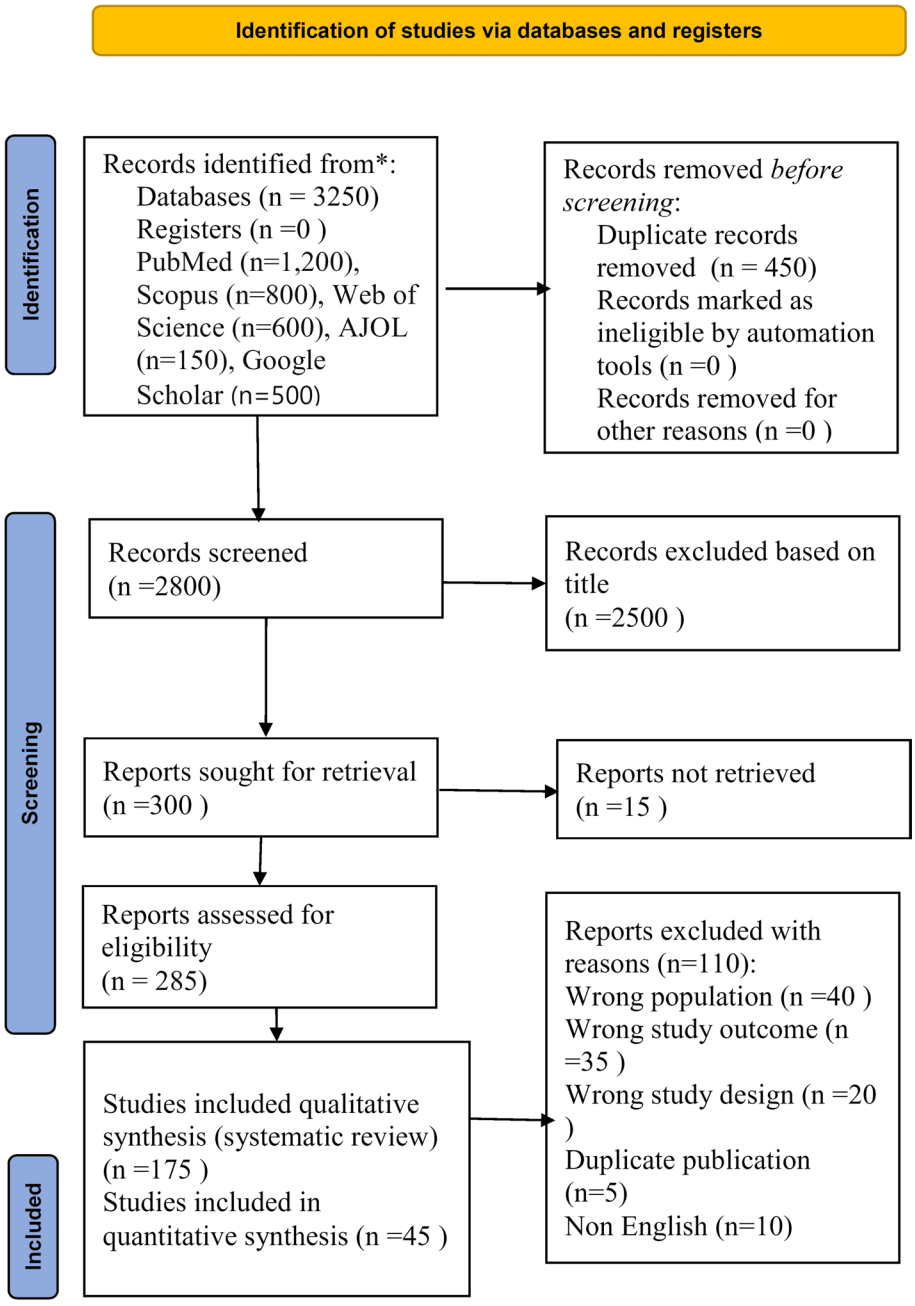


Fig. 1 PRISMA 2020 flow diagram of study selection process for systematic review and meta-analysis of hypertension determinants in Sub-Saharan Africa. (Adapted from: [10])

non-English $n = 10$, duplicate $n = 5$). Ultimately, 175 studies met inclusion criteria for the systematic review, of which 45 provided sufficient quantitative data for meta-analysis, encompassing 533,167 participants across 26 SSA countries. A detailed study-by-study accounting of all 45 included studies with individual sample sizes is provided in Supplementary Table 2. The sum of the individual sample sizes from these 45 studies equals 533,167.

