International Heart and Vascular Disease Journal. Volume 13, № 46, June 2025
ISSN: 2311-1623 (Print)
ISSN: 2311-1631 (Online)
http://www.heart-vdj.com

Early Predictors and Diagnostic Consideration of Childhood Hypertension in South Africa

Eteneneng EJ, Tiagha AK, Nkeh-Chungag B.

Walter Sisulu University (WSU), Nelson Mandela Drive, South Africa.

AUTHOR

Eteneneng Enoh Jude*, Researcher, PhD in Chemical Pathology, Cardio-Metabolic Health Research Group, Faculty of Natural Sciences, Walter Sisulu University, South Africa. ORCID: 0000-0001-5941-0774

Tiagha Akah Roland, Researcher, PhD in Public Health, Cardio-Metabolic Health Research Group, Faculty of Natural Sciences, Walter Sisulu University, South Africa. ORCID: 0009-0002-1579-4854

Nkeh-Chungag Benedicta, MPH, PhD, Professor, Head of Cardio-Metabolic Health Research Group, Faculty of Natural Sciences, Walter Sisulu University, South Africa. ORCID: 0000-0003-4805-4051

Abstract

Childhood hypertension is not just a rising, but an urgent public health concern in South Africa, a trend that is similarly reflected in other parts of the country. This review examines childhood hypertension's prevalence, risk factors, early predictors and diagnostic considerations of Childhood Hypertension in South Africa.

The available literature on Childhood hypertension in South Africa is evolving, with estimated prevalence from literature ranging from 1.3-32.6%, with a particular increase in adolescents. The increase in the prevalence can be attributed to rapid nutritional transition, socioeconomic inequalities, urbanization, and lifestyle changes. Early identification of children at risk for hypertension is crucial. Unchecked hypertension in childhood tremendously increases the risk of developing adult cardiovascular diseases, such as Organ Damage in the heart, kidneys, and blood vessels, along with problems related to the vision of the child. Family history of Hypertension, Low Birth Weight, and Rapid Weight Gain in Infancy and Early Childhood are early predictors of prime importance. Diagnosis requires accurately measuring blood pressure (Multiple Measurements) using the Appropriate Cuff Size. Tackling childhood hypertension in South Africa requires a serious public health response through prioritizing prevention, early detection, and effective management strategies.

Keywords: childhood hypertension, prevalence, early predictors, South Africa.

Conflict of interests: none declared.

Recieved: 18.03.2025
Accepted: 05.05.2025

* Corresponding author. Tel./Тел. (+27) 834321592. E-mail: jenoh@wsu.ac.za

For citation: Eteneneng E.J., Tiagha A.R., Nkeh-Chungag B. Early predictors and diagnostic consideration of childhood hypertension in South Africa. International Journal of Heart and Vascular Diseases. 2025. 13(46): 41-47. DOI: 10.24412/2311-1623-2025-46-48-55

Introduction

Blood pressure (BP) readings in children are expressed as percentiles for age, sex and height. Blood pressure percentiles ⩾95% on three different occasions is described as hypertension [1]. Prehypertension is when the readings fall between the 90th and 95th percentiles among preadolescents [2]. Although less common in children than adults, evidence suggests that adult essential hypertension has its roots in childhood [1, 2]. Childhood hypertension is an emerging significant global public health burden in the face of increasing obesity, especially in Africa. Community-based studies conducted within the last five years estimated the prevalence of hypertension among South African children to range between as low as 1.3% and up to 32.6% across different regions [2-4].

In South Africa, obesity, physical inactivity, poor diets heavy in processed foods and salt, family history of hypertension, and socioeconomic factors are major risk factors for Childhood hypertension [5-7]. Compared to their rural counterparts, children in urban areas are frequently more impacted by food and lifestyle changes [7].

In severe circumstances, childhood hypertension can result in kidney damage or heart failure in addition to other acute health problems like headaches and eye problems [8]. Untreated childhood hypertension raises the risk of adulthood chronic kidney and cardiovascular diseases [8–11].

Children with hypertension are usually diagnosed by taking multiple blood pressure readings while accounting for percentiles of height, gender, and age [8,10]. It is advised that children with a family history of hypertension, obesity, or other co-occurring diseases like diabetes should have routine blood pressure screening [1].

