

Hypertension in the Teenager

Elizabeth I. Anyaegbu, MD, MSCI^a,
Vikas R. Dharnidharka, MD, MPH^{b,*}

KEYWORDS

- Hypertension • Obesity • Adolescents • Antihypertensive medications
- Cardiovascular mortality

KEY POINTS

- Over the last two decades, essential hypertension has become common in children and adolescents, and it is related to the obesity epidemic.
- Hypertension is underrecognized in children and diagnosis is based on specific normative standards, including sex, age, and height.
- Modifiable risk factors for essential hypertension in children, such as obesity and sodium consumption, should be addressed during treatment.
- Primary care physicians may play an important role in reduction of cardiovascular mortality by early detection, appropriate management, and referral when needed.

INTRODUCTION

The current prevalence of hypertension in children is estimated at about 1% to 5%, with higher rates among minority adolescents.^{1–3} Primary hypertension (PH), also referred to as essential hypertension, previously considered a disease of adulthood, has now become increasingly common in the pediatric population largely due to the obesity epidemic.^{4,5} Obese children are three times more likely to develop hypertension than their nonobese counterparts.^{6,7} Therefore, this article focuses on obesity-related teenage hypertension. The article also discusses hypertension in nonobese teenagers, for which significant data exist.

The relationship between obesity and hypertension has been clearly defined in multiple studies across different ethnic and gender groups.^{1,7–12} The cause of obesity-related hypertension has been linked to sympathetic hyperactivity, insulin resistance, and vascular structure changes.^{13,14} Sorof and colleagues⁷ demonstrated the presence of sympathetic nervous system hyperactivity in obese school-age children,

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^a Division of Pediatric Nephrology, Driscoll Children's Hospital, College of Medicine, Texas A&M University, 3533 South Alameda Street, Corpus Christi, TX 78411, USA; ^b Division of Pediatric Nephrology, St Louis Children's Hospital, Washington University School of Medicine in St Louis, 660 South Euclid Avenue, St Louis, MO 63110, USA

* Corresponding author.

E-mail address: Dharnidharka_V@kids.wustl.edu

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evidenced by increased heart rate and blood pressure (BP) variability, which contributed to the pathogenesis of isolated systolic hypertension in this cohort. Increased sodium content of the cerebrospinal fluid has been shown to increase sympathetic nervous system activity through activation of the renin-angiotensin-aldosterone pathway in the brain.^{13,14} Obese individuals have selective insulin resistance, which leads to increased sympathetic activity and alteration of vascular reactivity. The resultant sodium retention is evidenced by decreased urinary sodium excretion.¹⁵ The lessons learned from the study of obese hypertensive individuals can be largely applied to the diverse population of hypertensive children.

DEFINITION AND CLASSIFICATION OF PEDIATRIC HYPERTENSION

Pediatric hypertension is usually asymptomatic and can easily be missed by health-care professionals. The National Heart, Lung, and Blood Institute (NHLBI) of the National Institute of Health (NIH) commissioned the Task Force on Blood Pressure Control in Children to develop normative standards for BP. These standards were derived from the survey of more than 83,000 person-visits of infants and children. The percentile curves describe age-specific and gender-specific distributions of systolic and diastolic BP in infants and children adjusted for height¹⁶; these have been updated periodically.

Hypertension in children and adolescents is diagnosed based on specific references, including age, gender, and height. Hypertension is defined as systolic and/or diastolic BP greater than the 95th percentile for age, gender, and height on three or more separate occasions. BP greater than 90th percentile but less than the 95th percentile for age, sex, and height defines prehypertension, representing a category of patients at high risk for developing hypertension.^{2,3,17–19} It is crucial that healthcare providers be aware that the BP at the 90th percentile for an older child often exceeds the adult threshold for prehypertension of 120/80 mm Hg. As a result, beginning at 12 years of age, the BP range that defines prehypertension includes any BP reading of greater than 120/80 mm Hg, even if it is less than the 90th percentile.¹⁶ We now know that prehypertension may not be completely benign and the rate of progression to hypertension was reported at 7% per year over a 2-year interval.¹⁸ Stage I hypertension refers to systolic and/or diastolic BP greater than the 95th percentile but less than or equal to the 99th percentile plus 5 mm Hg. There are no data on the progression from stage I to stage II hypertension in children.

Stage II hypertension is defined as systolic and/or diastolic BP greater than the 99th percentile plus 5 mm Hg. This represents a more severe form of hypertension, commonly associated with target organ damage. An analysis by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents revealed an increased risk for left ventricular hypertrophy (LVH)²⁰ in participants with stage II hypertension. Surprisingly, in some studies, children and adolescents with prehypertension also had a substantially increased left ventricular mass index with a twofold higher prevalence of LVH than their normotensive counterparts.^{21–23} Classification of hypertension is summarized in [Table 1](#).

Primary and Secondary Hypertension

Based on the cause, hypertension can be categorized as PH or essential hypertension when there is no identifiable cause and as secondary hypertension (SH) when there is an underlying cause for hypertension. PH is now the most common cause of hypertension in adolescents and young adults. It is usually characterized by stage I (mild) hypertension and associated with a positive family history of hypertension.²⁴ SH

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