

Nutrition and pregnancy

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Nutrition and pregnancy refers to the nutrient intake, and dietary planning that is undertaken before, during and after pregnancy. Nutrition of the fetus begins at conception. For this reason, the nutrition of the mother is important from before conception (probably several months before) as well as throughout pregnancy and breast feeding. An ever-increasing number of studies have shown that the nutrition of the mother will have an effect on the child, up to and including the risk for cancer, cardiovascular disease, hypertension and diabetes throughout life.

An inadequate or excessive amount of some nutrients may cause malformations or medical problems in the fetus, and neurological disorders and handicaps are a risk that is run by mothers who are malnourished.^[1] 23.8% of babies worldwide are estimated to be born with lower than optimal weights at birth due to lack of proper nutrition.^[2] Personal habits such as smoking, alcohol, caffeine, using certain medications and street drugs can negatively and irreversibly affect the development of the baby, which happens in the early stages of pregnancy.^[3]

Caffeine is sometimes assumed to cause harm to the unborn baby but there is not enough evidence to say if this is true.^[4] A recent review showed that more research is needed to show whether caffeine intake effects birth weight, preterm births, gestational diabetes and other outcomes.^[4]



Pregnant woman eating fruit.

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Nutrition before pregnancy

Beneficial pre-pregnancy nutrients

As with most diets, there are chances of over-supplementing, however, as general advice, both state and medical recommendations are that mothers follow instructions listed on particular vitamin packaging as to the correct or recommended daily allowance (RDA). Daily prenatal use of iron substantially improves birth weight, potentially reducing the risk of Low birth weight.^[5]

- Folic acid supplementation is recommended prior to conception, to prevent development of spina bifida and other neural tube defects. It should be taken as at least 0.4 mg/day throughout the first trimester of pregnancy, 0.6 mg/day through the pregnancy, and 0.5 mg/day while breastfeeding in addition to eating foods rich in folic acid such as green leafy vegetables.^[6]
- Iodine levels are frequently too low in pregnant women, and iodine is necessary for normal thyroid function and mental development of the fetus, even cretinism. Pregnant women should take prenatal vitamins containing iodine.^[7]
- Vitamin D levels vary with exposure to sunlight. While it was assumed that supplementation was necessary only in areas of high latitudes, recent studies of Vitamin D levels throughout the United States and many other

countries have shown a large number of women with low levels. For this reason, there is a growing movement to recommend supplementation with 1000 mg of Vitamin D daily throughout pregnancy,^[8] vitamin D is necessary to prevent rickets, a disease causing weak bones.

- A large number of pregnant women have been found to have low levels of vitamin B12, but supplementation has not yet been shown to improve pregnancy outcome or the health of the newborn, although there are suspicions.^[9]
- Polyunsaturated fatty acids, specifically docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) are very beneficial for fetal development. Several studies have shown a small drop in preterm delivery and in low birth weight in mothers with higher intakes.^{[10][11]} The best dietary source of omega-3 fatty acids is oily fish. Some other omega-3 fatty acids not found in fish can be found in foods such as flaxseeds, walnuts, pumpkin seeds, and enriched eggs.^[12]
- Iron is needed for the healthy growth of the fetus and placenta, especially during the second and third trimesters. It is also essential before pregnancy for the production of hemoglobin. There is no evidence that a hemoglobin level of 7 grams/100 ml or higher is detrimental to pregnancy, but it must be acknowledged that maternal hemorrhage is a major source of maternal mortality worldwide, and a reserve capacity to carry oxygen is desirable. Evidence shows that giving 100 mg of elemental iron three times weekly is adequate during pregnancy.^[13]

Nutrition during pregnancy

During the early stages of pregnancy, since the placenta is not yet formed, there is no mechanism to protect the embryo from the deficiencies which may be inherent in the mother's circulation. Thus, it is critical that an adequate amount of nutrients and energy is consumed.

