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EDITORIAL COMMENT

Children and Adolescents

Cardiovascular Health in the Future*

Jing Liu, MD, PhD

Childhood is a critical phase of growth and development, and children's health is a cornerstone of sustainable development of populations and societies. During past decades, China has made tremendous progress in ensuring health and well-being for children and adolescents. The total mortality of Chinese children and adolescents aged 5 to 19 years has declined markedly from 393.65 per 100,000 in 1953 to 39.51 per 100,000 in 2016.[1] Despite this encouraging trend, Chinese children and adolescents face challenges of cardiometabolic risk as a result of rapid socioeconomic improvement and lifestyle changes. For example, the prevalence of overweight and obesity increased from 5.3% to 20.5% among Chinese children and adolescents aged 7 to 18 years from 1995 to 2014.[2] Failure to protect cardiovascular health (CVH) in children and adolescents may lead to a surge in cardiovascular disease among the adult population in the future.

CVH can be measured by 7 metrics initially introduced by the American Heart Association (AHA).[3] It is defined as the coincident presence of 4 health behaviors (nonsmoking, body mass index, physical activity, healthy diet score) and 3 health factors (total cholesterol, blood pressure, and fasting plasma glucose) being at ideal levels. A study in a nationally representative sample of the general adult population in China found that the estimated percentage of ideal CVH was as low as 0.2% in 2010 and the rates varied considerably according to age, urbanization, and economic level.[4] Given the evidence showing that the development of cardiovascular disease is determined early in life,[5] the status of CVH in Chinese children and adolescents is of potential concern and thus important to understand.

In this issue of *JACC: Asia*, Zhu et al.[6] report the status of ideal CVH in Chinese children and adolescents based on the Chinese national intervention program against obesity. In this cross-sectional study among 15,583 participants aged 7 to 17 years recruited from 7 provinces in 2013, CVH was estimated using AHA criteria modified for Chinese children and adolescents. The authors found that the prevalence of ideal CVH was only 1.7% in the children and adolescents, and that the prevalence of ideal CVH behaviors (3.1%) was much lower than that of ideal health factors (53.6%). Disparities in CVH status in children and adolescents were also reported, with being female, being a younger age, having an undeveloped economic level, living in southern regions, and having no family history of cardiovascular disease associated with more ideal CVH status. These findings clearly indicate that most Chinese children and adolescents did not meet optimal levels of CVH, and the status was worse for the 4 health behaviors in comparison with the 3 health factors. This situation is alarming. Without effective interventions to promote CVH and reduce health disparities in early life, the success in improving the status of CVH in adulthood and reducing the burden of cardiovascular disease in the near future seems uncertain.

There are 2 major limitations that need to be considered when interpreting the results from this study. First, the behavioral factors (including smoking, physical activities, and diet) along with sociodemographic factors were self-reported. Therefore, misclassification of these factors may exist, particularly for self-reports from children. Moreover, dietary habits are highly divergent and difficult to evaluate for children and adolescents. However, supposing that children tended to overreport healthy behaviors, the actual status of CVH could be even worse than the results suggest.

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From the Department of Epidemiology, Beijing Anzhen Hospital, Capital Medical University, Beijing Institute of Heart, Lung and Blood Vessel Diseases, Beijing, China.

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Despite these limitations, this study has important implications for public health. First, the report sets out new threats to child health and calls for urgent action to address these threats during early life. The study revealed the extremely low proportions of ideal CVH in Chinese children and adolescents, consistent with other reports in Chinese adults. This status in childhood is even more worrisome: today's poor CVH in childhood may translate as worsened CVH and increased cardiovascular events in adulthood in the future. In terms of preventing cardiovascular disease, establishing healthy lifestyles during childhood is more effective than changing unhealthy behaviors during adulthood. A randomized trial demonstrated that instilling and developing healthy dietary and physical activity behaviors in children aged 3 to 5 years improved knowledge, attitudes, and habits and, more importantly, translated into a beneficial effect on adiposity.[7] A notion is that early childhood is a critical or sensitive period for interventions, whereas later interventions are less effective. Furthermore, the behavior and health problems of a child can have long-term impacts. As shown in the 21-year follow-up of the Cardiovascular Risk in Young Finns Study, the number of ideal CVH metrics present in childhood was associated with reduced risks of hypertension, metabolic syndrome, high low-density lipoprotein cholesterol, and carotid artery intima-media thickening in adulthood, suggesting that pursuit of ideal CVH in childhood is important to prevent cardiometabolic outcomes in adulthood.[5]

The second implication of this study is to call for great effort on primordial prevention of cardiovascular disease in China. Compared with primary prevention, which focuses on the control of risk factors to prevent the occurrence of clinical cardiovascular events, primordial prevention aims to reduce the onset of risk factors among healthy individuals through behavioral and environmental changes.[8] Including the 4 metrics for healthy behaviors in the criteria of ideal CVH promoted the initiative toward implementation of primordial prevention. Primordial prevention is of particular importance for cardiovascular disease, because people with controlled risk factors are still at increased risk of developing adverse cardiovascular outcomes compared with persons with no risk factors in the first place.[9]

The challenge of improving childhood CVH status is clear in China given the extremely low prevalence of ideal CVH and large sociodemographic disparities associated with CVH. Despite the serious challenge, solutions are in sight. The Healthy China Action plan has been issued to implement the country's initiative to improve people's health throughout the life span. The plan highlights the particular importance of childhood and adolescence for overall lifelong health. Although the observation by current study that only 1.7% of Chinese children and adolescents had all 7 ideal CVH metrics seems alarming, the fact that most of them had 3 to 5 ideal CVH metrics and those for health behaviors are less prevalent than the health factors gives hope for improvement through effective interventions. Among all 7 metrics, ideal physical activity (male children and adolescents 34.6%, female children and adolescents 23.9%) and diet (male children and adolescents, 28.3%, female children and adolescents, 30.1%) were the least prevalent, followed by ideal smoking (male children and adolescents 41.8%, female children and adolescents 43.5%). The modified definition of ideal smoking by adding passive smoking to the original AHA criteria on active smoking is unique in this study, given the adverse impact of passive smoking on CVH in children and an underestimate of tobacco exposure in Chinese children and adolescents if only active smoking is considered. These findings suggest that preventive strategies focused on behaviors would be a good start in improving overall CVH. In fact, a comprehensive package of interventions for school-aged children and adolescents, including adequate time for outdoor exercise, decreased exposure to electronic screens, and balanced nutrition, has been initiated in China. However, because remarkable disparities in the status of CVH were found in the study, effective preventive strategies targeting high-risk populations and areas are of necessity. Most importantly, the implementation of these strategies needs to be strengthened and their effects on children's health are to be evaluated in future studies. With the mobilization of participation in these interventions at the individual, family, community, and society levels, it is reasonable to anticipate improvements in the health of Chinese children and adolescents and a Healthy China by 2030.

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ADDRESS FOR CORRESPONDENCE: Dr Jing Liu, Beijing Anzhen Hospital, Capital Medical University, Beijing Institute of Heart, Lung and Blood Vessel Diseases, No. 2 Anzhen Road, Chaoyang District, Beijing 100029, China. E-mail: jingliu@ccmu.edu.cn.

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