

Good clinical practice advice: Micronutrients in the periconceptional period and pregnancy[☆]

FIGO Working Group on Good Clinical Practice in Maternal–Fetal Medicine^{*,a}

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PREMISE

This advice elaborates the pivotal recommendations produced by the FIGO Working Group on Adolescent, Preconception and Maternal Nutrition, chaired by Professor Mark Hanson. This represents a short summary concerning the area of micronutrients.

Considering that the amount of calories required for a typical pregnancy is small, some nutrient requirements are relatively large.^{1,4} Thus, pregnant women should focus on increasing high-quality, nutrient-dense foods and attempt to limit intake of processed empty-calorie foods and beverages.^{5,6} The key components of a healthy diet during pregnancy are appropriate weight gain (Table 1)^{7,8}; appropriate vitamin and mineral supplementation^{1,4}; avoidance of alcohol, tobacco, and other harmful substances⁶; and safe food handling.²

Supplementation refers to the direct provision of vitamins and minerals above which could be supplied by diet. Supplements can be given daily or intermittently (i.e. once, twice, or three times a week on non-consecutive days).⁹ Multiple micronutrient supplements should be recommended for pregnant women who do not consume an adequate diet.^{1,4} Although well-nourished women may not need these supplements to satisfy daily requirements, it is recommended that in the absence of careful evaluation by a nutritionist, indication should be prudent.^{2–4,8} Currently, supplementation efforts are focused on the provision of iron, folic acid, iodine, and multiple micronutrient formulations.^{1,4}

FIGO recommends the following (Boxes 1 and 2):

1. Consultation with a healthcare professional trained in providing advice on nutrition, such as a registered dietitian with special training in maternal nutrition, is appropriate and recommended for women with special nutritional needs, such as vegetarian and vegan diet, multiple gestation, obese and overweight pregnant women, and prior history of bariatric surgery, diabetes, hypertension, and gastrointestinal disorders.³

2. All pregnant women should take continuous or intermittent iron supplementation (1–3 times per week) of 30 mg/d starting at the first prenatal visit or as soon as possible to reduce the risk of anemia and low birth weight.^{2,4}
3. Women with iron deficiency anemia (defined as hemoglobin <11 g/dL at any stage) should receive an additional iron supplement of 30–120 mg per day until anemia is corrected.^{9,11}
4. Iron absorption decreases with increasing dose; thus, larger supplementation amounts are best split into several doses during the day. Iron absorption can be enhanced by association with vitamin C.^{9,10}
5. Women who plan to become pregnant or who are of childbearing age and not using a contraceptive method, and women who do not have risk factors for neural tube defects, should take 400 µg (0.4 mg) of synthetic folic acid beginning at least 30 days before

TABLE 1 Recommendations for pre-pregnancy weight and gestational weight gain.

Body mass index (kg/m ²)	Weight gain	
	kg	lb
<18.5 (underweight) ^a	12.5–18.0	28–40
18.5–24.9 (normal weight)	11.5–16.0	25–35
25.0–29.9 (overweight)	7.0–11.5	15–25
≥30.0 (obese) ^b	5.0–9.0	11–20

^aThe International Federation of Gynecology and Obstetrics (FIGO) recommends that healthcare professionals take action to ensure appropriate gestational weight gain in relation to pre-pregnancy body mass index. Nevertheless, this should not be overemphasized at the expense of important assessments, such as blood pressure measurement, urine testing for protein, and abdominal examination, to avoid unnecessary overconsumption.

^bEvidence shows that current weight gain recommendations are excessive. However, there is no consensus on which target to recommend. Therefore, the most accepted targets are maintained by FIGO, although it may be appropriate to amend these targets soon.

