

Review Article

Paediatric Hypertension in South Africa: Epidemiology, Intergenerational Risk, and Future Directions

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Funding: Lisa J Ware is supported by a Wellcome Trust UK Career Development Award [301436/Z/23/Z].

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Abstract

Paediatric hypertension is increasingly recognised as an important but underappreciated public health problem in South Africa. Once regarded predominantly as a disease of adulthood, elevated blood pressure (BP) in children and adolescents is now known to contribute to early vascular injury, chronic kidney disease progression, and increased adult cardiovascular risk. This narrative review examines the epidemiology, intergenerational determinants, lifestyle-related risk factors, health system challenges, and future policy priorities related to paediatric hypertension in South Africa.

INTRODUCTION

Paediatric hypertension in South Africa is increasingly recognised as an important but underappreciated public health problem.⁽¹⁾ Traditionally viewed as a disease of adulthood, hypertension in children and adolescents has historically received limited clinical and policy attention. ⁽²⁾ However, contemporary evidence suggests that elevated blood pressure (BP) in childhood is common, tracks into adulthood, and contributes to long-term cardiovascular and renal morbidity.⁽³⁾ Within South Africa's evolving epidemiological landscape, paediatric hypertension represents an intersection between the growing burden of non-communicable disease, persistent socioeconomic inequality, and constrained healthcare resources.

South Africa faces a unique quadruple burden of disease, in which infectious diseases, maternal and child health challenges, non-communicable diseases, and trauma-related morbidity compete for limited healthcare funding and clinical attention.^(4,5) In this context, childhood hypertension is frequently deprioritised despite mounting evidence that early vascular injury begins in childhood and adolescence.⁽⁶⁾ The result is delayed recognition, fragmented care pathways, and missed opportunities for prevention.^(7–9)

Although obesity and sedentary lifestyles are important contributors to primary hypertension in children, the South African burden is shaped by a broader interplay of intergenerational cardiovascular risk, poverty, nutritional transition, urbanisation, limited healthcare infrastructure, and inequitable access to specialist care.⁽¹⁰⁾ Furthermore, the lack of standardised national surveillance systems and locally derived BP reference values complicates both diagnosis and epidemiological interpretation.⁽¹¹⁾

This essay examines the current burden of paediatric hypertension in South Africa, explores intergenerational and lifestyle-related risk factors, highlights methodological and health-system challenges, and proposes future research and policy priorities. The evidence strongly supports the need for a coordinated national response that integrates surveillance, prevention, implementation science, and equitable healthcare delivery.

PAEDIATRIC HYPERTENSION IN THE SOUTH AFRICAN CONTEXT

Paediatric hypertension remains under-recognised and inadequately managed across much of South Africa.⁽¹²⁾

Several factors contribute to this gap. Firstly, hypertension is still widely perceived as an adult disease, resulting in low clinical suspicion among healthcare workers and inconsistent BP measurement during childhood consultations. (2) Secondly, healthcare facilities frequently lack validated paediatric BP devices and appropriately sized cuffs, particularly in under-resourced primary care settings. (13) Thirdly, clinicians may be unfamiliar with the complex percentile-based diagnostic criteria required for paediatric BP interpretation. (2)

International guidelines themselves are inconsistent regarding routine BP screening in children. (14) The 2017 American Academy of Pediatrics guideline advocates routine screening from the age of three years. In contrast, the United States Preventive Services Task Force has highlighted insufficient evidence to support universal screening. (15,16) These differing recommendations contribute to uncertainty in resource-limited settings such as South Africa, where competing healthcare priorities already limit implementation.

The consequences of under-recognition are substantial. Childhood hypertension is associated with left ventricular hypertrophy, vascular dysfunction, chronic kidney disease progression, and increased adult cardiovascular risk. (17) Importantly, elevated BP in childhood frequently persists into adulthood, making early intervention critical. (3) Yet referral pathways remain fragmented, continuity of care is poor, and access to paediatric nephrologists and cardiologists is concentrated in tertiary centres. (7–9)

Socioeconomic determinants further complicate management. Poverty, food insecurity, urbanisation, psychosocial stress, and high dietary salt intake all contribute to cardiovascular risk. (18–20) At the same time, healthy dietary options and opportunities for physical activity are often limited within low-income communities. (21) As a result, childhood hypertension in South Africa cannot be understood purely as an individual clinical problem; rather, it reflects broader structural inequalities and changing population health patterns.

