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The 1996 “Update on the 1987 Task Force Report on Blood Pressure in Children and Adolescents” adopted the fifth Korotkoff phase to define diastolic blood pressure and added height, in addition to age and gender, to develop new standards for blood pressure (BP) in children. The present study was performed to determine whether these changes altered the previously reported prevalence of hypertension in junior high school-aged children. Blood pressure screening was conducted in 19,452 fifth to eighth grade students. All students with a systolic blood pressure more than the 70th percentile had their BP measured a second time (rescreening). Using the 1996 criteria, systolic hypertension was found in 2.7% and diastolic hypertension in 2% after the screening. After the rescreening, systolic hypertension had fallen to 0.8% and diastolic hypertension to 0.4%. The prevalence of systolic hypertension was slightly higher and diastolic hypertension slightly lower than in 1987. These reports show that the overall prevalence of hypertension (1%) using the 1996 Updated Task Force criteria is similar to the prevalence using the original 1987 criteria. These results also confirm the importance of the Task Force recommendation that multiple BP measurements should be obtained before making a diagnosis of hypertension. Am J Hypertens 2001;14:412–414 © 2001 American Journal of Hypertension, Ltd.

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Definitions for normal blood pressure (BP) and for the diagnosis of hypertension in children were reviewed in 1996 by a Working Group from the National High Blood Pressure Education Program. Data sets from newer epidemiologic studies were combined with data from the “Report of the Second Task Force on Blood Pressure Control in Children—1987,” and BP standards were redefined according to height, gender, and age. The 1996 Working Group also adopted the fifth Korotkoff phase (K5) rather than the fourth Korotkoff phase (K4), to define diastolic BP (DBP) for children of all ages.

The 1996 Working Group did not address the issue of whether the changes in definitions and standards would affect the previously defined prevalence of hypertension within the childhood population. In a previous study, the prevalence of systolic hypertension was found to be 0.3% and diastolic hypertension 0.8% when recommendations published in the 1987 Report were applied to BP data collected in a 1986 to 1987 screening of 10- to 15-year-old St. Paul and Minneapolis school children. To establish prevalence data and determine the effect of the new recommendations published in the 1996 Update Report, the Minneapolis screening data were reanalyzed, and the prevalence of hypertension was compared to the results obtained using the 1987 Report.

Methods

This study was approved by the University of Minnesota Committee on the Use of Human Subjects in Research. Blood pressure screening and rescreening were conducted by methods previously described. The study participants were fifth to eighth grade students enrolled in the St. Paul and Minneapolis public schools. The BP measurements were made by personnel trained and tested before their field assignment; a standardized protocol was used. During the period of school BP screening, personnel were evaluated weekly by computing their Z scores to compare the mean of measurements made by each observer with the
Systolic BP was significantly higher in boys than girls. The mean age of the children was 12.7 years (range, 10 to 15 years). Boys were taller than girls (155.1 ± 0.1 cm v 154.6 ± 0.1 cm, \( P < .003 \)) but girls were heavier (109.2 ± 0.3 lbs v 107.0 ± 0.3 lbs, \( P < .0001 \)) and had a greater body mass index (20.5 ± 0.1 kg/m\(^2\) v 19.9 ± 0.1 kg/m\(^2\), \( P < .0001 \)). Systolic BP was significantly higher in boys than girls (107.4 ± 0.1 mm Hg v 106.5 ± 0.1 mm Hg, \( P < .0001 \)); DBP was significantly higher in girls than boys (65.7 ± 0.1 mm Hg v 62.2 ± 0.2 mm Hg, \( P < .0001 \)). There were no significant differences in BP between the African Americans and whites.

The prevalence of hypertension was determined from the number of children with hypertension at the screening and rescreening BP measurements (Table 1). Using the 1996 Update criteria, systolic hypertension was found in 402 children (2.7%) and diastolic hypertension in 290 children (2%) after the initial screening. There was no significant difference in the prevalence of systolic hypertension between girls (197 or 2.8%) and boys (205 or 2.7%), but there was a significantly greater number of girls (189 or 2.7%) than boys (101 or 1.3%) with diastolic hypertension. There were no significant differences in systolic or diastolic hypertension between African Americans and whites (4.2% v 4.5%, respectively).