Box 1 FIGO advice regarding administration of multiple micronutrient supplements.^a**Population**

- Pregnant women

Recommendation: Daily multiple micronutrient supplements

- General counseling
 - Consultation with a nutritionist, such as a registered dietitian is appropriate and recommended for women with special nutritional considerations, such as vegetarian or vegan diet, multiple gestation, obese and overweight, prior history of bariatric surgery, diabetes, hypertension, gastrointestinal disorders, and other conditions
 - Pregnant women taking a multiple micronutrient vitamin should be advised to take no more than one daily dose of multiple micronutrient supplement, as indicated on the product label
- Iron
 - Pregnant women should take continuous or intermittent iron supplementation (one to three times per week) of 30 mg per day starting at the first prenatal visit or as soon as possible for preventing anemia at term
 - Iron absorption can be enhanced by association with vitamin C
- Folic acid
 - Women who plan to become pregnant or who are at childbearing age and not using a contraceptive method, and women who do not have risk factors for neural tube defects, should use 400 µg (0.4 mg) of synthetic folic acid
 - Women who have had a previous pregnancy affected by neural tube defects should be advised to take 4000 µg per day (4.0 mg). For both regimens, supplementation must begin at least 30 days before conception and be continued daily throughout the first trimester of pregnancy
 - Folic acid supplementation after the first trimester might be considered in order to prevent the decline in serum folate. The dose should be up to 0.6 mg per day. A higher dose must be avoided
- Iodine
 - Women who are planning pregnancy and those who are pregnant should supplement their diet with a daily oral multiple micronutrient supplement that contains 150 µg of iodine in the form of potassium iodide
 - Pregnant women should be encouraged to routinely use iodized salt (containing 95 µg of iodine per one-quarter teaspoon) if it is available
- Calcium
 - There are no clear additional benefits of calcium supplementation to prevent adverse neonatal outcomes
 - While the benefit is uncertain, calcium supplementation might be the dose in a standard prenatal multiple micronutrient supplement
- Vitamin D
 - There is insufficient evidence to recommend vitamin D supplementation for prevention of preterm birth and/or pre-eclampsia
 - Screening for vitamin D deficiency (defined as 25-hydroxyvitamin D <20 ng/dL or 50 nmol/L) might be indicated for pregnant women who are vegetarians/vegans or who have limited sun exposure (cold climates, resident in northern latitudes, or wearing of sun and winter protective clothing), and for ethnic minorities
 - Pregnant women can take routine vitamin D supplementation in a standard prenatal vitamin supplementation formula (e.g. between 250 IU and 600 IU per day) until more evidence is available to support a different dose
 - Multiple micronutrient supplements should specify the type of vitamin D, and cholecalciferol (D3) is preferred over ergocalciferol (D2)
- Vitamin A
 - Supplementation is unnecessary when habitual vitamin A intake exceeds three times the recommended dietary allowance (i.e. 8000 IU or 2400 µg retinol equivalents)
 - Pregnant women should avoid multiple micronutrient multivitamin supplements that contain more than 5000 IU (1500 µg) of vitamin A
- Vitamin E
 - Vitamin E supplementation is unnecessary in order to reduce stillbirth, neonatal death, preterm birth, pre-eclampsia, preterm or term premature rupture of membranes, or poor fetal growth

Box 1 (Continued)

- Vitamin C
 - Vitamin C supplementation is unnecessary in order to reduce stillbirth, neonatal death, preterm birth, pre-eclampsia, preterm or term premature rupture of membranes, or poor fetal growth

Abbreviation: FIGO, The International Federation of Gynecology and Obstetrics.

^aThis recommendation does not apply to women who have signs of deficiency of micronutrients or present with other risk factors that determine specific assessment.

Box 2 FIGO advice regarding administration of micronutrient supplements for iron deficiency anemia and vitamin A and D deficiency.**Population**

- Pregnant women
 - Women who have signs of deficiency of micronutrients or present with other risk factors that determine specific assessment
- Iron
 - Women with iron deficiency anemia defined as hemoglobin less than 11 g/dL at any stage should receive an additional iron supplement of 30–120 mg per day until the anemia is corrected
 - Iron absorption decreases with increasing dose; thus, larger supplementation amounts are best split into several doses during the day
 - Iron absorption can be enhanced by association with vitamin C
- Vitamin A
 - In areas where vitamin A deficiency (serum retinol <0.7 mol/L) is endemic, such as Southeast Asia and sub-Saharan Africa, a daily supplement less than 10 000 international units (3000 µg retinol equivalents) or a weekly supplement less than 25 000 IU (8500 µg retinol equivalents) appears to have some maternal and fetal/neonatal health benefits (e.g. reduction in maternal anemia and night blindness with no evidence of teratogenicity) but does not reduce maternal or perinatal mortality, as has been suggested in some early studies^{23,24}
 - Consumption of vitamin supplements containing vitamin A levels higher than 10 000 IU per day (3000 µg retinol equivalents) appears to be teratogenic and should be avoided
- Vitamin D
 - Vitamin D deficiency is treated with 1000–2000 IU per day

