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Secular Trends in Blood Pressure and Overweight and Obesity in Chinese Boys and Girls Aged 7 to 17 Years From 1995 to 2014

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Abstract**—**The current study aimed to assess the secular trends in overweight and obesity status and high blood pressure (HBP) in Chinese children and adolescents for 2 decades. Data on 943 128 participants aged 7 to 17 years were obtained from the Chinese National Survey on Students' Constitution and Health from 1995 to 2014. The population attributable risk of overweight status for HBP was calculated. The prevalence of overweight increased from 4.3% in 1995 to 18.4% in 2014, whereas HBP prevalence fluctuated in the range of 4.4% to 6.4% during the same time period, the lowest in 2005. Within each survey year, blood pressure levels and HBP prevalence increased with higher body mass index. Notably, the population attributable risk of HBP because of being overweight steadily increased from 6.3% in 1995 to 19.2% in 2014. The same trends of linear growth for obesity, fluctuating blood pressure, and its sustained increasing population attributable risk for overweight also occurred among the domestic 29 provinces. Despite dramatic increases in overweight prevalence among Chinese children from 1995 to 2014, the HBP prevalence remained relatively stable, suggesting that other independent factors are affecting HBP trends to a greater extent. Yet, over time, the magnitude of the impact of being overweight or obese on HBP increased sharply, predicting looming heavy burden of HBP. Reductions in overweight status may aid in preventing HBP so as to prevent coronary risk in adulthood. **(*Hypertension*. 2018;72:298-305. DOI: 10.1161/HYPERTENSIONAHA.118.11291.)** • **Online Data Supplement**

Key Words: blood pressure ■ child ■ hypertension ■ obesity ■ overweight

Hypertension or high blood pressure (HBP) has been a well-recognized important risk factor for cardiovascular disease among adults for ≈60 years, causing a significant global disease burden, especially in Asia.[1–3] Although HBP once was considered a rare disease in children, it is now actually a major public health problem worldwide.[4] In addition, studies have revealed that HBP in childhood can be progressive into adulthood and is the strongest predictor of HBP in adulthood.[5,6] HBP in childhood also carries an increased risk of organ damage, such as coronary artery calcifications, ventricular hypertrophy, and increased carotid intima-media thickness.[7,8] Therefore, it is important to identify and treat HBP timely in childhood.

Increasing evidence in recent years has supported that overweight status may be a causal factor for HBP, with the prevalence of HBP ranging from 19% to 22% in obese children, relative to 4% to 6% in normal weight children,[9,10] which are pressing health concerns in China and the world. Although an extensive literature has documented the increase in overweight and obesity, few data of population-based regular surveillances are available to analyze the HBP trends in children and adolescents. Considering the high prevalence and rapid increase in childhood obesity and its strong connection with HBP, it is generally believed that the dramatic epidemic of excess body weight during the past several decades, including overweight and obesity, is expected to lead to a parallel rise in HBP in children.[11] However, it was not the case in many studies, which argued that trends in HBP in children are not necessarily accompanied by rises in excess body weight.[12–15] Chiolero et al[16] found that the worldwide epidemic of overweight and obesity in children has not resulted in a commensurate increase in blood pressure (BP) levels in children. Many countries even witnessed downward trends in HBP, despite the concomitant epidemic of overweight and obesity in youth, such as Seychelles,[17] South Korea,[18] Japan,[13] and Iran.[19] For example, an increase in the prevalence of obesity among children in Seychelles from 5.5% in 1998 to 8.5% in 2006 was accompanied by a mean 3-mm Hg decrease in systolic BP (SBP) levels.[17] Similar evidence from the United States indicated that mean BP levels and the prevalence of HBP among children have declined during the past decade,[20] despite increasing levels of childhood obesity.

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Limited large epidemiological studies in China are available to examine the trends in HBP with the concomitant epidemic of overweight and obesity in youth during the past 2 decades. The current study analyzed data on BP in children and adolescents from 5 large national successive cross-sectional surveys conducted in China to establish how recent increasing trends in overweight status have affected BP and its components in children over time. We aimed to (1) describe the BP levels and HBP prevalence among Chinese children and adolescents from 1995 to 2014, (2) determine whether increases in body mass index (BMI) are related to increases in HBP over time, and (3) calculate and examine secular change in the magnitude of the population attributable risk (PAR) of childhood HBP because of overweight and obesity.

Methods

The data that support the findings of this study are available from the corresponding author on reasonable request.

