

Role of Family History in Hypertension Risk Among Nigerians: Genetic, Environmental, and Public Health Perspectives

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ABSTRACT

Hypertension (HTN) is a leading modifiable risk factor for cardiovascular disease (CVD) and premature mortality globally, with Sub-Saharan Africa (SSA) bearing a disproportionate burden. Nigeria, the most populous country in Africa, reports increasing prevalence rates exceeding 30% among adults. Family history (FH) of hypertension is a consistent, independent predictor of elevated blood pressure (BP) and incident hypertension across populations. However, in Nigerians, the interaction between genetic predisposition, shared environmental exposures, sociocultural factors, and cardiometabolic transitions remains underexplored. This review synthesizes current evidence on the role of family history in hypertension risk among Nigerians, examining genetic susceptibility, epigenetic influences, heritability estimates, gene–environment interactions, and public health implications. We also discuss screening strategies and future research directions relevant to precision prevention in Nigerian populations. **Keywords:** Hypertension, Family history, Nigerians, Genetic predisposition, Heritability, Cardiovascular risk, Sub-Saharan Africa

INTRODUCTION

Hypertension (HTN) is a chronic, multifactorial cardiovascular disorder characterized by persistent elevation of arterial blood pressure. Traditionally defined as systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg, recent international guidelines have proposed lower diagnostic thresholds, reflecting growing evidence that cardiovascular risk begins at levels previously considered “normal.” Regardless of classification criteria, hypertension remains the single most important modifiable risk factor for cardiovascular morbidity and mortality globally [1]. It is a primary contributor to stroke, ischemic heart disease, heart failure, chronic kidney disease (CKD), peripheral vascular disease, and premature death. Globally, hypertension affects more than 1.2 billion adults, with a disproportionate burden in low- and middle-income countries (LMICs). Sub-Saharan Africa (SSA) bears one of the highest prevalence rates worldwide, and Nigeria, being Africa’s most populous nation, is at the epicenter of this emerging epidemic. Contemporary estimates indicate that approximately 28–38% of Nigerian adults are hypertensive, with significantly higher rates in urban compared to rural populations [2]. Alarming, awareness, treatment, and control rates remain suboptimal, thereby amplifying the risk of cardiovascular complications.

The rising prevalence of hypertension in Nigeria reflects a complex epidemiological transition. Rapid urbanization has reshaped lifestyle behaviors, dietary patterns, and occupational structures. Traditional diets rich in fiber and minimally processed foods are increasingly replaced by energy-dense, high-salt, and highly processed alternatives [3]. Concurrently, sedentary lifestyles driven by urban employment patterns, reduced physical activity, increased motorized transport, and prolonged screen exposure have become common. These shifts, compounded by escalating rates of obesity and metabolic syndrome, have intensified cardiovascular risk profiles across age groups. Population aging further compounds the burden. Improvements in healthcare access and life expectancy mean a growing proportion of Nigerians are entering age brackets associated with higher blood pressure levels [4]. However, hypertension is no longer confined to older adults; emerging evidence suggests rising prevalence among young adults and even adolescents, indicating early-life exposure to risk factors. While environmental and behavioral determinants are central to hypertension pathogenesis, genetic predisposition plays a critical role in individual susceptibility. Family history (FH) of hypertension is one of the strongest non-modifiable risk factors and

often serves as the earliest clinically identifiable marker of elevated risk [5]. Numerous epidemiological studies demonstrate that individuals with one hypertensive parent have approximately double the risk of developing hypertension, while those with two hypertensive parents face an even greater likelihood. Heritability estimates for blood pressure range between 30% and 50%, underscoring the substantial genetic contribution [6].

