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Updated and revised reference values of aortic pulse wave velocity in children and adolescents aged 3-18 years

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Introduction: Measurement of aortic stiffness – expressed as aortic pulse wave velocity (PWVao) – is an accepted method in the process of detecting organ damages and stratifying individual cardiovascular (CV) risk in adults. Diseases in children and adolescents might influence aortic stiffness. It is necessary to exclude overweight (OW), obese (O) subjects, and individuals with increased systolic (SBP) and/or diastolic blood pressure (DBP) from the population, when creating reference values of PWVao in the pediatric population. Body mass index (BMI), SBP and DBP cut-off values have changed in this population during the last decade.

Aims of our study were to expand the database of our previously published (2012) reference values of PWVao for children and adolescents; and to revise it by the application of the recently determined BMI and SBP, DBP cut-off values.

Methods: PWVao was measured by an invasively validated occlusive-oscillometric device in a healthy population aged 3-18 years. To categorize subjects into OW and O subgroups, cut-off values published by Cole (2012) were used. Increased SBP, DBP were defined by applying the reference values published by Schwandt (2015). Finally, n=4.690 (2.599 boys) participants were recruited.

Results: Mean PWVao values increased with around 1 m/s between the ages of 3 and 18 years in both sexes, namely, this parameter rose from 5.4 ± 0.6 to 6.4 ± 0.5 m/s ($p<0.05$) in boys and from 5.5 ± 0.6 to 6.4 ± 0.5 m/s ($p<0.05$) in girls. Mean PWVao values were significantly higher in boys according to girls in the age groups of 13-15, and 17 years. After the comparison of mean PWVao values measured in 2012 and 2018, significantly lower mean PWVao values were found in 2018 (in boys in the age group of 7-16 years; in girls in the age group of 10-17 years).

Conclusions: To the best of our knowledge this is the largest database of PWVao of the healthy population aged between 3-18 years published to date. Due to the change of anthropometric and physiological cut-off values during the last decade, the “old” database of PWVao needed to be revised. As a result of this, reference values of PWVao decreased significantly in both genders.