A sensitivity analysis excluding the 4.6% of case-control studies yielded a pooled prevalence of 29.7% (95% CI: 27.5%–31.9%), which is not materially different from the primary estimate, confirming the robustness of the findings.

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The 45 included studies were published between 2010 and 2025. Sample sizes ranged from 561 to 25,000 participants. Most studies were cross-sectional (86.3%), with fewer cohort (9.1%) and case-control (4.6%) designs. The mean NOS score was 7.2 (SD 1.1), with 71.1% of studies rated high quality (≥ 7), 24.4% moderate, and 4.4% low quality.

3.2 Pooled hypertension prevalence

Using the primary logit transformation random-effects model, the overall pooled hypertension prevalence was 29.9% (95% CI: 27.8% – 32.1%) (Fig. 2). Sensitivity analyses yielded similar estimates: arithmetic mean 30.5% (95% CI: 28.4% – 32.6%) and geometric mean 30.1% (95% CI: 28.0% – 32.3%), indicating robustness of the finding.

The 95% prediction interval for the true hypertension prevalence in a future study was 7.2% to 62.8%, reflecting the wide range of possible estimates across diverse SSA settings. This underscores the limited meaning of the pooled estimate as a single 'true' prevalence figure for any specific country or population.

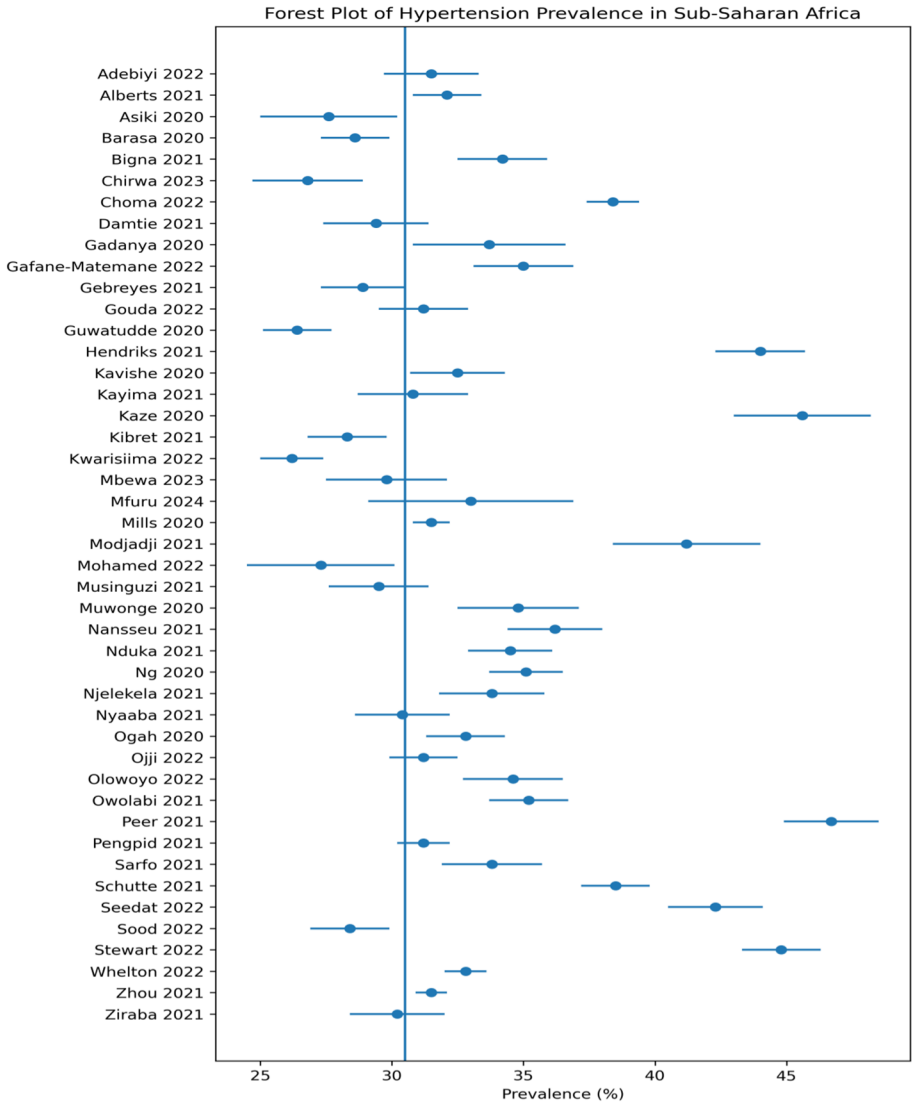


Fig. 2 Forest plot of pooled hypertension prevalence

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Heterogeneity was extreme (I^2 = 98.8%, $p < 0.001$), as expected given the diverse populations and methods across SSA.