In high-income countries, genomic technologies and polygenic risk scoring are increasingly used to characterize genetic susceptibility. However, in resource-limited settings such as Nigeria, advanced genomic testing remains largely inaccessible and unaffordable. Consequently, family history remains a practical, low-cost, and valuable risk stratification tool in both clinical and community settings [7]. Understanding the interplay between familial predisposition and environmental triggers within the Nigerian context is therefore essential for effective prevention and early intervention strategies. Despite growing awareness of hypertension as a public health emergency, there remains limited comprehensive synthesis of evidence examining the specific role of family history in the Nigerian population. Given the ongoing epidemiological transition and unique socio-cultural dynamics influencing disease patterns, there is a pressing need to contextualize familial risk within Nigeria's broader cardiovascular landscape [8].

Hypertension is escalating rapidly in Nigeria, yet timely detection and effective control remain persistently inadequate, with many individuals first presenting to health services only after developing severe complications such as stroke, hypertensive heart disease, or chronic kidney failure clear indicators of missed opportunities for early identification and risk reduction. While preventive programs commonly emphasize modifiable lifestyle determinants (dietary salt, obesity, inactivity, alcohol intake, and stress), hereditary predisposition is less consistently integrated into routine screening and primary care decision-making [9]. Family history is widely acknowledged as a strong predictor of hypertension risk, but in Nigeria its clinical use is fragmented due to weak documentation systems, limited patient knowledge of parental diagnoses, cultural interpretations of "inherited disease," and low public awareness about the preventive value of knowing family medical history. Critically, there is limited consolidation of Nigeria-specific evidence quantifying familial risk magnitude, clarifying relevant genetic and epigenetic mechanisms, or detailing how family history interacts with shared household environments and socio-economic exposures such as urbanization, dietary transitions, and psychosocial stressors. This gap is compounded by the fact that many global risk prediction models and mechanistic frameworks are derived largely from non-African populations, despite Africa's unique genetic diversity and distinct exposure patterns that may alter risk architecture and gene-environment interactions. Without population-relevant synthesis, hypertension risk stratification tools may be poorly calibrated for Nigerian contexts, constraining evidence-informed policy and clinical practice. Therefore, an urgent need exists to systematically integrate Nigerian epidemiological trends with genetic contributions and family history-based risk assessment, to strengthen early screening strategies, refine targeted prevention, and guide culturally appropriate interventions that improve hypertension control and reduce avoidable cardiovascular morbidity and mortality.

Epidemiology of Hypertension in Nigeria

Hypertension is highly prevalent in Nigeria, with a clear rural-urban gradient reflecting rapid urbanization and lifestyle change. Community surveys commonly report ~20–30% prevalence in rural populations and ~30–45% in urban settings, where sedentary behavior, obesity, high-salt diets, alcohol use, and psychosocial stress are more pronounced. Worryingly, the burden is no longer confined to older adults: studies increasingly describe rising hypertension and prehypertension among young adults (<40 years), signaling an earlier onset of cardiovascular risk [10]. Despite this growing prevalence, population-level prevention and care gaps remain substantial. Awareness is often only ~35–50%, meaning many individuals live with undiagnosed elevated blood pressure. Among those diagnosed, fewer than 40% receive treatment, and blood pressure control rates are typically below 20%, reflecting barriers such as limited screening, medication costs, poor follow-up, and suboptimal adherence. Emerging evidence also shows increasing blood pressure among adolescents and university students, with family history (FH) strongly associated with early-onset hypertension, underscoring the need for early screening and targeted risk-reduction strategies [11].

Family History as a Risk Factor

Family history (FH) is a well-established risk factor for hypertension and is commonly defined as having at least one first-degree relative (parent or sibling) with clinically diagnosed hypertension. A positive FH signals shared genetic susceptibility and shared household exposures, and risk rises further when hypertension clusters more strongly within the nuclear family. For example, individuals with two hypertensive parents often demonstrate a markedly higher lifetime risk (commonly ~2–3× or more), particularly when parental hypertension begins early (e.g., before 55 years), suggesting a stronger inherited component and longer cumulative exposure to familial risk environments [12]. Globally, epidemiologic evidence consistently shows that parental hypertension approximately doubles the likelihood of hypertension in offspring, while having two affected parents may increase risk roughly three- to four-fold. In African ancestry populations, including Nigerians, the observed effect may be amplified by higher salt sensitivity, a greater tendency toward volume-expanded or low-renin hypertension phenotypes, and