Management of hypertension in South Africa has been reported to be focused on encouraging healthy lifestyles through school-based initiatives, community-based health interventions, and legislation targeting reducing childhood obesity and enhancing nutritional practices [12]. South Africa, being a country with a very heterogeneous population and wide gap in the socioeconomic strata, faces serious public health challenges; one such challenge is the rise in juvenile hypertension. Thus, a better understanding of the epidemiology and socioeconomic determinants that may all contribute to its growing concern should be recorded appropriately. These can be understood in the prevalence, risk factors, and socioeconomic determinants that further this increasing concern. It is necessary to look at the prevalence, risk factors, and socioeconomic determinants that contribute to this increasing concern to comprehend the epidemiology of this ailment in South Africa.

Earl Predictors and Epidemiology of Childhood Hypertension in South Africa

While influenced by local conditions, the epidemiology of childhood hypertension in South Africa follows the larger global trends with the prevalence of similar modifiable/nonmodifiable risk factors (Figure 1) [8]. In South Africa, the prevalence of childhood hypertension has been increasing in tandem with rises in childhood obesity and other illnesses linked to lifestyle choices [2, 8, 13]. Research has shown that rates of hypertension in children in South Africa vary greatly, from 1.3% to 32.6%, depending on the community, diagnostic instrument and criteria standards applied [2, 4, 14]. These rising rates result from urbanisation, dietary modifications, and sedentary lifestyles, especially in cities where processed food availability and decreased physical activity are more prevalent [6, 15-17]. Generally, some of the key early predictors of childhood hypertension can be traced to factors such as birth weight, maternal health, and infant feeding practices [8,13]. Low birth weight, maternal hypertension or preeclampsia and smoking during pregnancy have been linked as significant predictors.

Obesity, poor dietary habits, socioeconomic, family history, and physical inactivity influence hypertension in South African children [13, 17, 18]. Poor dietary habits, including shorter duration of breastfeeding, early introduction of solid food, high sodium intake and low consumption of fruits and vegetables, are prevalent among South African children and contribute to the risk of hypertension [6, 7, 13, 16]. Due to the high levels of income disparity in the nation, children

International Heart and Vascular Disease Journal. Volume 13, № 46, June 2025
ISSN: 2311-1623 (Print)
ISSN: 2311-1631 (Online)
http://www.heart-vdj.com

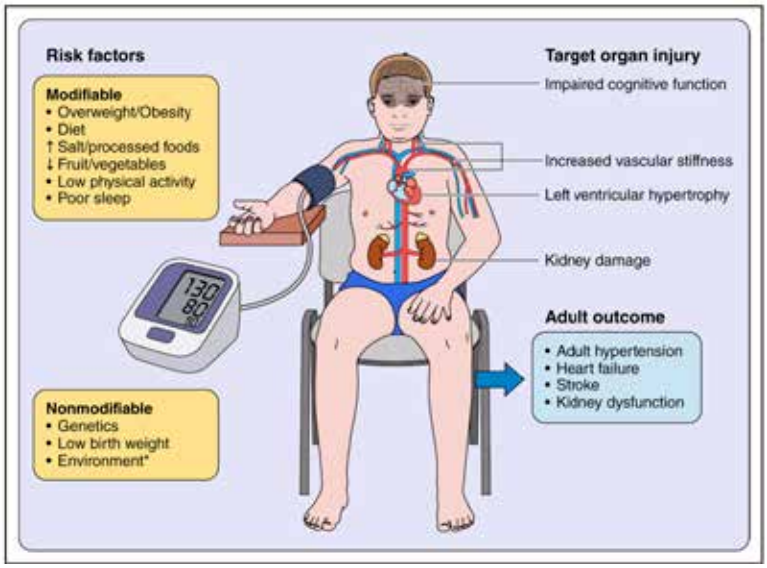

Fig. 1. Modifiable risk factors for high BP in children and adolescents, including improving dietary intake and physical activity and reducing excess adiposity [8]

from lower-income families are more susceptible to hypertension and the risk factors that go along with it [7]. Insufficient availability of healthcare services in certain regions may lead to delays in diagnosing and treating hypertension, culminating in more severe health consequences [2, 7].