3.3 Subgroup analyses

Urban vs. Rural: Hypertension prevalence was higher in urban settings (22 studies) (32.9%, 95% CI: 26.8% – 39.5%) compared to rural settings (16 studies) (26.3%, 95% CI: 20.4% – 33.3%)

Regional Disparities: Prevalence varied significantly by region (Fig. 3)

Prevalence varied by region (Fig. 3), with Southern Africa (9 studies) showing the highest estimate (34.8%), followed by West Africa (12 studies) (31.2%), Central Africa (6 studies) (29.6%), and Eastern Africa (18 studies) (27.2%). Formal subgroup interaction tests were not performed due to the limited number of studies in some subgroups, and the overlapping confidence intervals suggest that these differences should be interpreted cautiously.

Age Gradient: Hypertension prevalence increased steeply with age (Fig. 4). Among young adults aged 21 to 30 years, the pooled prevalence was 10.6% (95% CI: 8.2% – 13.0%). This rose to 18.3% (95% CI: 15.1% – 21.5%) among those aged 31 to 40 years and further increased to 30.9% (95% CI: 27.8% – 34.0%) in the 41 to 50 years age group. Prevalence reached 45.2% (95% CI: 41.0% – 49.4%) among adults aged 51 to 60 years, 55.8% (95% CI: 51.2% – 60.4%) among those aged 61 to 70 years, and peaked at 66.4% (95% CI: 64.2% – 68.7%) in the oldest age group of 71 to 80 years

Sex: Mean systolic blood pressure was slightly higher in males (mean difference: 3.10 mmHg, 95% CI: 2.30–3.90), but hypertension prevalence did not differ significantly between sexes

