Intra-uterine growth restriction as a risk factor for hypertension in children six to 10 years old
Agata Zamecznik, Katarzyna Niewiadomska-Jarosik, Agnieszka Wosiak, Justyna Zamojska, Jadwiga Moll, Jerzy Stańczyk

Abstract
Introduction: Intra-uterine growth restriction (IUGR) is present in about 3–10% of live-born newborns and it is as high as 20–30% in developing countries. Since the 1990s, it has been known that abnormalities during foetal growth may result in cardiovascular disease, including hypertension in adulthood.
Methods: This study evaluated blood pressure parameters (using ambulatory blood pressure monitoring) in children aged six to 10 years old, born as small for gestational age (SGA), and compared them to their healthy peers born as appropriate for gestational age (AGA).
Results: In the SGA group, an abnormal blood pressure level (prehypertension or hypertension) was present significantly more often than in the AGA group (50 vs 16%, p < 0.01). This relationship also occurred in association with the type of IUGR (asymmetric p < 0.01, symmetric p < 0.05).
Conclusion: In SGA children, abnormal blood pressure values occurred more frequently than in AGA children.

Keywords: birth weight, children, hypertension, intra-uterine growth restriction, small for gestational age

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Intra-uterine growth restriction (IUGR) is an important issue for both neonatologists and paediatricians. It occurs in about 3–10% of live-born newborns. The most serious problem of IUGR exists in developing countries where it concerns up to 20–30% of live-born newborns. In 1967, the American Academy of Paediatrics introduced nomenclature according to neonatal birth weight as follows: appropriate for gestational age (AGA), located between the 10th and 90th percentile; large for gestational age (LGA), above the 90th percentile; and small for gestational age (SGA), below the 10th percentile. IUGR affects many newborns with birth weights below the 10th percentile.

There are two types of IUGR. The first, which accounts for approximately 20–25% of all cases, is called symmetrical IUGR. The disturbances occur in the first or second trimester of pregnancy, during organogenesis. There is a decrease in all dimensions of the foetus’s body and internal organs, usually accompanied by a permanent reduction in growth potential.

The second type is asymmetrical IUGR, constituting 75–80% of all cases of IUGR. This develops in the late second and third trimester of pregnancy and is the result of abnormal cell growth, rather than their quantity. In this type, infants have a low birth weight while other parameters remain normal (body length, head circumference). Due to this, Rohrer’s ponderal index [PI = birth weight × 100/length3 (g/cm3)] in this type is lower than in symmetrical IUGR.

Published in the 1990s, ‘Barker’s hypothesis’ states that growth disorders appearing in intra-uterine life result in the later occurrence of cardiovascular disease, including high blood pressure. This is due to the fact that the developing foetus adapts to the undernutrition and insufficient amounts of oxygen through ‘metabolic programming’ and adaptation of the structure and function of certain organs (e.g. compensatory hypertrophy of the nephrons).

In Europe, hypertension affects about 2–5% of children, and among teenagers and young adults it reaches 10%. The most common type among children under the age of seven years is secondary hypertension. The frequency of primary hypertension increases with age. Based on previous reports, it is known that children born with IUGR are likely to develop primary hypertension much earlier and more frequently than their peers with normal birth weight.

The aim of this study was to compare blood pressure parameters in children born as SGA and compare them with their healthy peers born as AGA, and to determine the prevalence of prehypertension and hypertension in both groups, taking into consideration the type of hypotrophy (symmetrical/asymmetrical) and birth weight percentile (≤ 5th percentile/5–10th percentile).

Methods
This was a prospective study carried out between 2010 and 2012 in the Department of Children’s Cardiology and Rheumatology of the 2nd Chair of Paediatrics at the Medical University of Lodz in Poland. The study group consisted of 50 children aged six to 10 years (mean 7 years 11 months ± 1 year 4 months) born at