Study Design and Subjects

Data were drawn from 5 large national successive cross-sectional surveys from 1995, 2000, 2005, 2010, and 2014 cycles of the Chinese National Survey on Students' Constitution and Health (CNSSCH) with design to investigate health status in Chinese school-aged children, which adhered to the principles of the Declaration of Helsinki and the Code of Federal Regulations. The surveys were approved by the Medical Research Ethics Committee of the Peking University Health Science Center (IRB00001052-18002). Informed consent was obtained from both children and their parents. The procedures of CNSSCH have been published previously and did not change during the 20-year period.[21] In brief, all participants were selected by stratified cluster sampling; that is, sampling took place in classes selected randomly from each grade in the selected schools. Sampling yielded equal numbers at 3 socioeconomic status groups (ie, upper, moderate, and low) at the regional level defined by regional gross domestic product, total yearly income per capita, average food consumption per capita, natural growth rate of population, and the regional social welfare index. The present study only included data from the Han children aged 7 to 17 years, so as to eliminate the influence of ethnic groups on research.

Data were from 29 mainland provinces excluding Tibet, Chongqing, Hong Kong, Macao, and Taiwan. In Tibet, the Han ethnicity is in the minority. Chongqing was set up after 1995. The data in Hong Kong, Macao, and Taiwan were not available because CNSSCH did not cover these regions. A total of 7720 observations (0.8%) were removed because of missing data or extreme height, weight, and BP values (>5 SDs of sex- and age-specific mean from every survey year), leaving 943 128 observations for analysis.

Measurements

Participants in the 5 CNSSCH surveys underwent a complete anthropometric evaluation according to the same protocol at all survey sites. Height (cm), weight (kg), and BP (mm Hg) were measured by a team of trained technicians following a standardized procedure. Height and weight were measured to the nearest 0.1 cm and 0.1 kg with a portable wall-mounted stadiometer and standardized scale using the mean values of 3 measurements. Both the stadiometers and scales were calibrated before use. BMI was calculated as body weight (kg) divided by height (m) squared (kg/m^2). Different BMI groups, including thinness, normal, overweight, and obesity, were defined using the International Obesity Task Force definition.[22,23]

BP was measured according to the recommendation of the National High Blood Pressure Education Program Working Group[24] in Children and Adolescents, using an auscultation mercury sphygmomanometer. An appropriate cuff for children with an inflatable bladder width that is at least 40% of the arm circumference at a point midway was used, and the cuff bladder length covered 80% to 100% of the circumference of the arm. The cuff was placed ≈2 cm above the crease of the right arm elbow. BP was measured at the first reading after children sat for at least 10 minutes. The feet of children were placed on a platform during BP measurement. SBP was determined by onset of the first tapping Korotkoff sound (K1), and diastolic BP (DBP) was determined by the fifth Korotkoff sound (K5). An average of 3 BP measurements at a single visit was calculated for each child. Systolic HBP (SHBP) and diastolic HBP (DHBP) were defined as SBP and DBP greater than or equal to the referent age-, sex-, and height-specific 95th centile, respectively, according to the National High Blood Pressure Education Program reference. HBP was defined as SHBP or DHBP of children. BP *Z* scores were calculated by using formulas in the National High Blood Pressure Education Program reference.[24]

Statistical Analyses

Descriptive statistics were calculated for all variables. For analysis of the trends in levels of BP (SBP and DBP) and BP *Z* scores (SBP *Z* score and DBP *Z* score), multivariate linear regression models that included survey year as the categorical predictor were used. We calculated the odds ratio and 95% confidence intervals of HBP, SHBP, and DHBP in thinness, overweight, and obesity groups compared with the normal group in 5 surveys form 1995 to 2014. Because age, height, province, urban/rural area, and socioeconomic status may influence the trends of BP levels and BP *Z* scores in different BMI category groups, we adjusted for all of these characteristics in the model when trends were assessed. A logistic regression model using the aflogit module for Stata was adopted to estimate the PAR (%) with corresponding 95% confidence intervals based on asymptotic approximations.[25] Calculation of PAR (%) implies a theoretical causal relationship between overweight/obesity and HBP. We also used PAR (%) to estimate intervention effects on HBP if overweight and obesity were averted in children and adolescents theoretically.[26] Finally, subgroup analysis was run for each of China's domestic 29 provinces to confirm the overall results in our study. All analyses were performed with Stata V.15 software (College Station, TX).

