**ENIAYE GRACE**

**16/MHS04/002**

**NTD 408 ASSIGNMENT**

**QUESTION**  
Under maternal health care, discuss the implications of Zinc deficiency on health of mother and child. Suggest practical measures to alleviate this deficiency

**ANSWER**

Globally, food insecurity is associated with micronutrient deficiencies, and an estimated 4.5 billion people worldwide are affected by some form of nutrient deficiency. Of this 4.5 billion, the most vulnerable groups are young children and women of childbearing age.

Undernourished pregnant women have higher reproductive risks, including death during or following childbirth. Many women suffer from a combination of chronic energy deficiency, poor weight gain in pregnancy, anemia, and other micronutrient deficiencies, as well as infections such as HIV and malaria. These along with inadequate obstetric care contribute to high rates of maternal mortality and poor birth outcomes. Undernutrition in pregnant women is directly linked to intrauterine growth retardation (IUGR), which results in low birth weight, pre-maturity, and low nutrient stores in infants. Maternal undernutrition also diminishes a woman’s productivity, causing repercussions for herself, her family, her community, and the broader society.

Zinc is a trace element essential for brain development and central nervous system function. More than 200 enzymes are zinc metalloenzymes, requiring zinc for normal neuronal development. Zinc is an essential mineral known to be important for many biological functions including protein synthesis, cellular division and nucleic acid metabolism. Zinc is a critical nutrient for central nervous system (CNS) development, which occurs during pre- and postnatal life. Because of the important role of zinc in CNS function, it is clear that maternal and early infant zinc deficiencies are likely to adversely affect fetal and infant neurologic and behavioral development. Severe zinc deficiency is rare in humans, but mild to moderate deficiency may be common, especially in populations with low consumption of zinc-rich animal-source foods and high intakes of foods rich in phytates, which inhibit zinc absorption.

Zinc deficiency has been estimated to result in more than 450,000 child deaths annually by increasing the risk of diarrhea and pneumonia mortality. Zinc deficiency presents threats to pregnant women and babies, especially in areas where there is limited access to health services. Women are at increased risk of zinc deficiency during pregnancy (in part because of high fetal requirements for zinc).

Severe maternal zinc deficiency has been associated with spontaneous abortion and congenital malformations (i.e., anencephaly), whereas milder forms of zinc deficiency have been associated with low birth weight (LBW), intrauterine growth retardation, and preterm delivery. Importantly, milder forms of zinc deficiency have also been related to complications of labor and delivery, including prolonged or inefficient first-stage labor and protracted second-stage labor, premature rupture of membranes (PROM), and the need for assisted or operative delivery. These complications in turn impair maternal and perinatal health because they lead to increased risk of maternal lacerations, high blood loss, maternal infections, fetal distress, stillbirth, neonatal asphyxia (low Apgar scores), respiratory distress, and neonatal sepsis.

It has been suggested that maternal zinc deficiency may compromise infant development and lead to poor birth outcomes. Low plasma zinc concentrations reduce placental zinc transport and may affect the supply of zinc to the fetus. It should be added that dietary zinc insufficiency might not be necessary for adverse effects of zinc deficiency on CNS development to occur. The zinc pool in the mother’s body that is transferred to the fetus is found in maternal plasma. Thus, factors known to influence maternal plasma zinc concentrations (other than chronically low dietary zinc intakes) may elicit the same CNS manifestations in the fetus seen in fetuses of mothers with low dietary intakes of zinc.

Zinc deficiency also alters circulating levels of a number of hormones associated with the onset of labour, and because zinc is essential for normal immune function, deficiency may contribute to systemic and intra-uterine infections, both major causes of pre-term birth. Low birthweight and prematurity are significant risk factors for neonatal and infant morbidity and mortality. It has been hypothesized that zinc supplementation may improve pregnancy outcomes for mothers and infants.

Zinc deficiency leaves the body incapable of fighting pneumonia and diarrhea. Childhood diarrhea especially is a key public health issue in many developing countries. Diarrhea claims the lives of approximately 1.5 million children under the age of five every year nearly one in five child deaths according to UNICEF. The children become dehydrated, losing bodily fluids and nutrients.

