

Trajectories of Cardiovascular Health: Life Course Epidemiology in Brazil

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Cardiovascular epidemiology has advanced enormously in the study of risk factors for atherosclerosis¹, as evidenced by publications in *Arquivos Brasileiros de Cardiologia (ABC)* in the last years²⁻⁴.

Based on this information, it is possible to explore new hypotheses and, therefore, new frontiers for prevention. The different perspectives for the study of these risk factors include the life course epidemiology. This perspective considers that the onset of the disease may occur long before the establishment of traditional risk factors in adulthood. Thus, health and diseases can be considered as a result of long-term effects of exposure to different factors throughout the various stages of life, including intrauterine life, childhood, adolescence and adulthood⁵.

This significantly increases the complexity of analysis⁶, but also adds dimensions previously little explored in epidemiology and cardiovascular prevention. A basic concept within this line of epidemiological interpretation is that of critical or sensitive periods, that is, the idea that stimulus acting for a certain critical period of development may bring long-lasting consequences on the structure or function of organs. For example, the intrauterine period in which tissues and organs are forming, is critical for the establishment of a risk profile for the rest of the course of life. Metabolic adaptations of the fetus occurred in this period could persist for the rest of life, thus increasing the risk of chronic diseases such as coronary artery disease, diabetes and obesity during adulthood. This process has been called intrauterine programming of chronic diseases⁷.

The *ABC* have been publishing interesting articles on this topic, providing insights into the discussions that have been occurring in the international arena⁸⁻¹⁰.

In a study carried out in Goiânia¹¹, the authors compared the pressures measured by ABPM, of a group of children with low birth weight with those with adequate birth weight, observing that those with underweight had higher blood pressure and abnormal circadian rhythm of blood pressure with reduced nocturnal dipping.

Keywords

Cardiovascular diseases / epidemiology; Life change events; Risk factors; Periodicals as topic.

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DOI: 10.5935/abc.20140065

On the other hand, Souza et al.¹² studied the association between birth weight and cardiovascular risk factors in adolescents in Salvador, and observed two and a half higher prevalence of obesity and three times higher blood pressure in the group with high birth weight compared to the normal weight group.

These apparently conflicting findings may actually represent a U-shaped curve, in which both low weight and high weight would represent risk over normal weight at birth. In observational studies, newborns weighing less than 2,500 g had a higher incidence of cardiovascular diseases, hypertension and atherosclerosis – and glucose intolerance, – type II diabetes or metabolic syndrome in adulthood. – Babies with birth weight higher than 4 kg, regardless of gestational age or gender, have abnormal metabolism of carbohydrates and lipids associated with later development of obesity, diabetes and dyslipidemia¹³⁻¹⁵.

Besides the nonlinear association, there are many ways by which intrauterine factors can influence the pattern of disease in later stages. These effects may interact with other stimuli that occur in other periods, undergoing changes throughout life. Therefore, for example, birth weight considered in isolation would not be enough to explain the CAD. It is necessary to consider the relationship between this marker and the events following the moment of birth, such as the rapid recovery of growth in early childhood, that may further promote increased risk^{16,17}.

Therefore, the life course model supports studies on initial exposures and but their potential interaction with other intermediate factors. Gaining acquaintance with this sequence of events and with the idea of critical periods has important consequences in the adoption of preventive strategies, because it helps identify periods of increased need for intervention and helps consider social inequality in health as factors that affect the entire life cycle of many generations⁵.

The study of Rio de Janeiro¹⁸ evaluated the blood pressure of adolescents and, again, the same individuals 18 years later. Adolescents with abnormal blood pressure in the first assessment presented higher average weight, insulin, leptin, apolipoprotein B100 and A1, the highest prevalence of overweight, obesity, increased waist circumference and hypertension in the group with normal blood pressure in adolescence. Adolescence is a phase that deserves special attention. Good nutrition during this phase permanently affects the individual's life, since in this phase, 25% of adult height and 50% of body mass are acquired. Therefore, it is an important phase for weight control and acquisition of good eating habits.

Another interesting study published in ABC¹⁹ evaluated individuals at three different times in life. Adults diagnosed with metabolic syndrome presented, as early as in adolescence, significantly higher values for weight, waist circumference and body mass index. This fact has important implications for prevention, since early detection of these risk factors can mean significant benefit in the future^{20,21}.

The adoption of a life course model, therefore, has the potential to significantly change the paradigm

of prevention of cardiovascular diseases, of the current emphasis on control of risk factors in adulthood to a broader approach to prevention of risk factors per se throughout the course of life, including childhood and adolescence. Further Brazilian studies, including potential mechanisms, such as gene expression²², and interactions among the phases of life, body composition and environment²³ may add evidence to this set, opening new possibilities of intervention in our community.