Results

The characteristics of the study population in both sexes aged 7 to 17 years in 5 surveys are shown in Table 1. There was no difference in mean age of study participants but obvious increases in height, weight, and BMI from 1995 to 2014. The SBP levels in both sexes decreased from 1995 to 2005 and increased from 2005 to 2014. The DBP levels in both sexes fluctuated in 5 surveys from 1995 to 2014.

As presented in Figure 1, in both sexes, overweight and obesity increased linearly over time, whereas the prevalence of HBP, SHBP, and DHBP fluctuated from 1995 to 2014 with a bottom in 2005. Specifically, the prevalence of overweight and obesity steadily increased form 3.8% to 14.3% and 0.6% to 4.1% between 1995 and 2014, respectively, which was 3.8- and 6.8-fold greater in 2014 than in 1995. In contrast, the prevalence of HBP fluctuated around 4.3% to 6.1% between 1995 and 2014, and the highest and lowest prevalence was shown in 2010 and 2005, respectively. As a whole, the prevalence of HBP steadily declined from 1995 to 2005 but increased from 2005 to 2014. Similar patterns were found for both sexes in the prevalence of SHBP and DHBP (Table S1 in the online-only Data Supplement).

After additional controlling for confounders, the change trends in SBP and DBP levels in both sexes for the 4 BMI groups from 1995 to 2014 are shown in Figure 2. SBP and DBP levels in both sexes increased along with BMI groups at each survey year and fluctuated over time within the BMI

Table 1. Descriptive Characteristics of Chinese Children and Adolescents Aged 7 to 17 y Participating in Chinese National Survey on Students' Constitution and Health From 1995 to 2014

Year	n	Age, y	Height, cm	Weight, kg	BMI	SBP, mm Hg	DBP, mm Hg
Boys							
1995	92 513	12.1±3.1	148.4±17.8	39.4±13.9	17.2±2.7	104.7±12.5	62.6±10.6
2000	92 623	12.0±3.2	149.2±18.0	40.7±14.7	17.6±2.9	104.3±12.0	65.0±9.2
2005	100 410	12.0±3.2	150.5±17.7	42.2±14.8	18.0±3.0	103.6±12.2	63.9±9.4
2010	92 228	12.0±3.2	151.7±17.6	43.7±15.2	18.3±3.2	105.3±12.4	65.1±9.4
2014	91 037	12.1±3.2	153.1±17.4	45.6±15.7	18.8±3.3	105.7±12.9	65.6±9.4
Girls							
1995	91 806	12.0±3.1	145.0±14.4	37.4±11.9	17.3±2.9	102.8±11.2	62.4±9.9
2000	93 570	12.0±3.2	145.6±14.4	38.2±12.1	17.5±3.0	101.9±10.6	64.5±8.8
2005	101 079	12.0±3.2	146.5±14.1	39.2±12.2	17.8±3.0	100.5±10.9	63.1±9.1
2010	94 206	12.0±3.2	147.4±13.9	40.2±12.3	18.0±3.1	101.9±11.1	64.2±8.8
2014	93 656	12.0±3.2	148.6±13.7	41.7±12.7	18.4±3.2	102.2±11.4	64.6±8.9

BMI indicates body mass index; DBP, diastolic blood pressure; and SBP, systolic blood pressure.

groups from 1995 to 2014. For example, SBP levels for the 4 BMI groups in 2014 ranged from 102.1 to 112.5 mm Hg in boys and 99.4 to 109.7 mm Hg in girls. In the obesity group, SBP and DBP were at the highest level, and the trends were relatively flat over time for both sexes. In the other 3 BMI groups, the secular trends of SBP and DBP over time were turbulent.

There was a sustained decline for SBP in the thin, normal, and overweight groups from 1995 to 2005 in both sexes and an increase later from 2010 to 2014. A different pattern was shown for both sexes in DBP levels with sustained increased trends detected from 1995 to 2014, except 2000 (Table S2). After additional controlling for confounders, similar trends for SBP and DBP *Z* scores were observed (Figure S1; Table S2). As shown in Figure 3, the prevalence of HBP, SHBP, and DHBP in both sexes increased along with BMI groups in every survey and fluctuated over time within the BMI groups from 1995 to 2014.