INTERGENERATIONAL CARDIOVASCULAR RISK AND EARLY ORIGINS OF HYPERTENSION

Contemporary evidence increasingly supports the concept that cardiovascular risk begins before birth and may even extend across generations. In South African families, structural cardiovascular markers such as carotid intima-media thickness and left ventricular mass demonstrate heritability across grandparents, parents, and children. (22) Hypertension itself is influenced by both genetic and epigenetic mechanisms, interacting with shared environmental exposures and behavioural patterns. (23–25)

The developmental origins of health and disease (DOHaD) framework is particularly relevant in South Africa, where maternal nutrition, obesity, tobacco exposure, stress, and socioeconomic disadvantage remain highly

prevalent. (26) Exposures during the preconception period, pregnancy, and early childhood may all influence later cardiovascular health. (27)

Maternal obesity before and during pregnancy has been associated with higher infant BP detectable within the first year of life. (28) Excess gestational weight gain and maternal hypertensive disorders may further increase offspring risk of obesity and hypertension. (29,30) Paternal health also appears important, with evidence suggesting that both maternal and paternal obesity and tobacco exposure influence cardiovascular outcomes of their offspring. (31–34)

Within Soweto, studies have shown that approximately one-third of young women of reproductive age are tobacco users or tobacco-exposed. (35) Such findings highlight the broader social and environmental context within which cardiovascular risk develops.

Importantly, preconception and antenatal interventions appear capable of modifying these risks. Maternal weight-management interventions before and during pregnancy have been shown to reduce adverse cardiovascular remodelling in offspring. (36) These findings support the need for family-centred cardiovascular prevention strategies that extend beyond the individual child. (37)

Improving cardiovascular health, therefore, requires interventions directed at both biological parents before conception, during pregnancy, and throughout childhood. (38) Such interventions should include healthy weight promotion, smoking cessation, reduction in harmful substance use, stress reduction, healthy dietary patterns, and promotion of physical activity. (38)

EPIDEMIOLOGY AND BURDEN OF DISEASE IN SOUTH AFRICA

Although national surveillance data remain limited, available South African studies strongly suggest that paediatric hypertension is common. Prevalence estimates vary widely between studies, ranging from approximately 5% in broader primary-school populations to nearly 30% in disadvantaged peri-urban settings. (39,40) A national secondary analysis of the 2016 South African Demographic and Health Survey among adolescents aged 15–19 years estimated the prevalence of hypertension at 26%, with higher rates among males. (41)

However, interpretation of prevalence data requires caution. Many South African studies rely on single-visit BP measurements, which likely overestimate the true prevalence of hypertension because transient or white-coat elevations are not excluded. (42) Additionally, studies differ substantially in their methodology, including devices used, numbers of BP readings obtained, and reference standards applied. (13)

Provincial studies further illustrate this variability. In KwaZulu-Natal, researchers reported prehypertension in almost one-third of Grade 12 learners and hypertension in nearly 14%, with obesity strongly associated with elevated

BP.(43) In the Eastern Cape, prevalence estimates among primary school children ranged from approximately 5% to 18%, depending on the population studied and the BP classification system used.(39,44)

One Eastern Cape study demonstrated the profound effect of guideline selection on prevalence estimates. When local pseudo-normative tables were used, the hypertension prevalence was approximately 11%, but when American or German reference tables were used, it rose to nearly 29%.(40) Such findings highlight the urgent need for locally derived normative BP references.

Longitudinal data from the ExAMIN Youth South Africa study in the North-West province provide some of the most important evidence currently available. Among primary school children aged 5–9 years, researchers found high rates of overweight and obesity alongside significant rates of elevated BP and hypertension.(45) Follow-up over four years demonstrated persistent associations between elevated BP, socioeconomic disadvantage, obesity, and sugar-sweetened beverage intake.(46)

Collectively, these studies confirm that paediatric hypertension in South Africa is neither rare nor confined to affluent populations. Instead, the burden appears especially high in disadvantaged urban and peri-urban communities undergoing nutritional and lifestyle transition.

OBESITY, LIFESTYLE, AND MODIFIABLE RISK FACTORS

The strongest and most consistent modifiable risk factor for paediatric hypertension in South Africa is excess adiposity. Across multiple studies, higher body mass index (BMI), waist circumference, body fat percentage, and waist-to-height ratio are strongly associated with elevated BP.(39,40,43–45)

South Africa is experiencing a significant nutritional transition characterised by increased consumption of ultra-processed foods, sugar-sweetened beverages, and energy-dense diets, alongside declining physical activity levels.(21) These changes are occurring in parallel with urbanisation and socioeconomic transformation.(47)