Besides, the nutritional transition in South Africa, characterised by the switch from traditional to Westernised diets typically high in processed foods, sweets, and fats, has significantly affected children's health [16]. The scenario is clearer in urban and peri-urban areas where economic development influences changes in lifestyle and food availability [15, 19]. Though not directly linked to the cause, the high prevalence of some diseases, such as HIV, can impact childhood health and potentially increase the risk of hypertension [3].

Clinical and Diagnostic Considerations of Childhood Hypertension

Growing awareness of childhood hypertension as a health issue calls for rigorous clinical and diagnostic assessment. Hypertension is asymptomatic in many children, and many do not exhibit symptoms, so routine screening is crucial [9, 10]. Without overt signs, hypertension may go undiagnosed in children and discovered secondary to another health issue. When symptoms arise, they could include headaches, light-headedness, blurred vision, bleeding from the nose, exhaustion, and agitation [9,10]. The general nature of these symptoms makes them easily mistaken for other illnesses, which makes early diagnosis more difficult. During standard physical examinations, children's blood pressure and additional indicators of secondary hypertension, such as Cushing's syndrome symptoms and skin abnormalities suggesting neurofibromatosis or abdominal tumours, are usually recommended to be checked [10].

To accurately diagnose childhood hypertension, children should be in a calm environment, sitting quietly for at least three to five minutes with their backs supported and feet flat on the floor. Blood pressure is taken on both arms and legs to check for aortic coarctation. A minimum of three different readings is recommended for confirmation [9, 10]. Since most childhood hypertension is asymptomatic, some doctors recommend 24-hour ambulatory blood pressure monitoring (ABPM) [8, 20]. The ABPM monitoring offers a thorough evaluation, catches fluctuations, and aids in the diagnosis of asymptomatic, underdiagnosed, masked hypertension (normal readings in a clinical setting but elevated outside) or white coat hypertension (elevated readings in a clinical setting but not in everyday life). The percentiles of ABPM are compared to normative data for children's age, sex, and height [8, 20].

Secondary causes of childhood hypertension can be assessed through urinalysis, blood tests, renal ultrasonography, hormonal assays, doppler examinations, or echocardiography, depending on the preliminary results. Normal blood pressure is below the 90th percentile; elevated blood pressure is between the