Abbreviation: FIGO, The International Federation of Gynecology and Obstetrics.

conception and continue daily supplements throughout the first trimester of pregnancy.¹²

6. Pregnant women thought to be at high risk of having offspring with neural tube defects—such as those with a personal or family history of pregnancy affected by some neural tube defects, use of anticonvulsants, mutation in enzymes related to folate (e.g. *MTHFR*), insulin dependent diabetes, obesity (body mass index >30 kg/m²), malabsorption syndromes, and pregnant women with a history of surgery for obesity—should be advised to take 4000 µg per day (4.0 mg). For both regimens, supplementation must begin at least 30 days before conception and be continued daily throughout the first trimester of pregnancy.¹²
7. Patients should be asked about their use of iodized salt and be informed of the importance of adequate iodine nutrition to ensure optimal thyroid function both before and during pregnancy.^{13,15}
8. Pregnant women should be encouraged to routinely use iodized salt (containing 95 µg of iodine per one-quarter teaspoon), and also consider iodine supplementation.^{2,13,15}
9. Iodine supplementation may be considered for all pregnant and lactating women as a daily oral multiple micronutrient supplement that contains 150 µg of iodine in the form of potassium iodide.^{14,15}
10. Pregnant women can take routine supplementation of zinc in a standard prenatal vitamin supplementation formula until more evidence is available to support a different dose.¹⁶
11. There are no clear additional benefits of calcium supplementation to prevent adverse neonatal outcomes.^{17–20}
12. Currently, there is insufficient evidence to recommend screening of all pregnant women for vitamin D deficiency and vitamin D supplementation for prevention of preterm birth and/or pre-eclampsia.^{21,22}
13. Pregnant women can take routine vitamin D supplementation in a standard prenatal vitamin supplementation formula, of between 250 and 600 IU per day, until more evidence is available to support a different dose.²¹
14. Multiple micronutrient supplements should specify the type of vitamin D, and cholecalciferol (D3) is preferred over ergocalciferol (D2).^{21,22}
15. Screening for vitamin D deficiency (defined as 25-hydroxyvitamin D <20 ng/dL or 50 nmol/L) might be indicated for pregnant women thought to be at high risk of vitamin D deficiency, such

as those who are vegetarians/vegans or who have limited sun exposure (cold climates, resident in northern latitudes, wearing of sun and winter protective clothing), and for ethnic minorities.

16. Vitamin D deficiency is treated with 1000–2000 IU per day.^{2,21,22}
17. Vitamin A supplementation is unnecessary in many countries where habitual vitamin A intake exceeds three times the recommended dietary allowance (i.e. 8000 IU or 2400 µg retinol equivalents).^{2,3,23}
18. Pregnant women should avoid multiple micronutrient multivitamin supplements that contain more than 5000 IU (1500 µg) of vitamin A.^{2,3}
19. Multiple micronutrient supplements should specify the type of vitamin A. β-carotene is preferred over retinol, once high β-carotene intakes have not been related to birth defects.^{2,3,23,24}
20. In areas where vitamin A deficiency (serum retinol <0.7 mol/L) is endemic, such as Southeast Asia and sub-Saharan Africa, a daily supplement of less than 10 000 international units (3000 µg retinol equivalents) or a weekly supplement less than 25 000 IU (8500 µg retinol equivalents) appears to have some maternal and fetal/neonatal health benefits (e.g. reduction in maternal anemia and night blindness with no evidence of teratogenicity) but does not reduce maternal or perinatal mortality, which has been suggested in some early studies.^{23,24}
21. Consumption of vitamin supplements containing vitamin A levels higher than 10 000 IU per day (3000 µg retinol equivalents) appears to be teratogenic and should be avoided.^{23,24}
22. Pregnant women taking a multiple micronutrient vitamin should be advised not to take more than one daily dose of multiple micronutrient supplement, as indicated on the product label.¹²
23. Vitamin E and C supplementation are unnecessary in order to reduce stillbirth, neonatal death, preterm birth, pre-eclampsia, preterm or term premature rupture of membranes, or poor fetal growth.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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