**WAYS TO ALLEVIATE ZINC DEFICIENCY**

**SUPPLEMENTATION**

Supplementation programs are useful for targeting vulnerable population subgroups, which are at a particular high-risk of micronutrient deficiencies. The easiest way to supplement zinc could be to include it in programs already delivering daily or weekly nutrient supplements for the prevention of iron deficiency anemia and other micronutrient deficiencies. The recommended zinc dosages are 5 mg/day for children between 7 months and 3 years and 10 mg/day for older children. When formulating multi-nutrient supplements, it is recommended that salts providing readily absorbable zinc, like ZnSO4, zinc gluconate or zinc acetate are used because they are absorbed more efficiently. Supplemental zinc is also recommended as an adjunct therapy during the treatment of diarrhea in children. The recommended daily dosage is twice the age-specific RDA per day for 14 days; that is 10 mg/day for children under 3 years and 20 mg for older children. Several clinical trials have demonstrated that zinc supplements reduce the severity and duration of acute and persistent diarrhea. In 2004, UNICEF and the World Health Organization (WHO) released a joint statement on clinical management of acute diarrhea to recommend zinc supplementation along with oral rehydration salts to treat diarrhea.

* For preterm infants with zinc deficiency, normal breastfeeding is usually sufficient for correction, and the deficit usually resolves within weeks with no clinical symptoms. However, maternal breast milk can be zinc deficient if the mother's stores are depleted. Recommended daily dietary intake for lactating adult women increases from 11 mg per day to 12 mg per day. Also, low maternal secretion can occur. If breast secretion is low, the infant will need supplemental replacement.

As important as the provision of zinc supplementation is in saving the lives of children, it is only a short-term solution. A sustainable solution is the systematic inclusion of zinc in the food consumed in developing countries. This can be done through several means:

1. **DIETARY DIVERSIFICATION/MODIFICATION:** Dietary diversification or modification is a sustainable long-term approach to improving the intake of several nutrients simultaneously. Dietary diversification or modification strategies at the community or household level have the potential to increase the intake of bio-available zinc.
2. **FOOD FORTIFICATION:** which is the addition of nutrients to commonly eaten foods, beverages or condiments. Food fortification has played a major role in eliminating micronutrient deficiencies in industrialized countries. Infant formulas, infant cereals and ready-to-eat breakfast cereals are often fortified with zinc. Mexico is presently conducting a national, voluntary zinc-fortification program, where zinc and other micronutrients are added to wheat and corn flours used for preparing bread and tortilla. Mexico has also developed a fortified, milk-based beverage mix for pregnant and lactating mothers.
3. **BIOFORTIFICATION:** which is the use of zinc fertilizers to increase the zinc content and yield of cereal grains. Leading work has been done in Turkey, India and a few other countries on the results of zinc-fortified fertilizers on increased production, food security and improved human health. Among the most outstanding conclusions has been the fact that bio-fortification of rice and wheat grain with zinc may save the lives of up to 48,000 children annually in India.
4. **PLANT BREEDING:** which is developing varieties of corn, barley and rice with significantly lower levels of phytate and/or the ability to take up more zinc. When adults received a corn-based diet in which the phytate content was reduced by more than 55%, the average zinc absorption increased by 78%.
5. **AGRICULTURAL INTERVENTIONS:** focused on plant-based foods may have little impact on intake of bio-available zinc. Some benefit may be realized if accompanied by processing strategies to reduce the levels of substances that inhibit zinc absorption, such as phytate, however, this is likely to be insufficient to meet zinc needs of infants and young children.
6. **PROMOTION OF SMALL LIVESTOCK HUSBANDRY AND AQUACULTURE THAT WILL IMPROVE THE AVAILABILITY OF ZINC-RICH FOODS:** animal husbandry efforts that increase red meat or liver consumption by infants and young children can have a positive impact. Milk and cheese are also important sources of dietary zinc. These foods generally have a higher content of readily absorbed zinc than poultry, eggs, or fish. Nutrition education to promote dietary diversification or modification can lead to greater intakes of animal-source foods and thus bioavailable zinc.
7. **OTHER LONG-TERM STRATEGIES:** include genetic modification of plants to increase their level of absorbable zinc.

The overall nutritional status of the mother during pregnancy is a significant contributor to both maternal and perinatal mortality and morbidity and improving the quality, or nutrient density, of the mother’s diet is known to improve pregnancy outcomes.