In the obesity group, the prevalence of HBP, SHBP, and DHBP was the highest in 5 surveys in both sexes compared with the other 3 groups. In the thin and normal BMI group, the prevalence of HBP, SHBP, and DHBP did not change significantly over time. In the overweight and obesity groups, there was a sustained decline in HBP for boys from 1995 to 2005 and then an increase from 2010 to 2014, whereas in the obesity group for girls, no real changes in HBP, SHBP, and DHBP prevalence were observed over time (Table S3). The association analysis presented the same trends from 1995 to 2014 (Figure S2).

Table 2 presents the PAR% for HBP because overweight and obesity steadily increased from 6.3% in 1995 to 19.2% in 2014; the PAR% for SHBP and DHBP were 7.4% and 6.2% in 1995 and increased to 26.2% and 13.4% in 2014, respectively. Similar patterns for PAR% in HBP, SHBP, and DHBP for overweight and obesity were observed in both sexes from 1995 to 2014. The other finding was that the PAR% for SHBP because of overweight and obesity in both sexes was always ≈2-fold greater than that for DHBP.

Examined at the province level, and consistent with the overall findings, the prevalence of HBP, SHBP, and DHBP fluctuated from 1995 to 2014, despite the concomitant linear increase in pediatric overweight and obesity in every province (Figure S3). Consistently, the PAR% for HBP, SHBP, and DHBP because of overweight and obesity increased dramatically in every province. For example, the PAR% for HBP in the Yunnan province increased from 8.55% in 1995

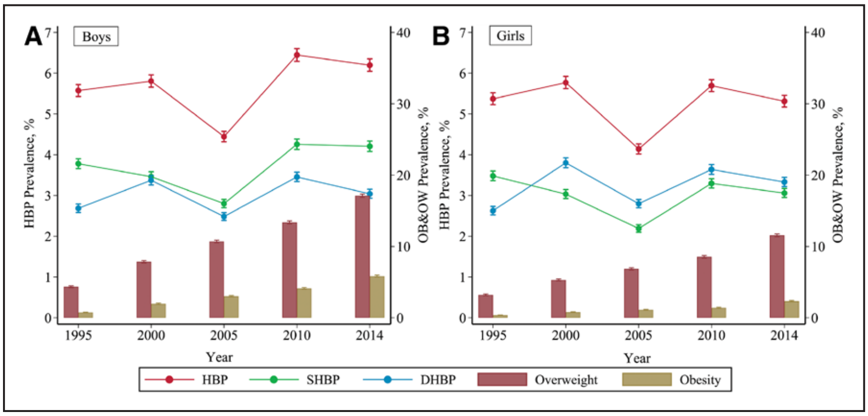

Figure 1. Trends in the prevalence of high blood pressure (HBP), Systolic HBP (SHBP), diastolic HBP (DHBP), and obesity (OB) and overweight (OW) in Chinese boys (**A**) and girls (**B**) aged 7 to 17 y from 1995 to 2014.