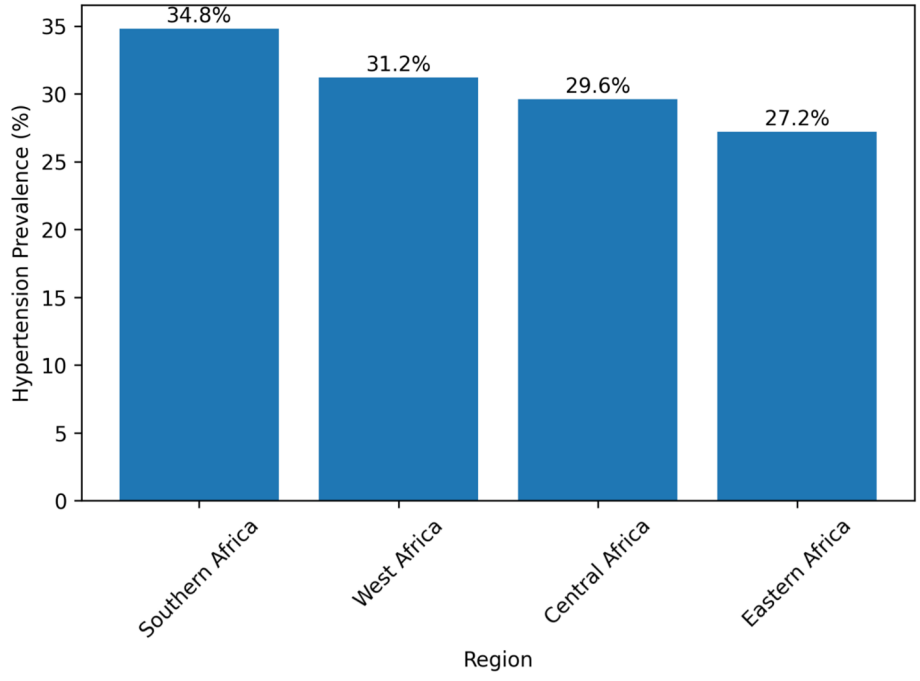


Fig. 3 Pooled hypertension prevalence (%) with 95% confidence intervals by geographic region in Sub-Saharan Africa

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The sex comparison was derived from study-level summaries (pooled prevalence estimates for males and females from individual studies), not from individual participant-level data.

The pooled hypertension prevalence was 30.2% (95% CI: 27.6%–32.8%) for males and 29.6% (95% CI: 27.0%–32.2%) for females, with no statistically significant difference between sexes ($p = 0.34$).

These subgroup analyses should be considered descriptive rather than explanatory. Formal interaction tests were not performed due to the limited number of studies in some subgroups, and the overlapping confidence intervals suggest cautious interpretation.

3.4 Publication bias

The funnel plot showed some asymmetry (Fig. 4), and Egger's regression test was statistically significant ($p = 0.042$), suggesting possible publication bias wherein smaller studies with higher prevalence estimates may be overrepresented (Fig. 5).

4 Discussion

This systematic review and meta-analysis, synthesizing data from 45 studies and 533,167 adults across 26 Sub-Saharan African countries, provides the most up-to-date and comprehensive estimate of hypertension prevalence in the region. The key finding is that approximately one in three adults in SSA has hypertension (pooled prevalence 29.9%, 95% CI: 27.8% – 32.1%). This confirms that SSA bears one of the highest hypertension burdens globally, comparable to Eastern Europe and Central Asia [2, 9].

The extreme heterogeneity (I^2 = 98.8%) likely reflects differences in: (a) study populations (urban vs. rural, national vs. regional samples); (b) measurement methods (single vs. multiple blood pressure readings, mercury vs. automated devices); (c) hypertension definitions (140/90 mmHg vs. 130/80 mmHg thresholds); (d) sampling strategies (random vs. convenience); and (e) time periods (2010–2025). Future research with standardized methodologies is needed to further explore these sources of heterogeneity.

Meta-regression was not performed because several key study-level covariates such as specific blood pressure measurement protocols (single vs. multiple readings, mercury

