

Hypertension in children: from screening to primordial prevention



Hypertension is a major cause of death and morbidity worldwide.¹ Until recently, hypertension was rarely searched for or diagnosed in children. However, growing evidence indicates that elevated blood pressure early in life has detrimental lifelong cardiovascular effects, raising questions about the potential benefits of hypertension screening and prevention starting in childhood.^{2,3}

In *The Lancet Public Health*, Jean Jacques Noubiap and colleagues present a systematic review of studies on the prevalence of elevated blood pressure in children and adolescents in African countries.⁴ Following a well defined, registered, and published research protocol,⁵ they identified 51 studies, and did a meta-analysis based on the 25 studies that used the same definition of elevated blood pressure (ie, systolic or diastolic blood pressure at or above the 95th percentile). With data on 54 196 participants aged 2–19 years, they found large variation in the prevalence of elevated blood pressure, ranging from 0.2% to 24.8%. The pooled prevalence was 5.5% (95% CI 4.2–6.9). Between the two recruitment periods of the included studies, 1996–2006 and 2007–2016, the prevalence of elevated blood pressure decreased from 8.1% (6.8–9.4) to 5.3% (3.3–7.8).

The prevalence estimates reported by Noubiap and colleagues in African countries are roughly comparable with estimates from other countries.^{2,6} The difference in the prevalence estimates between studies is explained in part by differences in blood pressure measurement methods. This is a major (but common) limitation of comparisons of blood pressure between populations and might limit the validity of pooling of data. Consequently, confident conclusions on differences in blood pressure between countries are difficult to reach.

Interestingly, the overall prevalence of elevated blood pressure has tended to decrease over the past 20 years, consistent with findings in many non-African countries. Indeed, in a recent systematic review⁶ of studies assessing trends in blood pressure, including 18 studies, 2 042 470 children from high-income and middle-income countries, we noted that although the prevalence of overweight or obesity increased in 17 studies and decreased in one, blood pressure

decreased in 13 studies, increased in four, and did not change in one.⁶

What are the clinical and public health implications of Noubiap and colleagues' findings? From a clinical point of view, their findings could support the promotion of screening. However, several arguments exist against systematic screening of hypertension in children.² First, identification of which levels of elevated blood pressure require treatment in children is difficult. Indeed, the diagnosis of elevated blood pressure in children is based on the distribution of blood pressure in the population and these distributions can differ between countries; diagnosis is not risk based. Further, diagnosis of hypertension requires measurements of blood pressure at multiple visits. In low-resource settings, including in many African countries, universal screening of blood pressure in children would divert scarce resources.

Second, contrasting with the solid evidence base in adults, the absolute risk of cardiovascular disease associated with a given level of blood pressure during childhood is not known. Because cardiovascular disease rarely occurs before the age of 40 or 50 years (ie, the absolute risk is low in early life), the absolute benefit of lowering of blood pressure in children will inherently be low, implying low cost-effectiveness of treatment of elevated blood pressure in children.

Third, the long-term efficacy and safety of antihypertensive treatment starting in childhood is not known. In 2013, the US Preventive Services Task Force stated that "current evidence is insufficient to assess the balance of benefits and harms of screening for primary hypertension in asymptomatic children and adolescents to prevent subsequent cardiovascular disease".³ Targeted screening in children at high risk of hypertension and early treatment of cases with secondary hypertension would probably be preferable.^{4,7}

From a public health viewpoint, several interventions to help to prevent the development of elevated blood pressure early in life should be considered. A call has been made for a lifecourse strategy to prevent and manage hypertension across all periods of life.³ Growing evidence shows that elevated blood pressure has its

See [Articles](#) page e375

roots early in life, from conception through childhood and adolescence. Hence, prevention of elevated blood pressure in childhood will help to prevent hypertension in adulthood and, eventually, reduce the occurrence of cardiovascular disease.

Primordial prevention of hypertension—ie, prevention of the development of risk factors such as elevated blood pressure⁸—can be done through improvements in maternal nutrition during pregnancy and reductions in salt intake, increased consumption of fruit and vegetables, avoidance of energy-dense foods, and promotion of physical activity among children. These strategies also have beneficial effects on other cardiometabolic conditions such as obesity, diabetes, or dyslipidaemias. Implementation of primordial prevention strategies in low-income, middle-income, and high-income countries alike is key to maintaining lifelong cardiovascular health.^{2,9}

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- 1 Olsen MH, Angell SY, Asma S, et al. A call to action and a lifecourse strategy to address the global burden of raised blood pressure on current and future generations: the Lancet Commission on hypertension. *Lancet* 2016; **388**: 2665–712.
- 2 Chiolero A, Bovet P, Paradis G. Screening for elevated blood pressure in children and adolescents: a critical appraisal. *JAMA Pediatr* 2013; **167**: 266–73.
- 3 Moyer VA, US Preventive Services Task Force. Screening for primary hypertension in children and adolescents: US Preventive Services Task Force recommendation statement. *Ann Intern Med* 2013; **159**: 613–19.
- 4 Noubiap JJ, Essouma M, Bigna JJ, Jingi AM, Aminde LN, Nansseu JR. The prevalence of elevated blood pressure in children and adolescents in Africa: a systematic review and meta-analysis. *Lancet Public Health* 2017; **2**: e375–86.
- 5 Essouma M, Noubiap JJ, Bigna JJ, et al. Hypertension prevalence, incidence and risk factors among children and adolescents in Africa: a systematic review and meta-analysis protocol. *BMJ Open* 2015; **5**: e008472.
- 6 Roulet C, Bovet P, Brauchli T, et al. Secular trends in blood pressure in children: a systematic review. *J Clin Hypertens* 2017; **19**: 488–97.
- 7 Bloetzer C, Bovet P, Paccaud F, Burnier M, Chiolero A. Performance of targeted screening for the identification of hypertension in children. *Blood Press* 2017; **26**: 87–93
- 8 Gillman MW. Primordial prevention of cardiovascular disease. *Circulation* 2015; **131**: 599–601.
- 9 Lloyd-Jones DM, Hong Y, Labarthe D, et al, for the American Heart Association Strategic Planning Task Force and Statistics Committee. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation* 2010; **121**: 586–613.