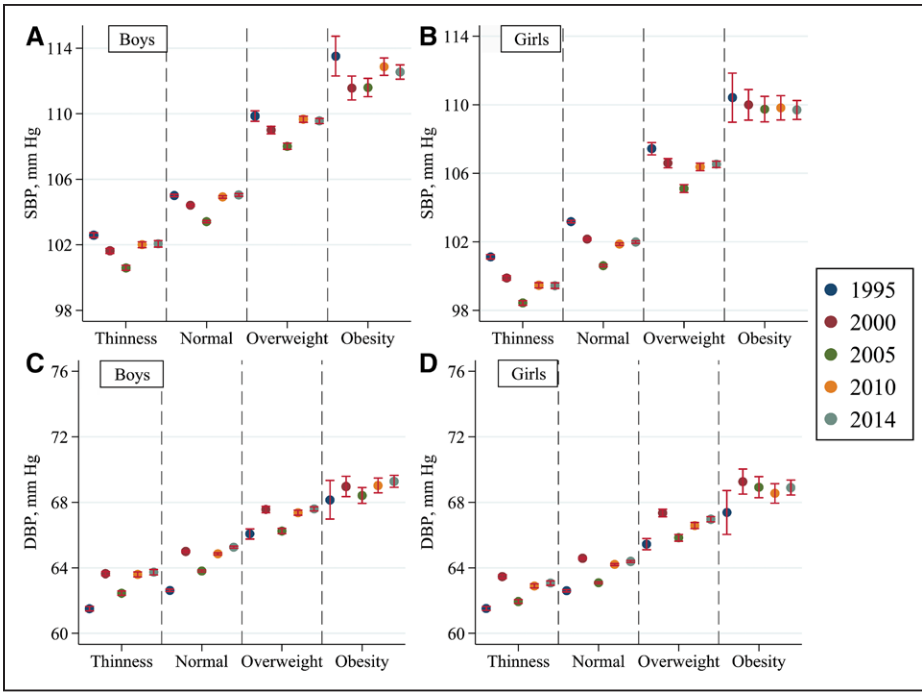

Figure 2. Trends in average systolic blood pressure (SBP; A and B) and diastolic blood pressure (DBP; C and D) levels in different body mass index groups in Chinese boys and girls aged 7 to 17 y from 1995 to 2014.

to 39.02% in 2014, and its PAR% for SHBP even surpassed 50% (Figure 4).

Discussion

Based on nearly a million children and adolescents aged 7 to 17 years in China during the past 2 decades, we found, as anticipated, large increases in BMI level and overweight and obesity status over time. In contrast, BP levels and HBP prevalence fluctuated over time and did not show an increasing trend parallel with changes in body mass. Few large-scale studies have analyzed the HBP trends among children, and the findings have suggested increases, decreases, and fluctuations over

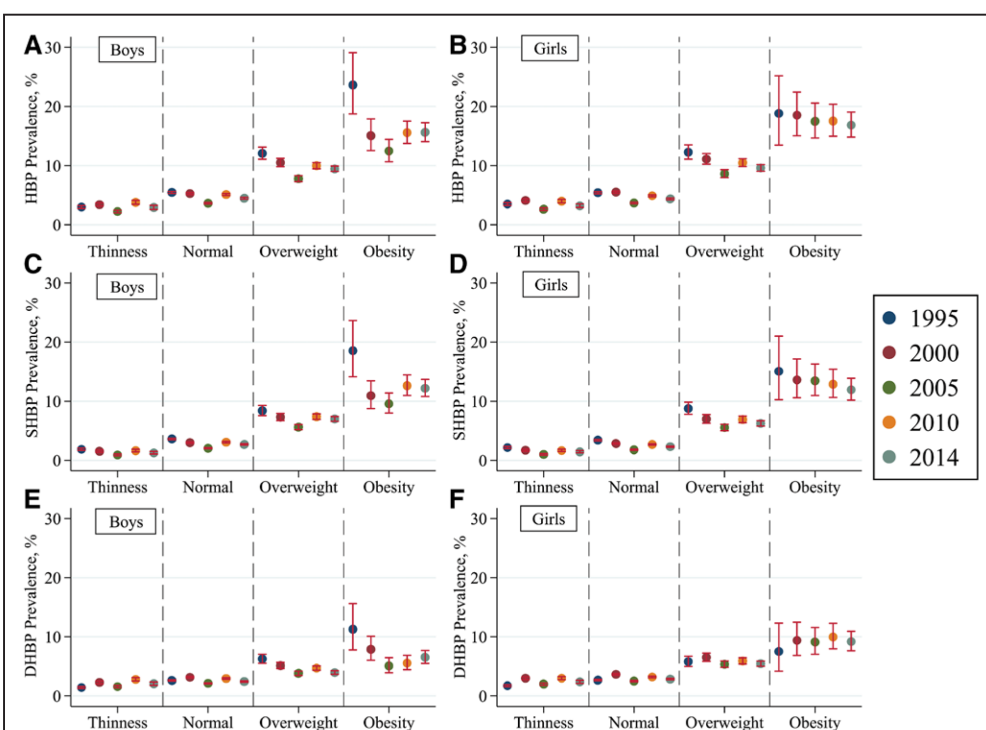

Figure 3. Trends in the prevalence of high blood pressure (HBP; A and B), Systolic HBP (SHBP; C and D), and diastolic HBP (DHBP; E and F) for different body mass index groups in Chinese boys and girls aged 7 to 17 y from 1995 to 2014.

