

Review Article

The Link between Fetal Programming, Inflammation, Muscular Strength, and Blood Pressure

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Hypertension affects one billion individuals worldwide and is considered the leading cause of cardiovascular death, stroke, and myocardial infarction. This increase in the burden of hypertension and cardiovascular diseases (CVD) is principally driven by lifestyle changes such as increased hypercaloric diets and reduced physical activity producing an increase of obesity, insulin resistance, and low-grade inflammation. Visceral adipocytes are the principal source of proinflammatory cytokines and systemic inflammation participates in several steps in the development of CVD. However, maternal and infant malnutrition also persists as a major public health issue in low- to middle-income regions such as Latin America (LA). We propose that the increased rates of cardiovascular and metabolic diseases in these countries could be the result of the discrepancy between a restricted nutritional environment during fetal development and early life, and a nutritionally abundant environment during adulthood. Maternal undernutrition, which may manifest in lower birth weight offspring, appears to accentuate the relative risk of chronic disease at lower levels of adiposity. Therefore, LA populations may be more vulnerable to the pathogenic consequences of obesity than individuals with similar lifestyles in high-income countries, which may be mediated by higher levels of proinflammatory markers and lower levels of muscle mass and strength observed in low birth weight individuals.

1. Introduction

The prevalence of arterial hypertension and cardiovascular diseases (CVD) has grown significantly in recent years, particularly in low- and middle-income regions such as in Latin America [1]. In 2008, more than 1,400 million adults were overweight and 500 million were obese [2]. Hypertension affects one billion individuals worldwide and is considered the leading cause of cardiovascular death, stroke, and myocardial infarction [3]. Approximately 75 percent of people with hypertension live in developing countries where health resources are limited and there is a low level of awareness and control of the disease [4]. It is estimated that two thirds of all strokes and half of coronary heart disease events are attributable to the inadequate control of high blood pressure [5].

This increase in the burden of hypertension and CVD is principally driven by lifestyle changes such as increased hypercaloric diets and reduced physical activity. These lifestyle factors, combined with a genetic predisposition among the population of developing countries, have led to rapid increases in obesity, insulin resistance, and low-grade inflammation and its complications such as diabetes mellitus type 2 (DM2) and CVD [6].

2. Abdominal Obesity, Inflammatory Response, and Cardiovascular Risk

In low- to middle-income countries (LMICs), the rapid changes consequent to the urbanization process have produced an environment which discourages physical activity