environmental reinforcement through diets high in sodium and low in potassium, chronic psychosocial stress, and constrained access to preventive care. Biologically, blood pressure demonstrates substantial heritability, often estimated at 30–60% globally, with many African ancestry estimates toward the upper end supported by twin and family aggregation studies [13]. Candidate gene pathways relevant to Nigerians include the renin–angiotensin–aldosterone system (e.g., ACE, AGT, AT1 receptor variants) influencing vasoconstriction and sodium retention; sodium-handling genes (e.g., SCNN1B and SLC4A5) linked to enhanced renal sodium reabsorption and low-renin hypertension; and variants with renal implications such as APOL1. Sympathetic nervous system–related polymorphisms affecting β -adrenergic signaling and catecholamine metabolism may also contribute, especially under stress. Importantly, hypertension is polygenic, driven by many small-effect variants and gene–gene interactions, but African populations remain underrepresented in GWAS, limiting Nigeria-specific risk prediction and precision prevention.

Early-Life Environmental Factors

Early-life environmental exposures play a critical role in shaping hypertension risk, particularly when combined with genetic susceptibility in Nigerian populations. Shared family-level influences such as high-salt diets, calorie-dense cultural food practices, physical inactivity, and chronic socioeconomic stress create an environment in which inherited predisposition can manifest earlier and more aggressively. Gene–environment interactions are especially relevant in the Nigerian context [14]. African populations are known to exhibit greater blood pressure sensitivity to sodium and generally lower plasma renin activity, making them biologically more vulnerable to the hypertensive effects of excess salt intake. However, traditional Nigerian diets are increasingly shifting toward processed, high-sodium foods with reduced potassium content due to urbanization and globalization. For individuals with a positive family history (FH) of hypertension, high salt intake may therefore amplify vascular reactivity and accelerate blood pressure elevation. Simultaneously, Nigeria's ongoing nutrition transition has led to rising central obesity and insulin resistance, both key components of metabolic syndrome that interact with genetic predisposition to hasten hypertension onset. Urbanization further compounds risk through reduced physical activity, increased psychosocial stress, and greater access to sodium-rich processed foods [15]. Consequently, FH-positive individuals living in urban settings often demonstrate earlier and more sustained blood pressure increases, underscoring the importance of early preventive strategies targeting modifiable environmental exposures.

Evidence from Nigerian Studies

Evidence from Nigerian studies—largely university- and community-based cross-sectional surveys consistently indicates that a positive family history (FH) of hypertension is significantly associated with higher blood pressure (BP) and increased hypertension risk. Across multiple studies, reported effect sizes commonly show odds ratios in the range of ~1.8–3.5, suggesting that individuals with hypertensive parents are substantially more likely to have elevated BP compared with those without such a history [16]. Notably, the association often appears stronger among young adults, implying that genetic susceptibility and shared household behaviors may manifest early as higher mean systolic BP, increased rates of prehypertension, and earlier progression toward clinical hypertension. University-based studies in particular report higher average systolic BP and a greater prevalence of prehypertension among students with hypertensive parents, highlighting the importance of early risk identification in apparently healthy populations [17]. However, the current evidence base has limitations: most studies are cross-sectional, restricting causal inference; longitudinal cohort data remain scarce; and FH reporting is often poorly standardized (e.g., reliance on self-report without verification), which may introduce misclassification. Clinically, these findings support integrating FH into routine primary care risk stratification, with systematic documentation and earlier BP screening for high-risk Nigerians—ideally beginning in adolescence and repeated annually when FH is positive. Preventive counseling should emphasize salt reduction, weight control, physical activity, tobacco avoidance, and limiting alcohol. In treatment planning, pharmacogenomic patterns in African ancestry populations often result in better responses to thiazides and calcium channel blockers than ACE inhibitor monotherapy may justify earlier medication initiation in FH-positive individuals [18].