Table 2. PAR and 95% Confidence Intervals for HBP, SHBP, and DHBP Because of Overweight and Obesity in Chinese Boys and Girls Aged 7 to 17 y From 1995 to 2014

Variables	Boys	Girls	Total
HBP			
1995	7.5 (6.6–8.3)	5.3 (4.5–6.0)	6.3 (5.7–6.9)
2000	10.8 (9.7–11.9)	7.1 (6.2–7.9)	8.8 (8.0–9.4)
2005	15.9 (14.5–17.4)	11.5 (10.2–12.7)	13.5 (12.5–14.5)
2010	16.4 (15.0–17.7)	11.3 (10.2–12.5)	13.8 (12.9–14.6)
2014	22.6 (20.9–24.2)	16.1 (14.7–17.5)	19.2 (18.1–20.3)
SHBP			
1995	8.3 (7.2–9.4)	6.6 (5.6–7.6)	7.4 (6.6–8.2)
2000	14.7 (13.1–16.2)	10.5 (9.1–11.8)	12.6 (11.5–13.6)
2005	22.4 (20.2–24.4)	17.8 (15.8–19.8)	20.2 (18.7–21.6)
2010	22.3 (20.4–24.1)	16.0 (14.3–17.7)	19.4 (18.1–20.7)
2014	29.5 (27.4–31.6)	22.1 (20.1–24.1)	26.2 (24.7–27.6)
DHBP			
1995	8.1 (6.8–9.4)	4.6 (3.5–5.7)	6.2 (5.4–7.1)
2000	8.1 (6.7–9.5)	5.3 (4.2–6.3)	6.4 (5.5–7.2)
2005	11.7 (9.8–13.6)	9.2 (7.7–10.7)	10.0 (8.8–11.2)
2010	11.2 (9.4–12.9)	8.5 (7.1–9.9)	9.4 (8.3–10.5)
2014	15.2 (13.0–17.4)	12.6 (10.8–14.3)	13.4 (12.0–14.8)

All such values are PAR% (95% confidence intervals) calculated after adjusting for age, height, province, urban/rural area, and province-level socioeconomic status. DHBP indicates diastolic high blood pressure; HBP, high blood pressure; PAR, population attributable risk; and SHBP, systolic high blood pressure.

time. Two studies conducted with Chinese children reported an upward trend in BP levels and HBP prevalence.[27,28] One of the studies[27] reported an increase in HBP between 2005 and 2010, consistent with the results of our study during this period. The other study showed an increase in HBP from 1993 to 2009, though with local and small sample sizes; the trend between these 2 year points was also consistent with our results between 1995 and 2010.[28] Some studies witnessed downward trends in HBP during the rising youth obesity epidemic, even after adjusting for some confounding factors.[17–19] For example, 1 study analyzing data from Seychelles' children witnessed that the prevalence of HBP decreased from 9.8% in 2000 to 6.9% in 2004, despite marked increase in the prevalence of obesity.[17] A US study found that BP levels and HBP among children have slightly declined between 1999 and 2012, after adjustment for the increase in BMI *Z* score.[20] These 2 downward trends were also consistent with our results in the same 2 periods of 2000 to 2005 and 2000 to 2014. The previous investigations of secular trends in BP and BMI among children were mainly drawn from cross-sectional data collected at only 2 time-points, which may yield an inadequate snapshot of the true HBP trends. The study with the most similarity in findings was conducted in the US and reported on data every 10 years. The trends in childhood BP levels were downward from 1963 to 1988 and then upward from 1999 to 2002, despite sustained increases in youth obesity over time.[15] As a group, the available studies support the hypothesis that HBP in children might be a fluctuating trend, which has not paralleled the rising obesity epidemic. Further, the real trends in BP levels and HBP prevalence require repeated surveillance.

Study findings indicated that PAR increased with time, whereas the overall prevalence did not, which suggests that other effective interventions or events occurred, which may contribute to BP trends, such as salt intake, early-life exposures, and physical inactivity. Salt intake is a risk factor for HBP and may be particularly relevant because of the high salt preference in Chinese cooking. Thus, reduced salt dietary interventions have been increasingly promoted across the country, especially in recent years.[29] One national survey of Chinese adults revealed that salt intake decreased from 6.6 g/d in 1991 to 4.7 g/d in 2009, which may counteract the effect of obesity on HBP and contribute to reductions in population