DOI: 10.24412/2311-1623-2025-44-43-50

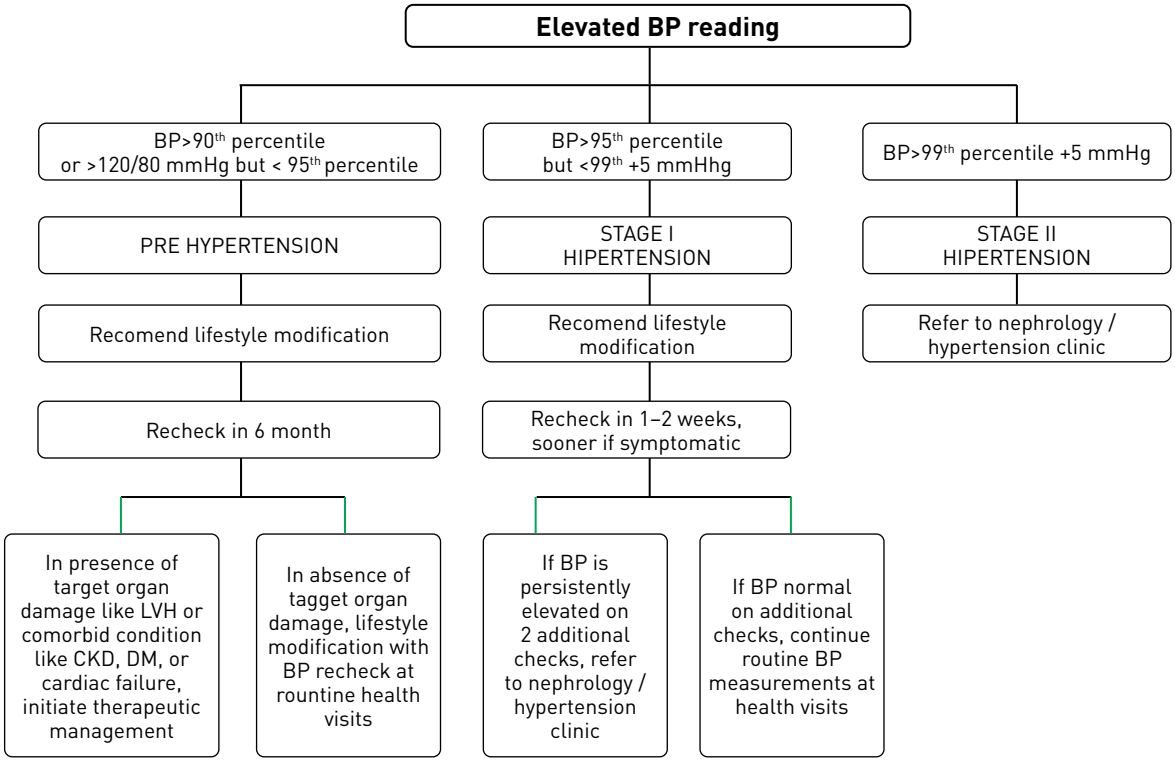

Fig. 2. Diagnosis of Hypertension in the Teenager-Pediatric Clinics [1]

90th and 95th percentile or above 120/80 mmHg. Stage 1 hypertension is blood pressure between the 95th percentile and 5 mmHg above the 99th percentile, and Stage 2 hypertension is blood pressure greater than 5 mmHg above the 99th percentile (Figure 2) [1, 8].

Knowledge gaps in childhood hypertension in South Africa

In South Africa, like the rest of the African continent, childhood hypertension is a growing underdiagnosed public health issue that requires urgent attention. Furthermore, the paucity of information on diagnosis, management, and prevention are a significant challenge. Understanding these challenges is important for properly managing the condition and minimising its chronic health effects. One of the major knowledge or information voids is the absence of thorough epidemiological data regarding the prevalence/distribution of childhood hypertension and the utilisation or effectiveness of antihypertensive agents in children and adolescents from different communities and regions in South Africa.

Childhood hypertension in South Africa is understood mainly due to a lack of knowledge about factors like genetic predispositions, socioeconomic situations, and environmental effects. The lack of standard procedures for screening and diagnosis can lead to incorrect or underdiagnosed diagnoses [21]. The best ways to manage and treat childhood hypertension, including pharmaceutical therapies and lifestyle modifications, are also unclear [3].

Recommendations for diagnosis and treatment of childhood hypertension

Regular screening, such as routine checks during hospital visits, school/community-based screening and awareness, will help to identify children at risk of developing high blood pressure early [2, 12]. Early diagnosis and prevention of childhood hypertension remains a critical focus, especially for high-risk populations such as South Africa, and is crucial in the management. A proper blood pressure measuring technique is necessary for accurately identifying childhood-onset hypertension, and the currently suggested blood pressure monitoring should be done on at least three different days/occasions because of variability in BP measurements [8]. Systolic blood pressure beyond the 95th percentile is considered hypertension. Hypertension is also defined by diastolic blood pressure ⩾95th percentile and systolic blood pressure ⩾95th percentile (Table 1).

Table 1. **Definitions of Normal and Abnormal Childhood Blood Pressure Levels [8]**

BP Category	Age <13 years	Age ⩾13 years
Normal BP	<90th percentile for age, sex, and height	<120/<80 mmHg
Elevated BP	90th to <95th Percentile for age, sex and Height	⩾120/<80 to 129/<80 mmHg
Stage 1 Hypertension	⩾95th percentile to 95th percentile plus 11mmHg	130-139/ 80-89 mmHg
Stage 2 Hypertension	⩾95th percentile plus 12mmHg	⩾140/⩾90 mHg

Obtaining an accurate blood pressure measurement in children and adolescents can be challenging since blood pressure varies with cuff size, anxiety level, caffeine intake, time of day and patient positioning [8, 10, 22]. Before and during the measurement, the patient should be rested in a quiet position for three to five minutes with their back supported and their feet flat on the floor (not crossed). Unless it is contraindicated (arteriovenous fistula present), the blood pressure should be taken from the right arm. The arm should be supported when applying the cuff so its midpoint is at heart level [8, 10]. The upper arm should be exposed beneath the cuff to prevent a tightly wrapped sleeve above the cuff. During measurement, it is expected that the patient and medical staff should refrain from conversing, reading, using electronics, and engaging in any other type of distraction [8, 10, 22].

