EDITORIAL

Micronutrients In Pregnancy- An Often Neglected Issue

Pregnancy is a period of increased metabolic demand with changes in the woman's physiology and the requirements of a growing fetus . During this time, inadequate stores or intake of vitamins or minerals, referred to collectively as micronutrients, can have adverse effects on the mother, such as anemia, hypertension, complications of labor and even death[1]. Furthermore, the fetus can be affected, resulting in stillbirth, pre-term delivery, intrauterine growth retardation, congenital malformations, reduced immunocompetence and abnormal organ development. Recent research suggests that even after the period of infancy, the health of the child and the adult can be influenced by the foetal period. Coronary heart disease, hypertension and type 2 diabetes are thought to originate, in part, from impaired intra-uterine growth and development. These diseases may be a consequence of "programming" whereby a stimulus or insult at a critical, sensitive period early in life has permanent effects on structure, physiology and metabolism [2].

During pregnancy, metabolic changes occur that protect the mother and her pregnancy through an increased metabolic efficiency. The foetus is also relatively protected at the cost of the nutritional status of the mother For micronutrients, similar mechanisms seem to be in place. In a deficiency state of the mother, the foetus will be in part protected with a higher stress on the mother.

Micronutrients :

Iron : Iron is one of the major trace element required during pregnancy from conception, throughout the pregnancy and during lactation. Iron deficiency can cause maternal anaemia , preterm labour and low birth weight[3]**.** Increased iron requirements in pregnancy are not often met by changes in diet or absorption. Iron supplementation during pregnancy has been shown to improve iron stores and reduce anemia**,** which might be expected in turn to reduce the risk of death from complications of pregnancy, such as hemorrhage and also morbidities like sepsis. The recommended daily intake of iron for pregnant women is 27 mg/day.Good dietary sources of iron (more than 2mg/serve) include liver, beef ,fortified cereals, cashew nuts, baked beans etc.Iron supplementation during pregnancy has been recommended by national and international bodies and has become the standard of care in most setting.

Zinc : Zinc deficiency has been associated with complications of pregnancy and delivery, such as pre-eclampsia, premature rupture of membranes, and pre-term delivery, intrapartum haemorrhage, infections and prolonged labour and with fetal growth retardation and congenital abnormalities [4]**.** Trials in developing countries have found that babies whose mothers were given zinc supplements in pregnancy have improved immune function and a reduction in diarrhea and respiratory illnesses in infancy, suggesting effects on immune competence that persist beyond birth [5]**.** Recommended dose in pregnancy is 11mg/day and 12 mg/day during lactation. Firm evidence to warrant a supplement during pregnancy is, however, still lacking.

Iodine : Iodine deficiency during pregnancy is responsible for development defects of the foetus, cretinism and possibly fetal wastage or pre-term delivery, mental retardation, deaf mutism, spastic diplegia, squint, hypothyroidism and dwarfism and the pathologies associated with endemic goitre. Iodine supplementation studies have shown beyond doubt that supplementing iodine during pregnancy can reverse the described abnormalities**.** Maternal health seems not directly affected by iodine deficiency. Salt fortification is now widely practiced throughout the world with an impressive decrease in associated morbidity [6]**.** Recommended dose is >220 micro gram/day. Food sources are sea fish, shellfish, cereals, and grains and fortified salt.

Magnesium : Magnesium is an essential mineral needed in relatively large amounts by humans. In a number of

retrospective studies magnesium levels during pregnancy were found to be associated with the risk of seizures in pre-eclampsia, prematurity, preterm labour and low birth weight [7]. Unfortunately the authors of the Cochrane review concluded that there is at present not enough evidence to show that dietary magnesium supplementation during pregnancy is beneficial.

Selenium : Selenium is thought to have an antioxidant property. Deficiency can result in osteoarticular disorders, cardiac enlargement arrhythmia, heart failure. It may increase risk of cretinism. Recommended dose during pregnancy is 65 microgram/day and to 70 microgram/day during lactation .Food sources are nuts, beef, meat, fish, egg, bread.

Calcium : Deficiency of calcium, may also be associated with abnormal fetal development, pregnancy induced hypertension, and preterm delivery [8]. Adequate calcium supplementation during pregnancy lactation is essential for fetal bone mineralization. A number of observation studies led to the hypothesis that an increase in calcium intake during pregnancy might reduce the incidence of high blood pressure and pre-eclampsia among women with low calcium intake [9]. Recommended dose during pregnancy is 1000-1500 mg/ day. Food sources are yoghurt, cheese, milk and milk product, orange juice, etc

Vitamin A : Vitamin A deficiency during gestation can lead to fetal wastage, growth retardation, preterm birth, low birth weight, placental abruption, although high doses of vitamin A in early pregnancy can be teratogenic as well [10]. In a large vitamin A supplementation trial in Nepal on 44646 women were followed [11] and showed that weekly vitamin A or beta-carotene supplements reduced maternal mortality by 50%. In women at risk of pre-eclampsia a supplement does have a benefit. Vit .A supplementation can increase the hemoglobin concentration by about 4 gm/L in marginally deficient maternal population .In situations where women are deficient it is warranted to correct the deficit to protect the newborn on breast milk. In the first months of life daily intake of 800 microgram is recommended.

