



NUTRITION AND BRAIN DEVELOPMENT IN EARLY CHILDHOOD

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Abstract

A majority of children born in less developed economies are exposed to the risk of under-nutrition and several millions of these children die annually from preventable causes. Nutrition during and after pregnancy is crucial to proper brain development and it lays the foundation for cognitive, psychomotor and socio-emotional achievements. This paper exposes through review of the likely effect of nutrition on the brain development of young people. It has been observed that under-nutrition influences brain development and it affects the neurodevelopmental process. It also influences brain development which in turn affects the child's experiences and socio-emotional dispositions. It is therefore crucial for government and others concerned with the worth of children to emphasise a balance nutritional programme in order to enhance proper brain development among children. This can be achieved through programmatic aid policy foundation aimed at ensuring that all children are properly feed especially during gestation and shortly after delivery.

Keywords: *Pregnancy, food and micronutrient supplementation, psychomotor development, brain development and early childhood.*

Introduction

The prevalence of low birth weight is high in developing countries due to under-nutrition. Deficiencies in several micro-nutrients are common in pregnancy and it has been suggested that supplementing pregnant women with multiple micronutrients may have greater benefits in their offspring at one to six years UNICEF report on child and maternal nutrition (2006) and Jiang, Christian, Khartry, Wul and West (2005) are of the view that balance protein-energy supplementation during pregnancy moderately increase the birth weight of the offspring and protein-energy deficiency during gestation may cause permanent alteration of brain structures and impaired cognitive function. The brain develops its structural form and functional capacity through dynamic bidirectional influences between biological factors such as nutrition, genetic factors like intelligence and the child's experiences and the child's behaviour. Experiences can affect brain development in at least two ways; behaviour and intellectual abilities. Experience-expectant assist the brain for normal development because the brain expects visual input through the optic nerve for the normal development of the visual cortex while the absence of these expected experiences impairs the neurodevelopmental processes that depend on them. (Tofail, Kabir & Hamadani, 2006). The experience expectant processes enable the individuals to adapt and thrive in their specific culture and environment while the experience expectant processes occur early in life which refers to the way the brain develops in response to an individual's experiences and acquired skills. The effects of under-nutrition must be understood in the context as well as the interactions between them. For example, low birth weight infants born into families with high socio-economical status are at low risk for poor developmental outcomes than those born into disadvantaged environment. Osrin, Vaidya, Shrestha, Bamiya, Nanandlor. Adhikari, Filtean, Tomkin & Costella (2005) concluded in their study that nutrition and psychosocial stimulation together result in greater improvements in child development than intervention alone.

Under-nutrition influences brain development by directly affecting brain process or indirectly by affecting children's experiences and behaviour. Inadequate availability of nutrients during gestation and infancy affects the structural and functional development of the brain. Gestation and infancy are periods of rapid brain development. The neural tube begins to form from sixteen days after conception and within seven months it takes on a form that resembles the adult brain. Nutrients are required for the biological processes that drive this transformation like the creation of new neurons which constitute neuron tissue that is able to transmit and receive neurons impulses to the brain (Meeks, Garder, Walker, Dowell & Grantham-Mc Gregor, 2003).

Consequences of Under-nutrition in Early Life

Severe acute malnutrition i.e. (low weight or height) in early life can have lasting consequences on brain development even after nutritional rehabilitation. Grantham & Ani (1999) and Estrom, Hyder and Chowdhury (2002) studies confirmed that school-age children who had suffered from an episode of severe acute malnutrition in early years of life had poorer IQ levels and cognition when matched with siblings who had functions and school achievements.

To treat these abnormalities WHO (2007) has recommended providing structured activities and health care education on feeding on appropriate food nutrients. Achenbah & Ruffle (2000) is of the view that providing such stimulations like health care and nutrition advices can help improve mental and motor development in severely malnourished infants. Chronic malnutrition as measured by poor physical growth is also associated with reduced cognitive and motor development. From the first year of life through school age, children who are stunted or underweight for their age perform poorly than their normal size peers on average in cognitive and motor task and in school achievement (WHO 2006).

Chronic under-nutrition in early life have long lasting consequences for brain development. Children who experience severe acute malnutrition, chronic malnutrition and low birth weight tend to face other disadvantages that affect brain development such as poor eating habits, poor housing and sanitation, poor health care and less stimulating home environments, makes it difficult to draw a causal link from observational studies (Abdullah, Karim & Samad, 2000).

Some negative effects of early under-nutrition on cognitive development appear to be reversible through subsequent improvement in nutrition, health care and enriched environments. When a child is adequately nourished during gestation and infancy, the essential energy, protein, fatty acids and micronutrients necessary for brain development are available during this crucial period, laying a foundation for lifetime brain function (Johnson, 2005).

Food supplementation programmes and food voucher programmes for low income families is found to have improved children's IQ, behaviour and school performance. Christian, Shrestha & Lederg (2003) evaluated a food supplementation programme by comparing a child born while the mother participated in the programme to a sibling born before participation showed a demonstrable benefits on school achievement with higher IQ, and higher learning potentials and fewer behaviour problems at age 6 – 8 years. Although these siblings studies suggested benefits of food supplementation in early life, the result of randomization of material and child food supplements showed strong evidence for long term benefits to cognition (Friis, Gomo & Nyazema, 2004).

Recommendation

All children should have opportunity to fulfil the developmental potentials.

The following conditions are effective in improving nutrition and the development of the individuals:

- Salt iodization to prevent iodine deficiency
- Provision of iron via home fortification such as micronutrient providers to prevent iron deficiency anaemia
- Education intervention that include a strong emphasis on feeding nutrient-rich animal source food in conjunction with food supplementation in food-insecure populations.
- Supplementation with iron and folic acid or multiple micronutrients during pregnancy
- In addition to iron the provision of multiple micronutrients during infancy
- Fortified food supplements provided during pregnancy and infancy
- Improve home environment and the quality of caregiver-infant interaction to complement and enhance the effect of nutrition to address the negative effects of adverse environmental conditions that co-exist in population where under-nutrition is common.

Conclusion

When a child is adequately nourished during gestation and infancy, the essential energy, protein, fatty acids and micronutrients necessary for brain development enhance life time function. The child is also more likely to interact with his or her care givers and environment in a way that provides the experiences necessary for optimal brain development. Children who do not receive adequate nutrition are at risk for failing to reach their developmental potential in cognitive, motor and socio emotional abilities. The development of these abilities is linked to academic achievement and economic productivity. Therefore, preventing or reversing this loss in early childhood is crucial for fostering economic development in low and middle income families as well as reducing economic disparities in high income families. The evidence is clear that key risk factors for poor cognitive, motor and socio emotional development and prevention should be a global health priority.

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