Physical inactivity further compounds risk. Children who fail to meet recommended moderate-to-vigorous physical activity targets are more likely to be hypertensive, particularly when overweight or obese.(44) Longitudinal evidence suggests that consumption of sugar-sweetened beverages increases the risk of hypertension among children and adolescents.(48)

These findings carry important policy implications. Preventative strategies targeting diet and physical activity must become central components of child health programmes.(49) Yet current interventions remain inconsistent and poorly integrated into routine healthcare.(44,50)

School environments represent a particularly important setting for intervention. Many South African children spend much of their day in school environments

characterised by limited opportunities for physical activity and easy access to unhealthy foods.(51) Consequently, school-based interventions aimed at reducing sugar-sweetened beverage intake, improving food procurement policies, and increasing structured physical activity may represent highly effective prevention strategies.(52,53)

Importantly, obesity-related hypertension should not obscure the ongoing burden of secondary hypertension in South Africa. Renal disease, congenital anomalies of the kidney and urinary tract, glomerular disease, and endocrine conditions remain important causes of childhood hypertension, particularly within tertiary services.(54) Given South Africa's limited access to paediatric nephrology services, improved pathways for identifying secondary causes remain essential.(8)

Beyond elevated BP alone, childhood hypertension is increasingly recognised as a marker of early target-organ injury. International evidence demonstrates associations between paediatric hypertension and left ventricular hypertrophy, increased carotid intima-media thickness, arterial stiffness, retinal vascular changes, and progression of chronic kidney disease.(17) These findings are particularly important in South Africa, where delayed diagnosis and inconsistent follow-up may allow significant cardiovascular and renal injury to develop before intervention occurs. Early identification of hypertension is therefore essential not only for BP control itself, but also for prevention of long-term vascular and renal complications.

METHODOLOGICAL CHALLENGES AND SURVEILLANCE GAPS

Existing South African studies vary substantially in measurement protocols, BP classification systems, devices used, and numbers of readings obtained, making direct comparison difficult. This heterogeneity creates uncertainty regarding prevalence estimates, complicates longitudinal trend analysis, and limits both clinical interpretation and international comparability.

The absence of nationally representative data is another major limitation. Most studies are concentrated in selected provinces or districts and may not adequately represent the diversity of South Africa's population, including rural communities, informal settlements, and various ethnic groups.

Health-system barriers significantly contribute to underdiagnosis and undertreatment of paediatric hypertension. Current South African Integrated Management of Childhood Illness frameworks primarily prioritise acute infectious and nutritional conditions and do not substantially incorporate routine childhood hypertension screening or management pathways, further contributing to missed opportunities for early detection.(55) At the primary care level, adherence to paediatric BP screening recommendations is often poor, contributing to inconsistent BP measurement and under-recognition of childhood hypertension.(2) Clinics may lack functioning BP monitors, validated paediatric devices, or correctly sized cuffs.(56,57) Even

where equipment is available, healthcare workers may have limited training in paediatric BP interpretation. The complexity of percentile-based BP classification creates additional challenges. Unlike adult hypertension, paediatric BP interpretation requires adjustment for age, sex, and height percentile. Without digital calculators or simplified tools, this process can be impractical in busy clinics.(13)

Referral systems are equally problematic. Access to paediatric nephrologists and cardiologists remains concentrated in major urban tertiary centres, leaving many children in rural or under-resourced districts without specialist evaluation.(8) Continuity of care is frequently poor, particularly among socioeconomically disadvantaged families facing transportation barriers, caregiver work constraints, and fragmented healthcare pathways.(8)

Implementation science, therefore, becomes critically important. South Africa already has institutional platforms that support paediatric hypertension care, including school health programmes, primary healthcare services, and national Standard Treatment Guidelines. South Africa's growing community health worker (CHW) network, a national workforce of around 60,000 community-based individuals, could also support BP screening, linkage to care, and family-based health education.(58,59) However, these systems are not yet adequately configured for childhood hypertension screening and management.(12)

Potential implementation strategies include:

- Standardised BP measurement training for nurses, CHWs, and school health teams.
- Digital BP percentile calculators are integrated into clinic systems.
- Simplified referral algorithms.
- Structured follow-up pathways.
- Quality-improvement dashboards, monitoring, screening, and referral completion.

A coordinated implementation package could substantially improve detection and management using existing healthcare infrastructure.

FUTURE DIRECTIONS AND RESEARCH PRIORITIES

Future South African research must move beyond fragmented prevalence studies toward a coherent national strategy.

A national surveillance platform should include:

- Standardised BP measurement protocols.
- Repeat-visit confirmation of elevated BP.
- Urban, peri-urban, and rural sampling.
- Oversampling of underrepresented populations.
- Age-, sex-, and height-specific normative tables.

