

## Trajectories of Cardiovascular Health: Life Course Epidemiology in Brazil

Lucia Campos Pellanda

Programa de Pós-graduação em Ciências da Saúde: cardiologia, Fundação Universitária de Cardiologia. Universidade Federal de Ciências da Saúde, Porto Alegre, RS - Brazil

Cardiovascular epidemiology has advanced enormously in the study of risk factors for atherosclerosis<sup>1</sup>, as evidenced by publications in *Arquivos Brasileiros de Cardiologia (ABC)* in the last years<sup>2-4</sup>.

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 adulthood<sup>5</sup>.

This significantly increases the complexity of analysis<sup>6</sup>, 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 diseases<sup>7</sup>.

The *ABC* have been publishing interesting articles on this topic, providing insights into the discussions that have been occurring in the international arena<sup>8-10</sup>.

In a study carried out in Goiânia<sup>11</sup>, 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.

**Mailing Address: Lucia Campos Pellanda** •  
Instituto de Cardiologia / Fundação Universitária de Cardiologia (IC-FUC).  
Endereço: Avenida Princesa Isabel, 370 / 3º andar, Unidade de Pesquisa.  
Porto Alegre, Rio Grande do Sul - Brazil. Postal Code: 90620-000.  
e-mail: pellanda.pesquisa@gmail.com

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On the other hand, Souza et al.<sup>12</sup> 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 dyslipidemia<sup>13-15</sup>.

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<sup>16,17</sup>.

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 generations<sup>5</sup>.

The study of Rio de Janeiro<sup>18</sup> 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 ABC<sup>19</sup> 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<sup>20,21</sup>.

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 expression<sup>22</sup>, and interactions among the phases of life, body composition and environment<sup>23</sup> may add evidence to this set, opening new possibilities of intervention in our community.

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