Multiple micronutrient supplements taken with iron and folic acid can improve birth outcomes for women in low income countries.^[14] These supplements reduce numbers of low birth weight babies, small for gestational

age babies and stillbirths in women who may not have many micronutrients in their usual diets.^[14] Undernourished women can benefit from having dietary education sessions and, balanced energy and protein supplements.^[15]

A review showed that dietary education increased the mother's protein intake and helped the baby grow more inside the womb.^[15] The balanced protein and energy supplement lowered risk of stillbirth and small babies and increased weight gain for both the mother and baby.^[15] Although more research is needed into the longer term effects on the mothers' and infants' health, the short term effects look promising.^[15]

Supplementing one's diet with foods rich in folic acid, such as oranges and dark green leafy vegetables, helps to prevent neural tube birth defects in the fetus. In addition, prenatal vitamins typically contain increased amounts of folic acid, iodine, iron, vitamin A, vitamin D, zinc, and calcium over the amounts found in standard multi-vitamins.^[16]

Zinc supplements have reduced preterm births by around 14% mainly in low income countries.^[17] No other benefits were seen^[18]. The World Health Organisation does not routinely recommend zinc supplementation for pregnant women because there is not enough good quality evidence.^[18]

For women with low calcium diets, taking calcium supplementation can reduce their risk of preeclampsia.^[19] It has also been suggested that calcium can reduce numbers of births that happen before the 37th week of pregnancy (preterm birth).^[20] However a more recent review looking into other benefits of calcium supplementation did not find any improvement in numbers of preterm or low birth weight babies.^[21] There is not enough good quality research to suggest best doses and timing of calcium supplementation.^[22]

Pregnant women are advised to pay attention to the foods they eat during pregnancy, such as soft cheese and certain fish, in order to reduce the risk of exposure to substances or bacteria that may be harmful to the developing

fetus. This can include food pathogens and toxic food components, alcohol, and dietary supplements such as vitamin A and potentially harmful pathogens such as listeria, toxoplasmosis, and salmonella.^[23] Dietary vitamin A is obtained in two forms which contain the preformed vitamin (retinol), that can be found in some animal products such as liver and fish liver oils, and as a vitamin A precursor in the form of carotene, which can be found in many fruits and vegetables.^[23] Intake of large amounts or, conversely, a deficiency, of retinol has been linked to birth defects and abnormalities.^[24] It is noted that a 100 g serving of liver may contain a large amount of retinol, so it is best that it is not eaten daily during pregnancy. Excessive amounts of alcohol have been proven to cause fetal alcohol syndrome. The World Health Organization recommends that alcohol should be avoided entirely during pregnancy, given the relatively unknown effects of even small amounts of alcohol during pregnancy.^[25] Although seafood contains high levels of Omega-3 fatty acids which are beneficial for both mother and the baby, but there is no consensus on consuming seafood during pregnancy. Pregnant women are advised to eat seafood in moderation.^[26]

Folic acid

Folic acid, which is the synthetic form of the vitamin folate, is critical both in pre-and peri-conception.^[23] Deficiencies in folic acid may cause neural tube defects; women who had 0.4 mg of folic acid in their systems due to supplementing 3 months before childbirth significantly reduced the risk of NTD within the fetus.^[27] The development of every human cell is dependent on an adequate supply of folic acid. Folic acid governs the synthesis of the precursors of DNA, which is the nucleic acid that gives each cell life and character. Folic acid deficiency results in defective cellular growth and the effects are most obvious on those tissues which grow most rapidly.^[28]

Water

During pregnancy, one's mass increases by about 12 kg.^[29] Most of this added weight (6 to 9 L) is water^[29] because the plasma volume increases, 85% of the placenta is water^[30] and the fetus itself is 70-90% water. This means that hydration is an important aspect of nutrition throughout pregnancy. The European Food Safety Authority recommends an increase of 300 mL per day compared to the normal intake for non-pregnant women, taking the total adequate water intake (from food and fluids) to 2,300 mL, or approximately 1,850 mL/ day from fluids alone^[31]

Nutrition after pregnancy

Proper nutrition is important after delivery to help the mother recover, and to provide enough food energy and nutrients for a woman to breastfeed her child. Women having serum ferritin less than 70 µg/L may need iron supplements to prevent iron deficiency anaemia during pregnancy and postpartum.^{[32][33]}

During lactation, water intake may need to be increased. Human milk is made of 88% water, and the IOM recommends that breastfeeding women increase their water intake by about 300 mL/day to a total volume of 3000 mL/day (from food and drink); approximately 2,400 mL/day from fluids.^[34]

See also

- Smoking and pregnancy
- Prenatal nutrition

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Further reading

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