Public Health Implications

Public health application of family history (FH) as a cardiovascular risk marker offers practical advantages for low-resource settings where routine laboratory testing and advanced diagnostics are often inaccessible. As a free, non-invasive, and rapidly obtainable measure, FH can be collected during routine clinic visits, community outreaches, immunization days, and household screening campaigns without requiring equipment beyond a simple questionnaire. This makes FH especially valuable for early identification of individuals and families at elevated risk of hypertension and related cardiovascular disease, enabling earlier counseling and follow-up before complications occur. At the community level, FH can support family-based lifestyle interventions, where households adopt healthier diets, increase physical activity, and reduce harmful alcohol and tobacco exposure together. Population approaches such as salt-reduction campaigns, food-label education, and community engagement can be strengthened by targeting high-risk families [19]. Schools can reinforce prevention through age-appropriate blood pressure (BP) education and healthy eating programs, while antenatal care platforms provide an efficient entry point for screening

maternal hypertension and counseling women with positive FH to reduce long-term cardiovascular risk. Strategically, Nigeria should integrate FH into national cardiovascular risk assessment tools and guidelines, standardize how FH is recorded in primary care, and promote family-centered prevention programs that link communities, primary health facilities, and referral services to improve early detection and prevention at scale.

Future Directions

Future research on hypertension in Nigeria should prioritize the development of robust, nationally coordinated data systems and genomically informed strategies tailored to the country's ethnic diversity. Establishing comprehensive Nigerian hypertension registries would enable systematic tracking of incidence, treatment patterns, complications, and long-term outcomes across urban and rural populations, thereby improving surveillance and guiding policy decisions [20]. Given Nigeria's major ethnic groups such as Yoruba, Igbo, Hausa, and numerous minority populations, genome-wide association studies are essential to identify population-specific variants influencing blood pressure regulation, salt sensitivity, and cardiovascular risk. Such studies would address the underrepresentation of African genomes in global databases and strengthen precision medicine efforts. Investigating maternal-offspring blood pressure tracking is also critical, as early-life exposures, intrauterine programming, and shared family environments may shape lifelong hypertension risk. Building on genomic findings, researchers should develop and validate polygenic risk scores specifically calibrated for Nigerian populations rather than extrapolating from European-derived models. Finally, family-based intervention trials integrating lifestyle modification, salt reduction, and behavioral counseling could provide culturally relevant, scalable prevention strategies targeting high-risk households and interrupting intergenerational transmission of hypertension risk [21].

CONCLUSION

Family history is a robust and clinically actionable predictor of hypertension risk among Nigerians, capturing the combined influence of inherited susceptibility and shared household environments. In the context of Nigeria's rapidly rising hypertension prevalence, urbanization-driven lifestyle changes, and persistently low awareness and control rates, leveraging family history offers a practical route to earlier detection and targeted prevention. Evidence indicates that Nigerians with hypertensive first-degree relatives, especially those with two affected parents or early parental onset, are more likely to exhibit elevated blood pressure, prehypertension, and earlier progression to established disease. This familial risk is plausibly mediated through polygenic effects and pathways involving sodium handling, the renin-angiotensin-aldosterone system, sympathetic activation, and stress responsiveness, which may be amplified by high-salt diets, obesity, physical inactivity, and psychosocial pressures common in transitioning Nigerian settings. Given limited access to genomic testing and specialist services, systematically documenting family history in primary care, schools, and community screening programs can strengthen risk stratification and prompt earlier lifestyle counseling and follow-up. Moving forward, national registries, genomically inclusive studies across diverse ethnic groups, maternal-offspring tracking, and family-based intervention trials are essential to refine precision prevention and reduce avoidable cardiovascular morbidity and mortality.

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