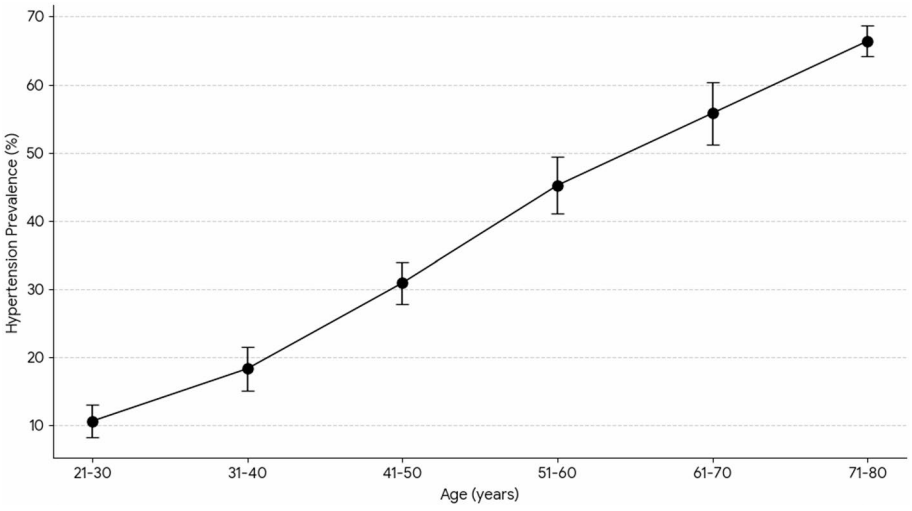


Fig. 4 Age-specific hypertension prevalence in SSA

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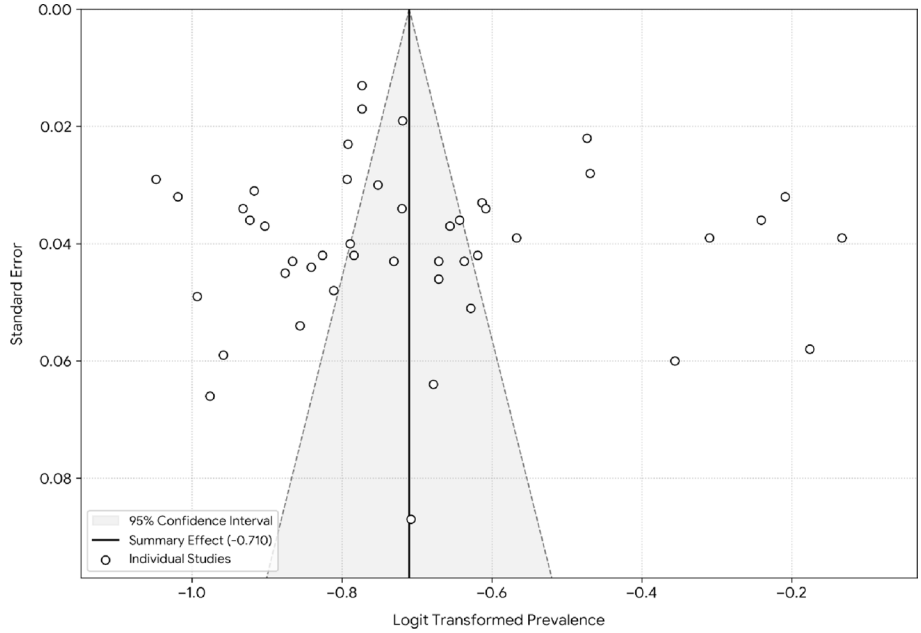


Fig. 5 Funnel plot for assessment of publication bias in hypertension prevalence studies

vs. automated devices) and WHO STEPs vs. non-STEPs methodology were not consistently reported across the 45 studies, resulting in substantial missing data for these variables. We have instead explored heterogeneity through descriptive subgroup analyses and discussed potential sources qualitatively. Future research with standardised methodologies and complete reporting of key covariates is needed to formally test sources of heterogeneity.

4.1 Regional and urban-rural disparities

The substantial regional variation – from 27.2% in Eastern Africa to 34.8% in Southern Africa – reflects different stages of the epidemiological transition [12]. Southern Africa, particularly South Africa, has undergone more rapid urbanization, dietary change, and adoption of sedentary lifestyles, driving higher obesity rates and consequently higher hypertension prevalence [13]. One possible hypothesis is that the lower prevalence in Eastern Africa reflects the persistence of traditional, plant-based diets and higher physical activity levels in rural populations, though this remains speculative and requires further investigation.

The urban-rural gradient (32.9% vs. 26.3%) is consistent with previous reviews [14] and highlights the role of urban environments in promoting hypertension risk factors: processed food consumption, reduced physical activity, alcohol availability, and psychosocial stress. However, the gap may be narrowing as rural areas increasingly adopt urban-like behaviors [15].

Previous SSA studies have consistently confirmed the high prevalence of hypertension in the region, with rates ranging from 25% to 35% in national surveys [3–6].

4.2 Age gradient: a window for prevention

The steep increase from 10.6% among young adults (21–30 years) to 66.4% among older adults (71–80 years) is striking. This pattern, while similar to high-income countries,

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appears to occur at younger ages in SSA, which may suggest premature cardiovascular ageing. However, this interpretation is speculative and should be investigated in longitudinal studies. Critically, the three-fold increase between the third and fifth decades of life identifies middle-aged adults as a high-risk window for primary prevention. Screening programs targeting adults aged 30 years and older could detect hypertension early before complications develop.