Rescreening BP were measured in 4252 (96%) of the 4415 children in the upper 30 percentiles of the BP distribution (3284 of 3398 white and 968 of 1017 African American; \( P = .77 \)). All 150 students with systolic hypertension and 422 of 506 students with diastolic hypertension participated in the rescreening. To account for the missing 84 children with diastolic hypertension, it was assumed that the percentage with hypertension at the rescreening would be similar to those actually rescreened. As noted in Table 1, after the rescreening, the prevalence of systolic hypertension decreased by 70% (2.7% v 0.8%) and the prevalence of diastolic hypertension decreased by 80% (2% v 0.4%).

The data using the 1987 Task Force criteria (Table 1) show a prevalence of 1.0% for systolic and 3.5% for diastolic hypertension after the initial screening and 0.3% for systolic and 0.8% for diastolic hypertension after the rescreening. These results were significantly different from results using the 1996 criteria.

**Discussion**

This study shows that, using the new standards, the combined prevalence of systolic and diastolic hypertension in junior high school-aged children did not substantially change from the previously reported level of approximately 1%. This study also supports the Task Force recommendation that multiple BP measurements should be obtained before making a diagnosis of hypertension. The prevalence of hypertension was higher after an initial set of measurements (systolic, 2.7%; diastolic, 2.0%) than after a second set of measurements made at a later date (systolic, 0.8%; diastolic, 0.4%). This reduction in prevalence is consistent with the Task Force expectation. Because the Task Force standards were developed from BP measurements obtained at a single visit, it would be expected that 5% of a population would have hypertensive levels only after an initial screening. With subsequent visits high BP measurements tend to decrease due to accommodation of the child to the measurement procedure and the statistical phenomenon of regression toward the mean.

Although the overall prevalence of hypertension continued to be low, the prevalence of systolic hypertension significantly increased and the prevalence of diastolic hypertension significantly decreased between the 1987 Report and the 1996 Update. In deriving the Update standard tables levels of BP were based on height, in addition to age and gender. The result was a decrease in the levels used to define normal BP in the shorter children, thus correcting an underestimation of systolic hypertension in that group by making the diagnosis more dependent on weight. The strong relation between weight and BP is well-recognized in childhood, as discussed in the Task Force reports, and more recent evidence has shown that childhood weight, as opposed to height, is related to levels of SBP and other cardiovascular risk factors in young adulthood. It is unlikely that there was an increase in the number of tall children with systolic hypertension, as the levels defining hypertension in tall children are now higher in the updated tables than the previously used mean values.

For the same theory to be applied to the decrease in diastolic prevalence, it would have to be assumed that results from the new standards are identifying fewer tall children with diastolic hypertension. However, the decrease in diastolic prevalence may also have resulted from use of K5 rather than K4 to define DBP. Measurements of DBP are technically less consistent than measurements of SBP, and correlations (r) between repeated measures of SBP have been reported to be 0.6 in contrast to correlations of 0.2 between repeated DBP measurements. Moreover, there are significant differences between the levels of BP recorded for K4 and K5 in a substantial percentage of children, and using K5 rather than K4 to define hypertension can decrease the prevalence of hypertension in population studies.

It is not clear why a significantly greater number of girls had diastolic hypertension. Other studies in Minneapolis junior high school children have shown higher Tanner scores in girls at this age, and the girls in this study were heavier and had greater body mass index. Thus, the difference in prevalence of diastolic hypertension between girls and boys may simply be related to the ages and developmental stages of this cohort. As generally recognized, both SBP and DBP become significantly higher in boys by the end of high school.

Despite the low prevalence of hypertension in children confirmed by this study, we believe it is important to obtain yearly measurements of BP in children, as recommended. Upward trends of BP during youth, particularly when associated with other risk factors, such as obesity, may be important indicators of future adult risk and an aid to cardiovascular disease prevention.

References