References

- Schmidt MI, Duncan BB, Azevedo e Silva G, Menezes AM, Monteiro CA, Barreto SM, et al. Chronic non-communicable diseases in Brazil: burden and current challenges. *Lancet*. 2011;377(9781):1949-61.
- Fuchs SC, Biolo A, Polanczyk CA. Cardiovascular epidemiology: the legacy of sound national and international studies. *Arq Bras Cardiol*. 2013;101(2):98-100.
- Evora PR, Nather JC, Rodrigues AJ. Prevalência das doenças cardíacas ilustrada em 60 anos dos Arquivos Brasileiros de Cardiologia. *Arq Bras Cardiol*. 2014;102(1):3-9.
- Moreira LF. Os Arquivos Brasileiros de Cardiologia e a divulgação da pesquisa em ciências cardiovasculares no Brasil. *Arq Bras Cardiol*. 2014;102(1):1-2.
- Ben-Schlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *Int J Epidemiol*. 2002;31(2):285-93.
- Davey-Smith G, Hart C. Life-course socioeconomic and behavioral influences on cardiovascular mortality: the collaborative study. *Am J Public Health*. 2002;92(8):1295-8.
- Barker DJ. The origins of the developmental origins theory. *J Intern Med*. 2007;261(5):412-7.
- Desai M, Beall M, Ross MG. Developmental origins of obesity: programmed adipogenesis. *Curr Diab Rep*. 2013;13(1):27-33.
- Hallal PC, Dumith SC, Ekelund U, Reichert FF, Menezes AM, Victora CG, et al. Infancy and childhood growth and physical activity in adolescence: prospective birth cohort study from Brazil. *Int J Behav Nutr Phys Act*. 2012;9:82.
- Schilithz AO, da Silva CM, Costa AJ, Kale PL. Ecological analysis of the relationship between infant mortality and cardiovascular disease mortality at ages 45-69 in the Brazilian 1935 birth cohort. *Prev Med*. 2011;52(6):445-7.
- Salgado CM, Jardim PC, Teles FB, Nunes MC. Baixo peso ao nascer como marcador de alterações na monitorização ambulatorial da pressão arterial. *Arq Bras Cardiol*. 2009;92(2):107-21.
- Sousa MA, Guimarães IC, Daltro C, Guimarães AC. Associação entre peso de nascimento e fatores de risco cardiovascular em adolescentes. *Arq Bras Cardiol*. 2013;101(1):9-17.
- Victora CG, Adair L, Fall C, Hallal PC, Martorell R, Richter L, et al. Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: consequences for adult health and human capital. *Lancet*. 2008;371(9609):340-57. Erratum in *Lancet*. 2008;371(9609):302.
- Schilithz AO, Silva CM, Costa AJ, Kale PL. Ecological analysis of the relationship between infant mortality and cardiovascular disease mortality at ages 45-69 in the Brazilian 1935 birth cohort. *Prev Med*. 2011;52(6):445-7.
- Pereira JA, Rondo PH, Lemos JO, Pacheco de Souza JM, Dias RS. The influence of birthweight on arterial blood pressure of children. *Clin Nutr*. 2010;29(3):337-40.
- Dulloo AG. Thrifty energy metabolism in catch-up growth trajectories to insulin and leptin resistance. *Best Pract Res Clin Endocrinol Metab*. 2008;22(1):155-71.
- Berends LM, Fernandez-Twinn DS, Martin-Gronert MS, Cripps RL, Ozanne SE. Catch-up growth following intra-uterine growth-restriction programmes an insulin-resistant phenotype in adipose tissue. *Int J Obes (Lond)*. 2013;37(8):1051-7.
- Campana EM, Brandão AA, Pozzan R, Magalhães ME, Fonseca FL, Pizzi OL, et al. Pressão arterial na adolescência, adipocinas e inflamação no adulto jovem. Estudo do Rio de Janeiro. *Arq Bras Cardiol*. 2014;102(1):60-9.
- Oliveira RM, Franceschini Sdo C, Rosado GP, Priore SE. Influence of prior nutritional status on the development of the metabolic syndrome in adults. *Arq Bras Cardiol*. 2009 Feb;92(2):101-12.
- Reilly JJ, Kelly J. Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. *International Journal of Obesity* 35, 891-898
- Giuliano ICB, Caramelli B, Pellanda L, Duncan B, Mattos S, Fonseca FAH et al. I Diretriz de Prevenção da Aterosclerose na Infância e na Adolescência. *Arq. Bras. Cardiol*. 2005, 85(6): 3-36.
- Lima-Leopoldo Ana Paula, Leopoldo André Soares, Silva Danielle Cristina Tomaz, Nascimento André Ferreira do, Campos Dijon Henrique Salomé de, Luvizotto Renata de Azevedo Melo et al. Influência de prolongados períodos de obesidade sobre a expressão gênica miocárdica. *Arq. Bras. Cardiol* 2013; 100(3): 229-237.
- Bertaso Angela Gallina, Bertol Daniela, Duncan Bruce Bartholow, Foppa Murilo. Epicardial fat: definition, measurements and systematic review of main outcomes. *Arq. Bras. Cardiol* 2013; 101(1): e18-e28.