Hidden Hungers and Hearing Loss in Children

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Abstract

Hidden hungers and Micronutrient deficiencies (MNDs) are global challenges that have a huge impact on health of vulnerable population like children. Nutritional imbalances are increasingly thought to be a causative factor in hearing loss. However, less attention has been paid towards MNDs, which can be prevented. Therefore, this mini-review aims to draw attention of concerned authorities and researchers to combat against MNDs that affect hearing. The major causes of MNDs were poor diet, diseases and infestations, and poor health caring practices. Hearing loss has profound health, social, and economic consequences. Affected children are likely to experience speech, language, and cognitive delays and poor school performance. Only severe prenatal iodine deficiency is listed by the WHO as a nutritional cause of hearing loss, leaving the broad roles of diet and nutrition within its complex set of etiologies yet to be defined.

Keywords: Hearing Loss; MNDs; Protein-energy malnutrition

Introduction

Apart from the protein-energy malnutrition (PEM, which includes marasmus and kwashiorkor), there exists another form, which is less visible and a result of vitamins and minerals deficiencies, known as micronutrient deficiency (MND) [1]. Therefore, MND can be regarded as a subset of malnutrition. Deficiencies of fat soluble vitamins, iron, and zinc are particularly common, but deficiencies of other water-soluble vitamins, minerals, and trace elements are also found and have great impact in physical, mental, and cognitive development of an individual. Iron deficiency is the most prevalent nutrition problem in the world [2]. Micronutrients (MNs) (vitamins and minerals) are essential for proper growth and development apart from macronutrients (carbohydrates, fats, and proteins). MND has global health impact because its manifestations become less visible and usually begins to show when condition is severe and has already led to serious health burdens, justifying the name “hidden hunger.” Deficiencies occur when people do not have access to micronutrient-rich foods such as fruit, vegetables, animal products, and fortified foods, usually because they are too expensive to buy or are locally unavailable [2]. Although the deficiency affects every age group of both sexes, the most vulnerable groups are children and women of reproductive age including pregnant and lactating mothers [3]. The World Health Organization (WHO) estimates that more than 2 billion people are deficient in key vitamins and minerals, including a third of world’s children. Most of these people live in low-income countries [2,4].

Hidden Hunger and Hearing Loss

In fact, Micronutrient deficiencies (MNDs) are increasingly thought to be a causative factor in hearing loss [5]. Age-related hearing loss is actually not due to any kind of mechanical dysfunction in ear; rather it is how brain processes information that results in reduced hearing. Hearing (considered broadly as the function of human auditory brain and its peripheral end organs) has
Among micronutrients found to be most beneficial for protecting and improving hearing are: Carotenoids, especially astaxanthin and vitamin A, vitamin C, Folate [15], Zinc [16], and Magnesium [17]. These nutrients support hearing in a number of ways e.g. protecting against oxidative stress inside the cochlea; preventing free radical damage; improving blood flow, thereby reducing cochlear damage related to a compromised vascular system and/ or improving homocysteine metabolism [15-17]. While compelling evidence of the role of vitamin A in preventing hearing loss mediated by ear infection now exists; Experimental animal evidence implicates an essential role for vitamin A in inner ear development so that routinely providing adequate amounts of vitamin A antenatally in undernourished regions of the world may promote normal inner ear development and reduce the risk of sensorineural hearing loss induced by gestational vitamin A deficiency [18].

For noise-induced tinnitus, folate (vitamin B9), has been shown to be beneficial. Folate also lowers homocysteine levels, which have been linked to age-related hearing loss [15]. Zinc in human plays an important role in cell mediated immunity and is also an antioxidant and anti-inflammatory agent. Zinc supplementation studies in the elderly have shown decreased incidence of infections, decreased oxidative stress, and decreased generation of inflammatory cytokines [19]. Furthermore, research has shown zinc may be useful for sudden idiopathic sensori-neural hearing loss (SSNHL). Whilst, the cause for SSNHL is unknown, one theory is that a viral infection or immunologic disease is involved. Thus may help explain the high rate of recovery, and why zinc appears to be so beneficial for this condition [16]. Zinc has anti-viral properties, and studies have shown it can prevent common cold viruses from replicating or attaching to nasal mucus membranes. Zinc also has immune-boosting properties against viral infection [20].

The nutritional origins of hearing loss differ in chronically undernourished settings [14], where etiologies of premature dysfunction may start in-utero. In India, Choudhury, et al. [21] screened newborn hearing via the auditory brainstem response. Delayed interpeak latencies and wave V latency, as observed in newborns with latent iron deficiency (i.e., cord plasma serum ferritin ≤75 ng/mL), is highly suggestive of abnormal myelination of the auditory pathway. Multiple facets of intracellular iron metabolism support oligodendrocytes signaling pathways, proliferation, and formation of myelin, which are critical for auditory neurotransmission.

Micronutrients that Affect Hearing

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Additionally, Choudhury and his coworkers [21] reinforce the importance of micronutrient imbalance or deficiency as determinants of hearing loss. The authors reported higher intakes of β-carotene, β-cryptoxanthin, and folate to be protective against incident hearing loss. Oxidative stress and impaired homocysteine metabolism appear to contribute to inner-ear dysfunction. Also, adequate carotenoid and folate may attenuate risk by postulated scavenging of free radicals and maintenance of antioxidant enzyme homeostasis respectively. Paradoxically, the risk of hearing loss was increased in subjects who reported an increased intake of vitamin C, also an established antioxidant, at amounts that exceeded the Recommended Dietary Allowance (i.e., >75–90 mg/d) but that fell well below the Tolerable Upper Intake Level (<2000 mg/d) of the Dietary Reference Intakes, suggesting that poorly understood, organ-specific nutrient interactions may exist. They add to a developing story that adequate and balanced nutrition during pregnancy, infancy, and adulthood may reduce hearing loss globally and across life span. Addressing the relation between hidden hungers and hearing loss represents an extraordinary opportunity to explore and potentially reduce the global burden of hearing loss and consequent disability in the developing world [23]. However, it will be imperative to scale up direct nutrition interventions with adequate micronutrients supply, success will be enhanced and sustained by addressing underlying determinants of malnutrition through action in multiple sectors such as poverty alleviation, education, social protection, clean water supply, and sanitation.

References