Such a system would finally permit reliable national prevalence estimates and trend monitoring.

The ongoing all-province national screening initiative registered as NCT05982847 represents a major opportunity to achieve this objective.(60)

The second major priority is the development of multi-centre longitudinal cohort studies. Existing South African evidence is heavily cross-sectional, limiting understanding of BP trajectories across childhood and adolescence.

Longitudinal cohorts should incorporate:

- Perinatal exposures.
- Maternal hypertensive disorders.
- Early growth trajectories.
- Diet and physical activity.
- Psychosocial stress.
- Kidney and vascular markers.
- Pubertal transition.

Studies that have such longitudinal data, such as the Soweto Birth to Forty cohort, have produced strong and policy-relevant insights on paediatric BP, lifelong hypertension risk, and cardiovascular disease, including actionable insights (targets and timing for intervention).(61,62) These studies are essential for understanding how cardiovascular risk evolves and which children are most likely to develop persistent hypertension or target-organ damage.

Thirdly, South Africa requires prevention-focused randomised trials. Observational evidence linking obesity, physical inactivity, and unhealthy diet to elevated BP is now sufficiently strong to justify intervention studies.

Cluster-randomised school-based interventions in low-income communities may be especially valuable. Potential interventions include:

- Restricting sugar-sweetened beverages.
- Improving school food procurement.
- Increasing structured physical activity.
- Family-centred nutrition education.
- Stress-management and sleep interventions.

Such programmes should evaluate both cardiovascular and educational outcomes.

Finally, implementation science must accompany efficacy research. Screening programmes that identify hypertension without providing accessible referral and follow-up systems risk exacerbating inequity rather than improving health outcomes.

POLICY AND PUBLIC HEALTH IMPLICATIONS

The growing burden of paediatric hypertension requires integration into broader child health and non-communicable disease strategies.

Firstly, BP measurement should become a routine component of school health and primary care assessments. Clear guidance regarding repeat measurements and referral pathways is essential.

Secondly, child and adolescent nutrition policy must prioritise cardiovascular health. South Africa's high dietary salt intake and increasing consumption of ultra-processed foods represent major modifiable risks. Policies aimed at reducing sugar-sweetened beverage exposure and improving school nutrition environments are likely to yield substantial long-term benefits.

Thirdly, emerging local normative BP tables should be rapidly translated into practical clinical tools. Simplified paper charts, mobile applications, and electronic decision-support systems could dramatically improve diagnostic accuracy.

Fourthly, capacity building is critical. Healthcare workers across multiple disciplines require training in paediatric BP measurement, cuff selection, interpretation, and referral pathways.

Importantly, equity must remain central to all future policy development. Rural districts, township schools, and under-resourced clinics should not merely serve as research sites but should directly benefit from implementation efforts.

Funding mechanisms will likely require collaboration among the government, universities, international cardiovascular funders, and child health organisations. Ethical implementation additionally demands that screening initiatives include funded pathways for follow-up care and specialist referral.

KEY PRIORITIES FOR STRENGTHENING PAEDIATRIC HYPERTENSION PREVENTION AND CARE IN SOUTH AFRICA INCLUDE:

- Establishing nationally representative BP surveillance systems and locally derived paediatric BP reference values.
- Integrating routine BP screening into primary healthcare and school health services, with clear repeat-measurement and referral pathways.
- Strengthening prevention strategies targeting obesity, unhealthy diet, high salt intake, sugar-sweetened beverages, and physical inactivity, particularly through school- and family-based interventions.
- Improving healthcare worker training in paediatric BP measurement, cuff selection, interpretation of BP percentiles, recognition of secondary hypertension, and referral systems.
- Expanding equitable access to paediatric nephrology and cardiology services through strengthened district referral networks and telemedicine support.
- Prioritising longitudinal cohort studies, implementation science, and intervention research focused on early-life cardiovascular risk, target-organ injury, and preventative strategies.

CONCLUSION

Paediatric hypertension in South Africa is an increasingly important public health challenge associated with substantial long-term cardiovascular and renal risk. Although elevated blood pressure is increasingly recognised among South African children and adolescents, underdiagnosis remains common due to inconsistent screening practices, limited local normative data, and inequitable access to care. Strengthening surveillance, improving early detection and referral pathways, and integrating prevention strategies into child health services should become national priorities. Most importantly, paediatric hypertension must be reframed not simply as a niche paediatric condition, but as a lifelong cardiovascular risk state with profound implications for future adult disease burden.

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