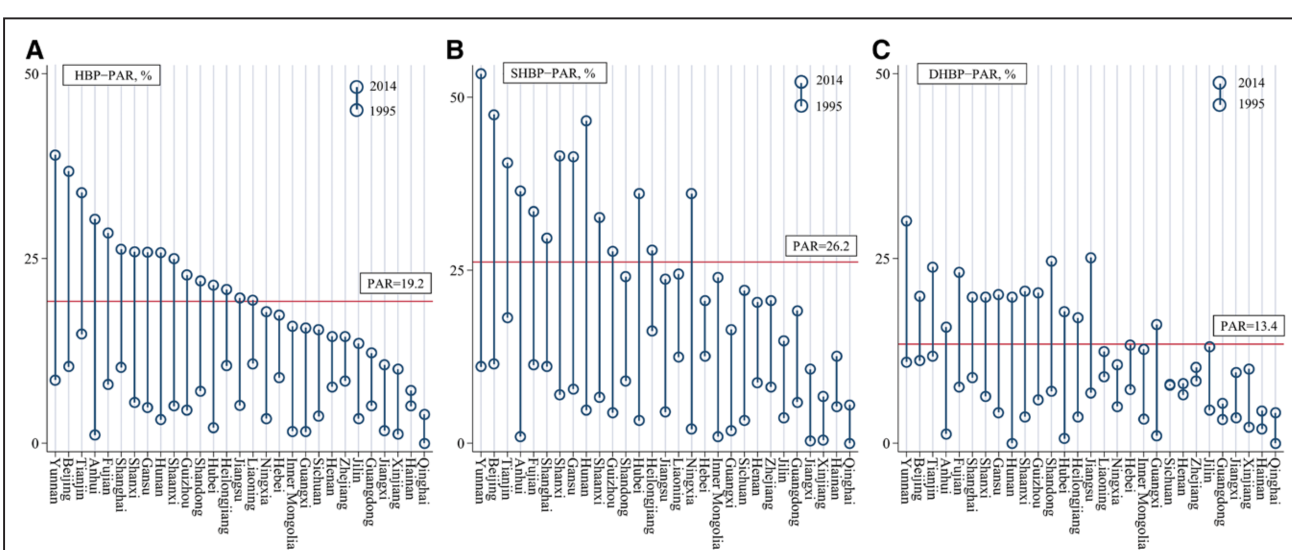

Figure 4. The change in population attributable risk (PAR) for high blood pressure (HBP; **A**), Systolic HBP (SHBP; **B**), and diastolic HBP (DHBP; **C**) because of overweight and obesity in Chinese youth by province between 1995 and 2014.

BP levels.[30,31] Although the data on salt intake was from adults, the dietary patterns of children are largely dependent on their parents for cooking the meals. Hence, the change in salt intake among adults over time may approximate that of children. Early-life exposures, such as high birth weight, also have been associated with downward trends in BP.[32,33] China witnessed an increase in mean birth weight during the last 2 decades[34,35]: from 3271 kg in 1996 to 3331 kg in 2010,[35] comparable with that observed in many other countries, such as the United States, Canada, the United Kingdom, and India.[36] Physical inactivity—a strong correlate of HBP[37]—was not consistently measured in CNSSCH, though research indicates increases in sedentary behavior among Chinese children and adolescents.[38,39] The discordant and intersecting effects of increased birth weight, reduced salt intake, and reduced physical activity, combined with the increase in obesity, may synchronously contribute to fluctuations in BP population trends over time. Thus, efforts should focus on controlling hypertension in youth by curbing the dramatic increase in childhood obesity and by emphasizing proven prevention and intervention strategies, including lifestyle modification to reduce sodium intakes, increase physical exercise, and promote health-supporting family environments, all of which were recommended in the updated pediatric hypertension guidelines in 2017.[40]

Notably, we found that the contribution of overweight and obesity to HBP in Chinese children 20 years ago was relatively low and then became stronger with time, consistent for all 29 domestic provinces in China. For example, the attribution of risk for HBP from overweight and obesity in Yunnan province increased by ≈5× from 8.6% to 39.0% and reached 53.4% for SHBP. Obesity has became an increasingly dominant health factor in Chinese children, and the findings suggest it will be the leading factor in HBP status in the near future. US studies reported a downward HBP trend before 1988, followed by an upward trend from 1999 to 2002, which suggested that there might be a time lag of ≈10 years between the rise in obesity and the rise in HBP in children and adolescents.[15] Although the HBP trends did not parallel with the increased trends of obesity, albeit with an average of 19.2% attributable proportion in HBP, the continued increased PAR for overweight and obesity on HBP across the country predicts an explosive epidemic of HBP in children because of the time lag. Furthermore, our results indicated the changes in BP levels were flatter in obesity groups compared with other groups, which suggests that obesity remained the dominant determinant for obese children.

