Issue 1

PLUS PLUS

Multiple Micronutrient Supplementation in Pregnancy

FIRST 1000 DAYS of Nutrition
Last a lifetime.

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Importance of micronutrients and vitamins in pregnancy

Pregnancy is a crucial period associated with several physiological adjustments that prepare the mother and her offspring for delivery.[1] Maternal nutrition in the prenatal period is an important determinant of maternal health, fetal growth and development.[2] Although the need for meeting nutritional requirements during pregnancy through a healthy diet including recommended quantities of different macro- and micronutrients, along with vitamins cannot be overemphasized, some nutritional requirements often cannot be supplemented through diet alone; supplements of micronutrients and multivitamins are therefore often prescribed to alleviate the nutritional deficiencies.[3]

First 1,000 days of nutrition: Critical window for child's optimum health and development

The first 1000 days of life refers to the period from conception through the child's second birthday.[4] This period is very crucial for the growth and development of the fetus and child and its long-term health outcomes.[5] Adequate nutrition and care during this time is vital for supporting critical periods of fetal growth and development, maternal health, and for promoting infant and toddler growth. Failure to provide key nutrients during the first 1000 days of life can result in developmental shortfalls such as a lifelong deficit in brain function and chances of developing nutrition-related non-communicable diseases.[4,5]

Maternal changes and key nutrients required during first 1000 days of life[4]

Day 25	100	140	280	Birth	310	370	640	1000
1st Trimester ↑↓ Hormone levels ↑ Metabolic rate ↑ Oxygen demand ↑ Blood volume ↑ Nutrient demands	**2nd Trimester** ↑ Cardiac output ↑ Hormone levels ↓ Insulin sensitivity		**3rd Trimester** ↑ Calcium absorption ↑ Plasma volume ↓ Sleep		**0-3 months Postpartum** • ↑ Breast-feeding support • Postpartum recovery • Risk of depression • Changes in hormones	**3-12 months Postpartum** • ↓ Caloric intake • ↑ Stress and lack of sleep • Backaches • Restored muscle tone and connective tissue	**12-24 months Postpartum** • Continued breast-feeding and nutrition support • Exercise • Balanced diet	
1st Trimester Folate, Iodine, Vitamin D	**2nd Trimester** Carotenoids, Folate, Iron, Omega-3		**3rd Trimester** Calcium, Carotenoids, Iodine, Iron, Omega-3, Vitamin D		**Postpartum** Calcium, folate, iron, omega-3s, vitamin D			

Lancet. 2013 Aug 10;382(9891):486-7.
Pediatrics. 2018;141(2): e20173716.

Common nutritional deficiencies in pregnancy: The menace of hidden hunger

Hidden hunger is referred to as the presence of nutritional deficiencies, which can occur without a deficit in energy intake as a result of consuming an energy-dense, but nutrient-poor diet.[6,7] The nutritional deficiency manifests in the form of micronutrient deficiencies, or the lack of essential vitamins and minerals that the body needs to sustain life.[6] The burden of hidden hunger during pregnancy remains an important concern since pregnancy is associated with physiologic changes that result in decreased concentrations of circulating nutrient-binding proteins and micronutrients.[8,9]

Several reports have confirmed increase in the requirement of many micronutrients and vitamins in pregnancy.[1] Anemia due to iron deficiency is one of the most prevalent micronutrient deficiencies globally.[10] In the Indian population, the prevalence of anemia has been estimated to range from 33% to 89% among pregnant women.[11] Anemia during pregnancy has been found to be associated with increased risk of maternal mortality, perinatal mortality, and infants with low birthweight (LBW).[10]

Multiple micronutrient deficiencies: A growing concern for perinatal health

Besides the high prevalence of iron deficiency, data from developing nations have shown that multiple micronutrient (MMN) deficiencies including those of, but not limited to, vitamin A, zinc, vitamin B12, iodine and folate often coexist among women of reproductive age. They are exacerbated in pregnancy due to the increased demands of the developing fetus, leading to potentially adverse effects on the mother and baby.[10,12] Data accrued from studies conducted among pregnant women in India suggest the prevalence of zinc deficiency to be 37%, vitamin A deficiency to be 27%, and vitamin D deficiency to be more than 90%.[13-15]

Short- and long-term consequences of maternal MMN deficiency

Inadequate maternal micronutrient status during the second and third trimesters of pregnancy might compromise birth size. Nutritional inadequacies of the developing fetal brain and central nervous system might compromise neurological development, function and cognition. Inadequate maternal nutritional status, including micronutrients, increases the risk of poor birth outcomes, and chronic disease in the offspring; and obesity, hypertension, and mortality in the mother (Table 1).[2,9]

Estimated prevalence of micronutrient deficiencies in pregnant women[11,13-15]

