

Prevalence and time-trends of hypertension among children and adolescents in Europe – systematic review and meta-analysis

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Background

Hypertension is the most important risk factor for cardiovascular disease and premature death worldwide.¹ In recent years, the life-course perspective on hypertension has been increasingly emphasized, with the identification of several childhood and adolescent factors contributing to lifelong vascular health and disease.²⁻⁴

The prevalence of hypertension among children and adolescents is increasing globally,⁵ with a sharp increase in the prevalence of isolated systolic hypertension seen in a series of adolescent Swedish males during the 21st century (Rietz et al. *J Hypertens. IN PRESS*). The rise in hypertension is further associated with a continuous increase in body weight and body mass index (BMI) during the last few decades.

Hypertension in children and adolescents is currently defined differently in Europe⁶ and the United States⁷, with the adult definition of hypertension applied from age 16 years in Europe and age 13 years in the U.S. Furthermore, European reference values are based on American data from the National Health and Nutrition Examination Survey (NHANES) collected in 1999 and 2000, including overweight children and adolescents, whereas the U.S. guidelines are based on children and adolescents with normal weight, resulting in slightly lower reference values per sex, age and height group.^{7,8}

One of the main aims of the HyperChildNet is to update the European reference values for hypertension in children and adolescents.⁹ To optimize the design of future studies aiming to establish new reference values, time-trends in the prevalence of hypertension with current definitions, as well as the association with other parameters known to change over time, is of crucial importance.

Objective

- To assess the prevalence of hypertension among children and adolescents in Europe
- To assess time-trends in the prevalence of hypertension among children and adolescents in Europe
- To identify potential modifiers of the prevalence of hypertension among children and adolescents in Europe
- To explore the impact of definition of hypertension on prevalence, time-trends and risk factor patterns.

Methods

We will perform a systematic review and meta-analysis guided by the recommendations from the Cochrane Collaboration.¹⁰ Reporting will follow the PRISMA 2020 guidelines.¹¹

Eligibility criteria

Cross-sectional studies and cohort studies with random or population-based selection of participants from any European country, with measurement date ≥ 1990 will be eligible. Estimates based on electronic health records from usual care will be excluded due to the potential risk for selection bias. Data will be collected on participants ≤ 18 years old, further stratified according to age to allow for granular analyses.

Study selection

We will search PubMed using the terms (hypertension OR “elevated blood pressure” OR “high blood pressure”) AND (children OR adolescents) AND (Europe OR [any European nation according to the UN definition]).

The primary screening of titles and abstracts will be performed by one investigator (G.S.). Full text articles will be examined against the above eligibility criteria by two investigators separately (M.B. and G.S.), and the final decision on inclusion will be a consensus decision by these two.

Data extraction

Data will be extracted by two investigators (M.B. and G.S.) separately into a specially designed excel-sheet; any discrepancies will be resolved by re-examination of the original data and discussion.

Variables to extract: author name, journal, year of publication, year of examination, country or region, sampling method, age (mean; range), sex, BMI (mean), obesity prevalence, mean systolic and diastolic blood pressure (BP), number of participants (n), n with hypertension according to European definition, n with hypertension according to U.S. definition, BP measurement procedure, BP measurement device.

Where data are not presented stratified according to age, original authors will be contacted and asked to provide aged-stratified data if possible.

Data synthesis

The prevalence of hypertension will be estimated for each study separately and pooled in meta-analysis using a random-effects model. Analyses will be stratified according to age, sex, time-period and obesity if possible. Heterogeneity will be assessed using the I-squared and Cochran’s Q, with $p < 0.10$ indicating possible heterogeneity. Random-effects metaregression analysis will be performed to explore potential heterogeneity for continuous variables.

References

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