The middle upper arm circumference is usually measured halfway between the olecranon and acromion to find the appropriate cuff size [8, 10, 22]. It is usually expected that bladder length should be at least 80% of the middle upper arm circumference, and the bladder width should be between 37% and 50% when measuring blood pressure manually by auscultation [10]. The recommended arm-circumference range on the cuff should be considered when choosing an automated instrument for blood pressure monitoring. To guarantee equal compression of the brachial artery during measurement, the cuff is positioned at the midpoint of the inflated portion (usually the delineated artery) 2 cm above the palpated brachial artery in the antecubital fossa [8, 10, 22]. Applying the cuff snugly means that there should not be room for more than two fingers to pass between the skin and the cuff [8, 10, 22].

Manual auscultation is begun by palpating the pulse in the radial artery and inflating the cuff 20–30 mmHg above the point at which the pulse stops [8, 10, 22]. The stethoscope diaphragm is placed over the location of the brachial artery, being careful not to tuck it under the cuff. Inflating the cuff to maximum capacity, it is deflated at 2–3 mmHg per second [8, 10, 22]. The first Korotkoff sound is the systolic blood pressure (K1), while the last audible sound represents the diastolic pressure (K5) [8, 10, 22].

Once a high blood pressure reading is confirmed in the office, the further management of the patient is mostly determined by the stage and severity of elevation (figure 3) [10]. Before starting medication, it is advised that lifestyle modifications be made to treat and manage hypertension. These adjustments entail eating a balanced diet low in processed sugar, salt, and saturated fat and high in fruits, vegetables, whole grains, and lean proteins. Also, weight loss and daily physical activity ranging from mild to intense are encouraged [9]. Antihypertensive medication is recommended to be introduced when lifestyle changes seem insufficient, and medication will depend on the child's underlying condition and need. Some common antihypertensive drugs used include Diuretics, angiotensin II receptor blockers, ACE inhibitors, beta-blockers, and calcium channel blockers [23].

Conclusion

Early identification of hypertension in children in South Africa is paramount to avert long-term cardiovascular implications. Such major predictors as obesity, family history, socioeconomic status, and lifestyle habits need to be incorporated into the regular screening. Simplifying early diagnosis by boosting awareness, access to medical care, and uniform diagnostic thresholds will improve early treatment and decrease the escalating childhood hypertension burden.

Gratitude

We thank the Institute of Medical Research and Medicinal Plants Studies (IMPM) and Walter Sisulu University for providing us with scientific resources and endless support.

Conflict of interests: none declared.