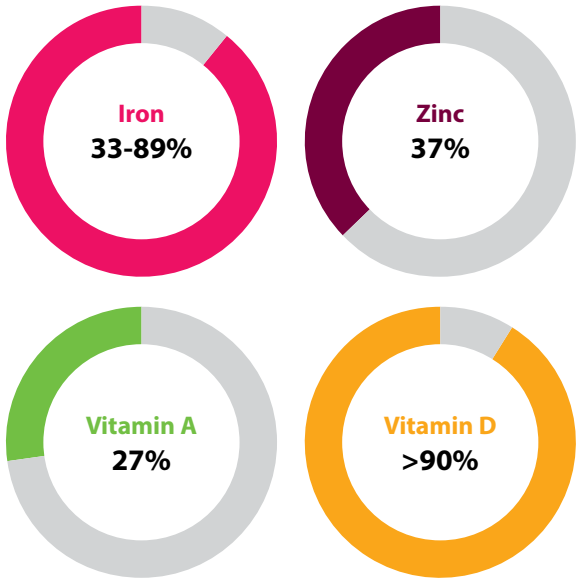

Table 1: Short- and long-term consequences of maternal MMN deficiency[2,9]

Short-term consequences
› Spontaneous or recurrent pregnancy loss
› Increased risk of congenital anomalies
› Compromised birth size
› Compromised neurological development, function and cognition
› Increased risk of preterm delivery
› Postnatal micronutrient deficiency
Long-term consequences
› Potential cardiovascular consequences
› Potential risk of altered blood pressure, kidney function, and insulin resistance
› Compromised cognitive, motor, and socio-emotional development of offspring
› Increased risk of poor birth outcomes and chronic disease in the offspring
› Increased risk of obesity, hypertension, and mortality in the mother

Table 2: The United Nations International Multiple Micronutrient Antenatal Preparation (UNIMMAP) formulation[10,19,20]

Micronutrient	Dose
Vitamin A	800 µg
Vitamin D	200 IU
Vitamin E	10 mg
Niacin	18 mg
Folic acid	400 µg (0.4 mg)
Vitamin B1	1.4 mg
Vitamin B2	1.4 mg
Vitamin B6	1.9 mg
Vitamin B12	2.6 µg
Vitamin C	70 mg
Zinc	15 mg
Iron	30 mg
Selenium	65 µg
Copper	2 mg
Iodine	150 µg

How to correct MMN deficiency in pregnancy?

A daily prenatal multivitamin is generally recommended before conception and during pregnancy.[16] However, the problem of hidden hunger, coupled with an increased prevalence of MMN deficiency and associated adverse pregnancy outcomes, underscore the need to provide MMN supplementations rather than single preparations during the perinatal period to ensure smooth and successful pregnancy outcomes.[17] In fact, combining different micronutrients necessary for pregnancy into one supplement has been suggested as a cost-effective way to achieve multiple benefits for women during pregnancy.[10,12]

The WHO at present recommends providing MMN supplements to pregnant women from populations with a high prevalence of maternal nutritional deficiencies, thus reducing the risks of LBW and small for gestational age (SGA) compared to iron-folic acid supplementation alone.[18] The evidence derives from trials using the widely available United Nations International Multiple Micronutrient Antenatal Preparation (UNIMMAP), which contains 15 micronutrients including 10 vitamins and 5 minerals (Table 2).[10,19,20] The MMN supplement based on the UNIMMAP formula provides women and their offspring with a healthy start to life in an efficacious, safe, and cost-effective way.[21]

Evidence-based efficacy for MMN supplementation

In a Cochrane review,[4] prospective randomized controlled trials evaluating MMN supplementation with iron and folic acid during pregnancy and its effects on the pregnancy outcome were evaluated. Results showed that pregnant women who received MMN supplementation had fewer LBW and SGA babies. Findings from another recently conducted Cochrane review[10] suggest a positive impact of MMN supplementation with iron and folic acid on several birth outcomes. MMN supplementation in pregnancy led to a reduction in babies considered LBW, and a likely reduction in babies considered SGA, and preterm births.

In a double-blind cluster-randomised trial,[22] it was observed that infants of women consuming MMN supplements had an 18% reduction in early infant mortality compared with those of women given iron and folic acid. Combined fetal loss and neonatal deaths were reduced by 11%. There was also a 14% decreased risk of LBW for those in the MMN group.

Conclusion

Pregnancy represents a period of major physiological and metabolic adjustments, aiming to ensure proper fetal growth and development. Adequate nutrition during the first 1000 days of life is necessary for the growth and development of the fetus and child and its long-term health outcomes. Consuming an energy-dense, but nutrient-poor diet, as is the case with a typical Indian meal, often leads to nutritional deficiencies or lack of essential vitamins and minerals that the body needs to sustain life.

Supplements of micronutrients and multivitamins are often prescribed to alleviate the nutritional deficiencies. Combining different micronutrients necessary for pregnancy into one supplement has been suggested as a cost-effective way to achieve multiple benefits for women during pregnancy. Findings from a large number of studies suggest a positive impact of MMN supplementation with iron and folic acid on several birth outcomes. ***MMN supplementation of pregnant women represents an effective approach to reduce both maternal and fetal adverse outcomes compared to iron-folic acid supplementation alone***.

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