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EDITORIAL

Brazilian pediatricians need to use national blood pressure reference values for their adolescents☆,☆☆

Pediatras brasileiros precisam usar os valores de referência nacionais de pressão arterial para os adolescentes

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Cardiovascular events are the most common causes of adult mortality with hypertension, being one of the most important treatable risk factors in both developed and developing countries. Globally, 7.6 million (13%) of premature deaths, 54% of all strokes, and 47% of all ischemic heart disease cases can be attributed to high blood pressure (BP) in adults.[1] The global prevalence of hypertension in adults has been increasing; it is estimated to reach 29% in 2025.[2] The prevalence of hypertension in pediatric populations is much lower, but high BP is associated with signs of hypertensive target organ damage even childhood. In 1987, only approximately 1% of children and adolescents were hypertensive with repeated measurements.[3] However, in the past decades, there has been an evident increase in the prevalence of hypertension (up to 4%), especially in the United States,[4] but also in Canada, Europe, Asia, and Latin America.[5,6] Therefore, detection of high BP is of a great clinical importance for the pediatric population and public health. The main diagnostic procedure in determining hypertension is BP measurement. The true goal of BP measurement in children and adolescents is to provide strategies for promoting cardiovascular health. Although the auscultatory method has always been the mainstay of clinical BP measurement, the clinical use of other BP measurement techniques is steadily increasing, especially oscillometric methods. The measurement of BP in children and adolescent is indisputable; however, some issues should be solved, *e.g.*, the method of measurement and availability of reference values for BP in children, as in this age group hypertension is defined statistically using the percentiles. In the last decade, many countries have developed their specific reference values, as the distribution of BP differs from one population to the other, both for auscultatory[7] as well for oscillometric measurement.[8,9] Moreover, as overweight/obesity has a great impact on the level of BP, some BP guidelines have included only the healthy population without overweight and obesity or were revisited for only the lean population.[8–10]

In this issue of Jornal de Pediatria, Jardim et al.[11] have published the office oscillometric BP reference values for healthy Brazilian adolescents as a part of the study of cardiovascular risk in adolescents (ERICA study). This study has several positive aspects that deserve being mentioned in this editorial.

First, these normative BP data are based on a very large sample size of more than 70,000 Brazilian adolescents (aged 12–17 years), improving its predictive value and matching the ethnic heterogeneity of the country. This is the largest

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study ever designed to construct BP percentiles in adolescents and the first trial reporting office BP in healthy Brazilian population; thus, it has a clear advantage, as it allows physicians to use Brazilian and not American or European guidelines (American Academy of Pediatrics – Clinical Practice Guidelines 2017, European Society of Hypertension Guidelines 2016)[12,13] for Brazilian adolescents. We would encourage the Brazilian pediatricians to use the Brazilian reference values for office BP, as suggested by Jardim et al., because they take into account the ethnicity, a factor that might influence the BP level, unlike non-Brazilian reference values.[11] For example, when compared with German[8] or Polish oscillometric normative data,[9] Brazilian adolescents have up to 6 mmHg lower 95th systolic BP percentiles for both girls and boys. Moreover, the 95th diastolic BP percentiles for girls and boys were lower than in German study, but higher than in Polish study. Therefore, there are substantial ethnical and national differences in office BP that need to be taken into account when interpreting BP in different individual.

The question of whether Brazilian pediatricians should adopt, for adolescents aged >12 years, the new United States pediatrics guideline to define hypertension (similar to the new adult guideline of that country; BP $\geq$130/80 mmHg regardless of age or sex or height)[12,14] or the traditional European adult guidelines (BP $\geq$140/90 mmHg).[15]

Another unanswered question is whether the age limit for adoption of the adult criteria should be 13 years (US guideline),[12] 16 years (European guideline)[13] or 18 years (current Brazilian guideline).[16]

In this study, the authors indicate that 38% of the participants were white and 49% were mixed-race. It would be interesting to know whether BP differs between adolescents of different ethnicities, as this would further underline the importance of the national and ethnic reference values.

The present study also reported lower systolic and diastolic BP percentiles (with the exception of systolic BP in male adolescents) compared with the BP percentiles obtained with auscultatory devices.[17] This fact further emphasizes that oscillometric BP values should not be interpreted using the reference values for the auscultatory method.[12,13] Blood pressure values obtained with oscillometric devices are usually higher than those from auscultatory technique.[13] The source of this discrepancy could be the algorithm used in the oscillometric device or observer error during the conventional sphygmomanometer measurement. However, further relevant factors may contribute to the observed differences in oscillometric normative datasets, such as demographics (ethnics, weight, exclusion of overweight subject, and definition of overweight, among others), use of different BP readings (first, second, mean of the first and second, or mean of the second and third, among others), and type of the oscillometric device.[18]

Another advantage of the present study is that, similar to the US study, it excluded all adolescents with overweight and obesity. The BP of these children might potentially increase the reference BP values due to higher BP values in overweight/obese children. The use of reference values of only non-overweight/obese children allows diagnosing children with overweight/obesity-induced hypertension, which in turn allows early hypertension treatment in overweight/obese children and may improve the prognosis of the adolescents. It would be interested to compare the BP between the non-overweight and overweight/obese children – how much higher was the BP in the (excluded) overweight/obese children?

The Brazilian authors used a rigorous standardized methodology of BP measurements with a very common auscultatory OMRON device. They measured BP – as recommended by the United States and European guidelines – three times, with an interval of three minutes between each measurement (six minutes in total), omitted the first BP measurement (usually the highest), and used the mean of the 2nd and 3rd BP readings (taken after the recommended three to five minutes of rest). This rigorous standardized methodology could result in lower values in comparison to BP studies where this parameter was measured only once or where it was measured three times but the first reading was not omitted.

This study also encourages Brazilian pediatricians to measure BP during all pediatric assessment from 3 years of age onwards, as it is recommended in the guideline,[16] to allow early diagnosis and treatment of hypertension, which could consequently decrease the cardiovascular risk in hypertensive children.

An interesting finding from this study is also the lack of an age-related increase of diastolic BP, in contrary to the increase of systolic BP with increasing age of the adolescents. This is similar to the ABPM normative data published by Soergel et al.,[19] where diastolic BP did not increase with age, unlike systolic BP. This may indicate that this phenomenon is caused by the method (oscillometric device) rather than by the type of BP measurement (office or 24-h ambulatory blood pressure monitoring).

We were also concerned about the high prevalence of other non-BP cardiovascular risk factors among Brazilian adolescents – approximately 25% of them were overweight or obese, 22% consumed alcohol, and 55% were physically inactive. The latter is rather surprising and disappointing in the five-times soccer world champion country. Preventive pediatric care must target not only hypertension, but also all these cardiovascular risk factors to improve the long-term cardiovascular health of the entire population. We believe that this is also the aim of the entire Brazilian school-based ERICA study.

Conflicts of interest

The authors declare no conflicts of interest.

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