

Abstract

A link between famine in early life and risk of chronic diseases was established repeatedly. Contradictory

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Keywords: Age-specific mortality, Early-life exposure, Gompertz associations between early-life exposure to famine and survival in later life. An analysis of the Dutch potato famine of 1846-47 found higher late-life mortality for cohorts born during the famine [7]. Men and women lost on average 4 and 2.5 years of life a year age 50, respectively a year exposure at birth to the famine. Lower social classes were more affected by early life exposure to the Potato famine than higher social classes.

Introduction

The effects of calorie restriction (CR; the reduced intake of a nutritious diet) starting in adult life have been widely studied in animal and human models [1]. However, the effects of malnutrition during the prenatal or early postnatal development on adult survival and longevity have been studied only in few studies. Susan E. Ozanne and associates have reported in a series of papers that changes in nutrition during fetal or early postnatal life are sufficient to have marked effects on lifespan in rats and mice [2-4]. Offspring born to normally fed dams but suckled by protein restricted dams grew slowly during lactation and exhibited significantly longer lifespan when fed ad libitum on standard chow. Conversely, offspring born to protein restricted dams but suckled by normally fed dams were smaller at birth, showed rapid catch-up growth and had a reduced longevity when fed ad libitum on standard chow.

For human beings, CR is defined as the deliberate reduction in calorie intake to level up to 30% below a standard calorie intake which for a 70 kg male, is 2,500 calories per day. The experimental studies of the long-term effects of exposure to CR during human development are not feasible, both for ethical reasons and the prolonged follow-up required. Therefore, it is important that observational studies including natural experiments and cross-country studies in suitable populations can be realized. Natural experiment is 'the naturally occurring circumstances in which subsets of the population have different levels of exposure to a supposed causal factor, in a situation resembling an actual experiment where human subjects would be randomly allocated to groups'[5]. The natural experiments provide an opportunity to re-examine important scientific questions concerning the link between early-life conditions and adult morbidity and mortality. The famine has multiple features that are beneficial for its use as a natural experiment. A causal link between the famine in early life and increased risk of age-associated chronic diseases was established in a number of studies [6]. Contradictory evidence exists, however, regarding the effects of the famine in early life on age-specific mortality rates and life expectancy.

Exposure to the Famine in Early Life and Age-Specific Mortality: Evidence around the World

Several studies around the world found both positive and negative

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mortality than either the pre-famine or the post-famine cohort. In his subsequent research, Song (2010) (11) with the aim of identifying the long-term effects of the 1959-61 Great Leap Forward Famine determined the cohort mortality differences up to age 22 in three cohorts of newborns (1956-58, 1959-61, and 1962-64). In this study, mortality level of the non-famine cohort caught up to and exceeded the level of the famine cohort between ages 11 and 12. The study by Kannisto et al. [12] also failed to find any long-term consequences of the Great Finnish Famine 1866-68 on old age mortality. Remarkably, in this study survival from birth to age 17 years was significantly lower in cohorts born before and during the famine than in the cohorts born after the famine; at subsequent ages, including old age, mortality was practically identical in the famine-born cohorts and in the cohorts born before and after the crisis. Similarly, in the analysis of the sustained effects of the 1974-75 famine on cohort mortality in a rural area of Bangladesh, Razzaque et al. [13] detected that mortality in the famine-born cohort was higher during the first and second years of life, while in the famine-conceived cohort it was higher during the first year

