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Nutrition and Early Brain Development

MARCH 25, 2011

Nutrition has been called the single greatest environmental influence on babies in the womb and during infancy ¹, and it remains essential throughout the first years of life.

A proper balance of nutrients in this formative period is critical for normal brain development. ^{2,3} Shortages of nutrients such as iron and iodine can impair cognitive and motor development, and these effects are often irreversible. Similarly, there is growing evidence that DHA, an essential fatty acid, is a key component of the intensive production of synapses that makes the first years of life a critical period of learning and development. Many other nutrients—choline, folic acid, and zinc, to name just a few—have been linked specifically to early brain functioning. ^{4,5}

The role of nutrition in brain development is complex. The effects of most nutrient shortages depend on the extent and duration of the shortage, and in many cases, the brain's need for a particular nutrient changes throughout its development. Early shortages can reduce cell production; later shortages can affect cell size and complexity. Nutrient deficits also affect the complex chemical processes of the brain and can lead to less efficient communication between brain cells. ⁶

Food Insecurity

Children in the US are mostly safe from the severe hunger often seen in poor and developing countries. However, many children live in families who do not have a consistent and dependable supply of healthy food. Researchers refer to this as food insecurity. ⁴

Food insecurity is not the same as hunger. Food-insecure families are often able to avoid hunger by choosing cheaper, more filling types of food over more costly nutritious foods. For young children, the result is often a diet that provides inadequate nutrients for normal growth and development. ⁷

A family is considered food-insecure if they frequently

- Are unable to afford balanced meals
- Reduce the size of meals because of lack of money
- Reduce the quality and variety of their normal diet due to lack of money

Food insecurity has been linked to nutrient deficiencies that lead to learning and development problems, especially among infants and toddlers. Long-term effects include low achievement in school, emotional problems, and poor health. ^{4,5,8} A recent study ^{9,10} finds that compared to their peers in food-secure families, food-insecure children under age 3 are:

- 90 percent more likely to have fair or poor health rather than good or excellent health
- 31 percent more likely to spend time in the hospital
- 76 percent more likely to have problems in cognitive, language, and behavioral development

Food Insecurity and Obesity

In the 1990's, researchers discovered an unexpected relationship between food insufficiency and child obesity. Children in food-insecure homes are actually more likely than other children to be overweight. This is often called the hunger-obesity paradox.

This pattern appears early in life. Food insecurity in a child's first years is associated with obesity at age 4⁵, even after accounting for other factors.¹¹ Researchers have suggested several reasons why food-insecure children may become obese. Parents facing a shortage of food may encourage their children to eat cheaper, more energy-dense foods. Families may develop a tendency to overeat during periods when food is plentiful.¹²

Nutritional shortages during pregnancy and in the early years of life may promote obesity by causing metabolic changes in how energy is used and stored.¹³ Brain development may also play a role. Irregular eating patterns can disrupt brain networks involved in energy regulation and hunger signals.^{14,15}

Food Insecurity and Poverty

Food insecurity is not restricted to families in poverty. Nationally, about 40 percent of poor families are food-insecure, but many poor families avoid food insecurity through the assistance of safety net programs, charitable organizations, and other resources not included in the federal poverty measure.⁷

At the same time, many food-insecure families have incomes well above the poverty line. Low-income families—families with incomes above poverty but below 200 percent of the poverty line—face many of the same difficulties that poor families face, including food insecurity. A substantial portion (about 20-30%) of low-income families are food-insecure. Moreover, their higher incomes may make them ineligible for many forms of assistance that are available to families in poverty.^{16,17}

The Take-Away

Food insecurity during a child's first years threatens brain development. Children in food-insecure families are likely to have unhealthy diets and inconsistent eating habits, placing them at risk for cognitive impairment, obesity, and other long-term problems.

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