4.3 Comparison with previous estimates

Our pooled prevalence of 29.9% aligns closely with Chen et al. (2026), who reported 30.5% (95% CI: 28.4%–32.6%) among 533,167 adults in an independent synthesis covering 1990–2023. The consistency across syntheses, despite different time periods and inclusion criteria, strengthens confidence in the estimate.

5 Strengths and limitations

Strengths include the comprehensive search across five databases, large sample size (over half a million participants), rigorous quality assessment using the Newcastle-Ottawa Scale (NOS), use of optimal statistical methods (logit transformation with random-effects meta-analysis), and transparent reporting following PRISMA 2020.

Limitations must be acknowledged. First, the extreme heterogeneity (I^2 = 98.8%) reflects true variation across diverse populations and methods. While meta-regression was not feasible due to the limited number of studies in some subgroups, we have explored heterogeneity through subgroup analyses and discussed potential sources qualitatively. Second, most included studies were cross-sectional, precluding causal inference about temporal trends. Third, geographic gaps remain: data were sparse from Francophone West Africa, Central Africa (e.g., DRC), and conflict-affected nations, limiting generalisability. Fourth, publication bias (Egger's p = 0.042) suggests that smaller studies with higher prevalence may be overrepresented; however, sensitivity analyses excluding smaller studies did not materially change the pooled estimates, suggesting that the overall conclusions are robust. Fifth, the predominant use of the 140/90 mmHg definition (rather than the newer 130/80 mmHg threshold) means our estimate likely underestimates the true burden [16]. Sixth, trim-and-fill analysis was not performed; this is acknowledged as a limitation. Seventh, grey literature, including theses, government reports, WHO STEPS surveys, and Demographic and Health Surveys (DHS), was not systematically searched, which may have contributed to publication bias. Eighth, restriction to English-language publications may have introduced language bias, potentially excluding relevant studies published in French, Portuguese, or other languages, particularly given the number of Francophone and Lusophone countries in SSA. Finally, the absence of prospective protocol registration (e.g., PROSPERO) is acknowledged as a limitation, as it reduces methodological transparency and increases the risk of selective reporting.

6 Implications for policy and practice

Our findings have several implications. First, the high prevalence (1 in 3 adults) and low detection rates reported elsewhere [3, 4] argue for universal, population-based hypertension screening integrated into primary care and community outreach. Second, the steep age gradient suggests that screening could potentially begin at age 30 years, though

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this implication should be evaluated in the context of local resources and health system capacity. Third, the urban-rural and regional disparities suggest that prevention strategies should be tailored: urban and Southern African populations require urgent lifestyle interventions, while Eastern Africa should focus on maintaining protective traditional diets and activity levels. Fourth, the substantial unexplained heterogeneity calls for more standardized surveillance using WHO STEPs methodology across all SSA countries.

7 Conclusion

This systematic review and meta-analysis found that approximately one in three adults in Sub-Saharan Africa has hypertension, with substantial regional and urban-rural disparities. Prevalence was highest in Southern Africa (34.8%) and lowest in Eastern Africa (27.2%), and increased steeply with age from 10.6% among young adults to 66.4% among older adults. These findings highlight the need for population-wide screening programmes, particularly targeting adults aged 30 years and older, and regionally tailored prevention strategies that address the specific epidemiological profiles of different SSA settings. The extreme heterogeneity observed underscores the importance of standardised surveillance using WHO STEPs methodology across all SSA countries to enable more precise monitoring and comparison of hypertension burden over time.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12982-026-02966-z.

Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

Supplementary Material 4.

Supplementary Material 5.

Supplementary Material 6.

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Author contributions
E.F. conceptualized the study, developed the methodology, conducted the literature search, performed data extraction and statistical analysis, assessed study quality, and wrote the original draft of the manuscript. M.K.H. supervised the research, provided critical methodological guidance, reviewed and edited the manuscript, and approved the final version. All authors reviewed the manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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