Folic Acid : Folate is critically important for foetal development. It is a cofactor essential in the ultimate methylation process of DNA. Interference with DNA synthesis gives rise to abnormal cell division specially rapidly dividing cells, such as those in the haematopoetic system, One of the clinical manifestations of folate deficiency is macrocytic anaemia . There is no doubt that folic acid deficiency is directly linked to neural tube defects. A recent Cochrane review [12] reveals that periconceptual folate supplementation reduced the incidence of neural tube defects by as much as 70% (odds 0.28 C.I. 0.15-0.53). Women with habitual abortions and who have given birth to offspring with neural tube defects had a higher prevalence of hyperhomocysteinemia [13]. Folate supplements reduce significantly the homocysteine concentrations. Limited data suggest that folic acid supplementation of pregnant women may improve fetal growth and reduce the incidence of low birth weight. Improvement in food quality and the use of fortified products seem the only effective strategy. Daily recommended dose is 600 microgram/day .

Vitamin D : Vitamin D helps in absorption of calcium and phosphorus from dietary intake which are required for stimulating bone formation of the fetus. Deficiency of Vit D during pregnancy may result in an infant with rickets or type 1 diabetes mellitus [14]. Recommended daily intake during pregnancy and lactation is 5 microgram/day. Food sources are cod liver oil, milk, oily fish, eggs, cereals.

Vitamin C : Vit.C stimulates better absorption of iron and therefore helps to reduce the risk of maternal anemia .As an antioxidant it guards the body against injurious free radicals. A few studies have shown that vitamin C deficiency plays a role in some pregnancy complications, such as premature rupture of membranes (PRM) and pre-eclampsia). Two such recent trial found that provision of vitamins C and E resulted in a 60 % lowering the rate of preeclampsia [15].The recommended daily intake in pregnancy is 60 mg/day. Dietary sources are various fruits, and vegetables.

Vitamin B group : (1) Vitamin B1 (Thiamine), (2) Riboflavin(B2) , (3) Nicotinic acid (B3), (4) Vitamin B6, (Pyridoxine), (5) Vitamin B12 (Cobalamin)

The group of B vitamins is essential for enhancing the immune system as well as reducing the plasma

concentration of homocysteine which may lead to pre-eclampsia, premature birth, and low birth weight. A recent controlled trial in HIV-infected women using high-dose B vitamins, as well as vitamins C and E, found reductions in intrauterine growth retardation and pre-term births, as well as a reduction in perinatal mortality [16]. Dietary sources are animal products including meat, eggs, fish .and milk. Daily recommended doses are: vit. B1-1-4 mg/day, Vit .B2-1.4mg/day, Vit B3-18mg/day. VitB6-1.9mg/day, Vit.B6-1.9mg/day, Vit B12-2.6microgram/day and folate-600 microgram/day.

There is a large body of evidence supporting the concept that deficiencies in micronutrients adversely affect maternal health and pregnancy outcome. It is important to underline here that not one micronutrient alone is responsible for these adverse effects. . It is therefore very unlikely that the supplementation or correction of one deficiency will yield high effects, as long as other deficiencies remain. For some deficiencies the maximum effect of correction is found when this happens in early pregnancy. For folic acid the supplement should ideally be given before conception and the highest effects of an iron supplement can be expected when taken in the first trimester. In developing countries unfortunately women usually don't consult for a pregnancy until well in the second half of pregnancy.

It seems thus that apart from an iodine fortification program, there is little scope for improving the micronutrient status of pregnant women with supplementation programs alone. Hope of achieving an improvement must lie in upgrading the nutritional status of women of childbearing age in general and providing nutritional advice during pregnancy. A nutrition approach should be integrated in antenatal care programs and they will need an intersectoral approach given the multicausal nature of the problem. In addition, more attention should be focused on dietary approaches, including fortification of foods with micronutrients, which may prove to be more beneficial and sustainable than provision of supplements during pregnancy. Additional research is needed on the possible beneficial and harmful effects of multiple or more selective micronutrient supplements in pregnancy before universal recommendations can be made for developing country populations.

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