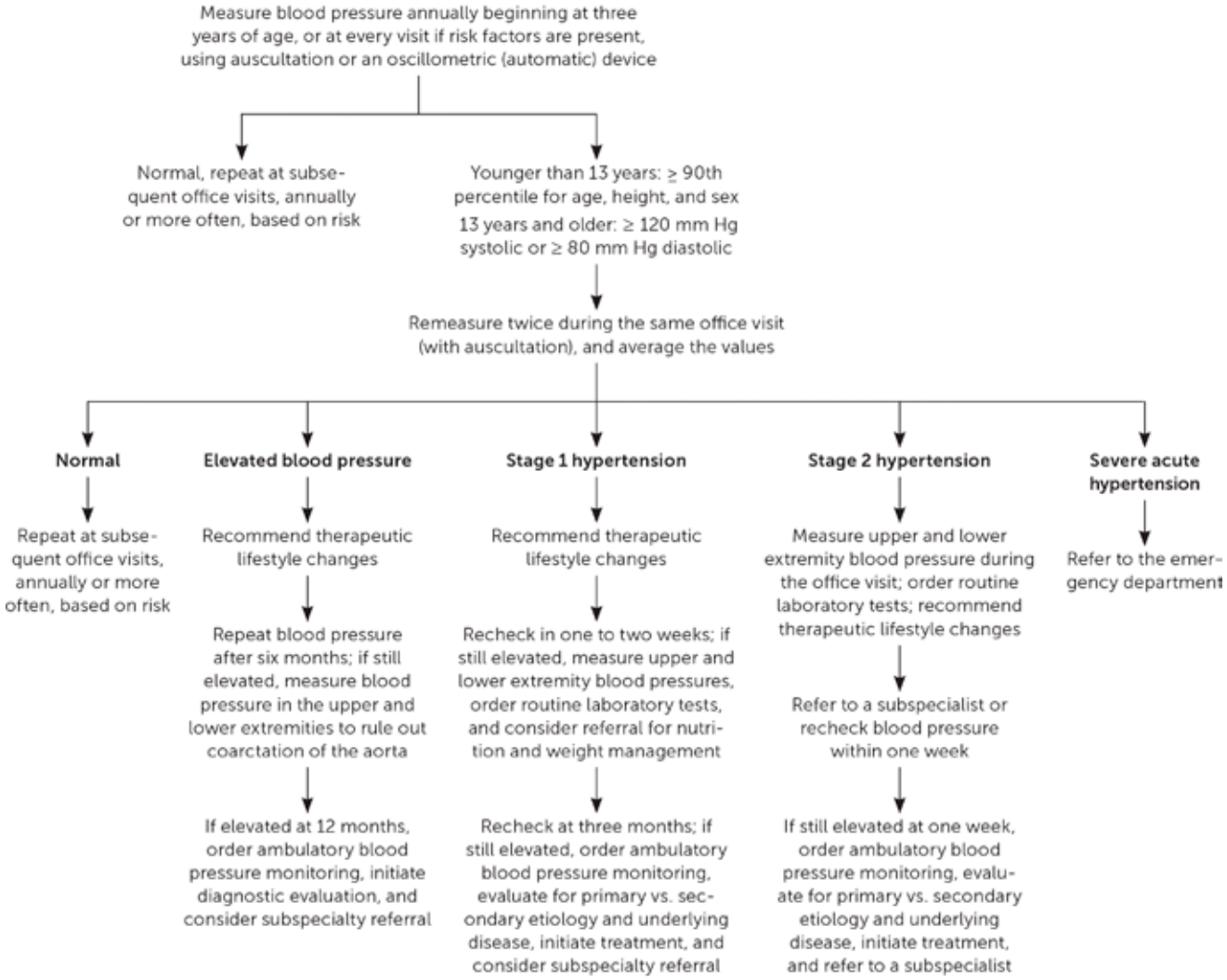

Fig. 3. Management/treatment guidelines for hypertension in children and adolescents [10]

References

1. Elizabeth IA, Vikas RD Hypertension in the Teenager. Pediatric Clinics. 2013. 61(1): 131-51. DOI: 10.1016/j.pcl.2013.09.011
2. Matjuda EN, Engwa GA, Letswalo PB et al. Association of Hypertension and Obesity with Risk Factors of Cardiovascular Diseases in Children Aged 6–9 Years Old in the Eastern Cape Province of South Africa. Children. 2020. 7, 4: 25. DOI: 10.3390/children7040025
3. Mphekgwana PM, Monyeki KD, Makgopa HM, Makgae PJ. Multiple points change in the association of blood pressure subtypes with anthropometric indices of adiposity among children in a rural population. Children (Basel). 2020. 7(4):28. DOI: 10.3390/children7040028
4. Craig A, Breet Y, Gafane-Matemane LF et al. Detecting and Managing Childhood Onset Hypertension in Africa: A Call to Action. Curr Hypertens Rep. 2023. 25: 211–230. DOI: 10.1007/s11906-023-01247-3
5. Gupta RD, Talukder A, Hossain MB et al. Prevalence and associated factors of hypertension among South African adults: findings from the Demographic and Health Survey 2016. J Public Health (Berl.) 2023. 31: 967–977. DOI: 10.1007/s10389-021-01607-w
6. Nandi J, Cheryl W, Rosa du Randt et al. Hypertension among South African children in disadvantaged areas and associations with physical activity, fitness, and cardiovascular risk markers: A cross-sectional study. Journal of Sports Sciences. 2021, 39:21: 2454-2467.DOI: 10.1080/02640414.2021.1939964
7. Madela S, Harriman N, Sewpaul R. et al. Individual and area-level socioeconomic correlates of hypertension prevalence, awareness, treatment, and control in uMgungundlovu, KwaZulu-Natal, South Africa. BMC Public Health. 2023, 23: 417. DOI: 10.1186/s12889-023-15247-0
8. Falkner B, Gidding SS, Baker-Smith CM et al. Pediatric Primary Hypertension: An Underrecognized Condition: A Scientific

