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Prevalence of High Blood Pressure Among Youth in India and Association With Future Cardiovascular Disease

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In this cross-sectional, nationally representative study, Vasudevan et al[1] describe the prevalence of high blood pressure (BP) and other cardiovascular disease (CVD) risk factors in children and adolescents enrolled in the 2016-2018 Comprehensive National Nutrition Survey (CNNS) of all 29 states of India. The analysis shows an alarming prevalence of high BP in Indian youth: 35% of 10- to 12-year-olds and 25% of 13- to 19-year-olds had BP in the stage 1 or 2 hypertension range, defined according to 2017 American Academy of Pediatrics cut points. Moreover, youth with high BP were more likely to have other CVD risk factors, such as overweight or obesity, high blood glucose levels, or lipid abnormalities. Using 2011 Indian census data, this finding translates to approximately 69 million Indian youth with high BP and possibly other CVD risk factors.

The prevalence of high BP in Indian youth is substantially higher in this study[1] than previously reported. The largest prior study[2] from 2007 to 2014 that measured BP in 11 312 youth from central India aged 5 to 15 years reported the prevalence of hypertension as approximately 7%, which is substantially lower than the current study.[1] Another study[3] reported variable rates of hypertension in Indian youth, from approximately 2% to 25%. Geographic variability may be important. One study[4] reported that individuals from southern Indian states had higher BP than those from the northern Indian states. Variations in diagnostic criteria, the age group studied, and inclusion or exclusion of malnourished children and those with obesity likely also contribute to differences in prevalence rates.

The high prevalence of high BP reported in this study could be partly explained by the study methods. An oscillometric device was used to measure BP instead of a manual one; oscillometric BPs are known to measure higher than manual BPs.[5] However, oscillometric BPs have advantages over manual measurement in avoiding digit preference and overcoming difficulties ascertaining Korotkoff sounds manually in moving children. The frequency of white-coat hypertension in adolescents might lead to overestimating the prevalence of high BP; however, in this study,[1] trained study staff made 3 measurements, and the analysis used the mean of the second and third measurements, which may have mitigated the effect of the white-coat hypertension response. Use of the 2017 American Academy of Pediatrics BP cutoffs could have led to a higher prevalence estimate than previously reported, particularly in children older than 13 years for whom lower adult cut points are now used instead of pediatric percentiles. US normative BP cut points, which are based on BP centiles, may not apply to Indian youth; however, no population-specific BP norms have been published for Indian youth. Of importance, the prevalence reported by Vasudevan et al[1] likely does not reflect the prevalence of diagnosed hypertension, which requires 3 readings at 3 separate sittings; 3 separate assessments would have been challenging to accomplish in this study.

However, the prevalence of high BP may reflect current reality for Indian youth. Hypertension is 1 of India's most common CVD risk factors, affecting approximately 30% of adults.[6] Obesity and metabolic obesity, found in as many as 50% of anthropometrically undernourished and normal-weight Indian children and adolescents, are key drivers for hypertension. High BP was associated with overweight and obesity in this study. More children with overweight or obesity children were included in the analysis, and the rates of obesity were higher in this study than in some prior studies. Not unexpectedly, high BP was also associated with high levels of fasting blood glucose, triglycerides, and low-density lipoprotein cholesterol. This finding may reflect the direct effects of poor nutrition

or inadequate physical activity; dietary data were not available in the CNNS, and physical activity measures were not analyzed in this study.

Downstream effects of unfavorable socioeconomic circumstances are likely also contributors; socioeconomic status was a strong correlate of hypertension in this study. Upstream factors may also be at play. Hypertension is associated with poor maternal health, which may lead to an unfavorable intrauterine environment, altering gene expression (epigenetic changes), and increased susceptibility to developing chronic conditions.[7] The prevalence of low birth weight in India is approximately 30%, with more than 50% of low birth weight attributable to intrauterine growth restriction, which can lead to ongoing growth restriction in children.[8] The authors were not able to assess the prevalence of low birth weight as a potential explanation for the higher prevalence of high BP in this data set, but stunting affected 25% of younger and 27% of older children and was associated with high BP.

This study adds to the increasing literature on hypertension as a worldwide public health crisis. The finding that one-quarter to one-third of Indian youth are affected by high BP should raise the alarm for burgeoning future rates of CVD in Southeast Asian populations. Undetected hypertension can lead to kidney dysfunction and left ventricular hypertrophy during childhood. Hypertension also tracks across the lifespan, with childhood hypertension associated with hypertension and CVD in adulthood. South Asian populations are known to be particularly afflicted by CVD, with more severe coronary artery disease that starts at a younger age.[9]

Childhood hypertension screening programs should use best methods to accurately measure BP, conduct a comprehensive CVD risk assessment, and include a survey of social determinants of health, as well as height and weight, birth history, and known CVD risk factors. Prevention efforts should focus on improving maternal and peripartum factors; minimizing known childhood risk factors, such as poor diet and inadequate physical activity; and reducing tobacco exposure.

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