We also found that the PAR for overweight and obesity in the development of SHBP was >2-fold higher than that for DHBP, especially in the 3 most recent survey points, also consistent across all 29 domestic provinces. A good deal of previous literature revealed that SHBP remained the most important cardiovascular risk indicator in adults, entitled the era of systolic hypertension.[41] Because of the rarity of cardiovascular events caused by HBP in children, it is difficult to determine the differential effect of SHBP and DHBP on cardiovascular disease in youth. However, obesity is a major risk factor for HBP in children, which may affect HBP components to different extents. In the early phase of hypertension evolving from children to young adults, the evolution of SHBP requires further attention. Thus, a potential implication of the present study is that the control of overweight and obesity is important to reduce the risk of HBP in children, particularly SHBP, which is more significant to reduce the onset risk of cardiovascular disease in early adulthood. This is one of the first studies examining the influence of differences in nutritional status on BP components over time in Chinese children using successive datasets for 2 decades.

The present study has several strengths. First, nearly a million participants of Han nationality accounting for ≈92% of the total Chinese population were included in the 5 CNSSCH surveys during a 20-year period to analyze secular trends, which supports the extrapolation of our conclusions. Further, because CNSSCH adopted a consistent sampling procedure and the same examination methodology in 5 surveys, such as the use of mercury sphygmomanometer and cuff size, it is acceptable to achieve comparability of data in different years. Limitations of the present study should also be noted. First, BP levels in our study were obtained at a single visit, which may overestimate the HBP prevalence.[42] The US pediatric BP guidelines in 2004 and 2017 recommended that clinical diagnosis of HBP needed at least 3 occasions in children and adolescents.[24,40] However, the same method of BP measurements was used in 5 surveys during the entire period and, therefore, was unlikely to influence the secular trends in HBP. Further, we examined consistency of findings in all 29 domestic provinces and witnessed the same results. In most epidemiological studies, screening of hypertension for adults or children mainly depends on 1 to 3 readings at a single visit.[43] Second, study findings indicated that the trends of hypertension in children did not correspond with the explosive epidemic of obesity, even with an ever-increasing PAR of hypertension for obesity. Yet, we cannot exclude the further progression of hypertension during adulthood following from obesity in adolescence. Needed are intensive regular surveillances and cohort studies with data into adulthood. Third, other confounders were not included in our analyses, such as individual-level socioeconomic status, which was not available for such a large-scale epidemiological survey. We did, however, control for province-level socioeconomic status.

Perspectives

Our study revealed that BP levels and HBP prevalence in Chinese children have not paralleled the explosive increasing trends in overweight and obesity during the past 20 years. Intensive surveillance helped us draw a real picture of fluctuating BP trends in children over time during the past 2 decades. However, overweight and obese children consistently demonstrated a higher level of BP and greater risk of HBP in each survey. A dramatic increase in attribution of HBP by overweight and obesity status in Chinese youth was observed over time, especially for SHBP, suggesting the possibility of a future epidemic in youth HBP, which would impose considerable burdens in future cardiovascular diseases in adulthood. Routine intensive BP surveillance in other countries and additional epidemiological studies assessing a wider range of risk or protective factors related to BP are warranted.

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Disclosures

None.

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Novelty and Significance

What Is New?

- Explosive epidemic for obesity did not result in secular increase in blood pressure among Chinese children aged 7 to 17 years from 1995 to 2014.
- Other independent factors affecting high blood pressure (HBP) trends in children might exist, but the impact of obesity on HBP increased sharply, predicting looming heavy burden of HBP in children.

What Is Relevant?

- Overweight status and HBP are related. Epidemiological studies have reported on steady increases in childhood overweight and obesity. Unstudied are the associated changes over time with HBP in youth.
- Considering the high prevalence and rapid increase in childhood obesity and its strong connection with HBP, it is generally believed that the dramatic epidemic of excess body weight is expected to lead to a parallel rise in HBP in children.

Summary

We assessed the secular trends in overweight and obesity status and HBP in Chinese children from 1995 to 2014. We add the new findings in the present study that despite dramatic increases in overweight and obesity prevalence among Chinese children from 1995 to 2014, the HBP prevalence remained relatively fluctuant during this period. Other independent factors affecting HBP trends in children might exist. Even though, we still found that the impact of being overweight or obese on HBP increased sharply, predicting looming heavy burden of HBP in children. Our study provides evidence that intensive routine surveillance and the comprehensive prevention and intervention strategies on blood pressure, including lifestyle intervention and the control of obesity, are needed so as to maintain a healthy blood pressure level in children.