Statement From the American Heart Association. Hypertension. 2023, 80(6), e101–e111. DOI: 10.1161/HYP.0000000000000228

9. Lurbe E, Álvarez J, Redon J. Diagnosis and treatment of hypertension in children. Current hypertension reports. 2010: 12(6): 480–486. DOI: 10.1007/s11906-010-0155-x
10. Riley M, Hernandez AK, Kuznia AL High Blood Pressure in Children and Adolescents. American family physician. 2018, 98(8): 486–494.
11. Eteneneng EJ. Challenges of early diagnosis and prevention of cardiovascular disease in Sub-saharan Africa. International Heart and Vascular Disease Journal. 2024, 12(43):33-40. DOI: 10.24412/2311-1623-2024-43-33-40
12. Woodiwiss AJ, Kruger R, Norton, GR et al. May Measurement Month 2018: an analysis of blood pressure screening results in South Africa. European heart journal supplements: journal of the European Society of Cardiology 2020, 22(Suppl H): H115–H118. DOI: 10.1093/eurheartj/suaa043
13. Goutham R Diagnosis, Epidemiology, and Management of Hypertension in Children. Pediatrics. 2016, 138 (2): e20153616. DOI: 10.1542/peds.2015-3616
14. Ngwenya NA, Ramukumba TS Prevalence of adolescent obesity at a high school in the City of Tshwane. Curationis. 2017, 40(1). DOI: 10.4102/curationis.v40i1.1662
15. Enoh JE, Akah RT, Nkeh-Chungag B. Cardiometabolic Risk Factors Among African University Students: A Systematic Review. BioMed. 2025. 5(1):1. DOI: 10.3390/biomed5010001
16. Weimann A, Oni T. A Systematised Review of the Health Impact of Urban Informal Settlements and Implications for Upgrading Interventions in South Africa, a Rapidly Urbanising Middle-Income Country. Int. J. Environ. Res. Public Health. 2019, 16, 3608. DOI: 10.3390/ijerph16193608
17. Hoosain, MS, Paul BS, Doorsamy W. et al. Comparing South Africa's Sustainability and Circular Economic Roadmap to The Rest of the World. Mater Circ Econ. 2023,5, 2. DOI: 10.1007/s42824-023-00073-x
18. Schutte AE, van Rooyen JM, Huisman HW et al. Dietary risk markers that contribute to the aetiology of hypertension in black South African children: the THUSA BANA study. Journal of Human Hypertension. 2003, 17: 29-35.
19. Nnyepi MS, Gwisai N, Lekgoa M, Seru T. Evidence of nutrition transition in Southern Africa. The Proceedings of the Nutrition Society. 2015.74(4): 478–486. DOI: 10.1017/S0029665115000051
20. Basalely A, Hill-Horowitz T. Sethna, CB. Ambulatory Blood Pressure Monitoring in Pediatrics, an Update on Interpretation and Classification of Hypertension Phenotypes. Curr Hypertens Rep. 2023,25: 1–11. DOI: 10.1007/s11906-022-01231-3
21. Brian R, Erika J, Yusuf V, Seedat YK South African Hypertension Society commentary on the American College of Cardiology/American Heart Association hypertension guidelines. Cardiovasc J Afr. 2019, 30: 184–187. DOI: 10.5830/CVJA-2019-025
22. Flynn JT, Kaelber DC, Baker-Smith CM et al. Subcommittee on Screening and Management of High Blood Pressure in Children. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. Pediatrics. 2017, 140:e20171904. DOI: 10.1542/peds.2017-1904
23. Seedat YK, Rayner BL, Veriava Y South African hypertension practice guideline 2014. Cardiovascular journal of Africa. 2014, 25(6): 288–294. DOI: 10.5830/CVJA-2014-062