

Iodine Supplementation During Pregnancy and Lactation

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DIETARY IODINE INTAKE IS OBLIGATORY FOR THE PRODUCTION of thyroid hormones. Despite substantial public health advances over the past 3 decades, iodine deficiency currently affects 1.92 billion people globally.¹ Dietary iodine requirements are increased during pregnancy due to increased thyroid hormone production, increased renal iodine losses, and fetal iodine requirements.² Dietary requirements remain increased in lactation due to the concentration of iodine in breast milk.

Adverse effects of iodine deficiency in pregnancy, when the deficiency leads to severe decreases in maternal thyroxine (T_4), include maternal and fetal goiter, cretinism, intellectual impairments, neonatal hypothyroidism, and increased pregnancy loss and infant mortality.³ Decreases in maternal T_4 associated with even mild iodine deficiency may have adverse effects on the cognitive function of offspring, and iodine deficiency remains the leading cause of preventable intellectual disability worldwide.

Iodine Status in the United States

Urinary iodine values are used most frequently to screen for iodine deficiency in populations. Identifying specific individuals at risk for iodine deficiency is not possible due to diurnal and day-to-day variation in urinary iodine excretion. According to World Health Organization (WHO) and International Council for the Control of Iodine Deficiency Disorders (ICCIDD) guidelines, median urinary iodine values for pregnant women between 150 and 249 $\mu\text{g/L}$ (to convert to nmol/L , multiply by 7.880) are consistent with optimal iodine intake.³ US iodine intake decreased by half between the 1970s and 1990s. In the most recent national survey, the median urinary iodine level for pregnant women was only 125 $\mu\text{g/L}$, suggesting that mild iodine deficiency occurs in at least a subset of pregnant US women.⁴

Recommendations for Iodine During Pregnancy and Lactation

The US Institute of Medicine's recommended dietary allowance for iodine is 220 μg per day during pregnancy and 290

μg per day during lactation, higher than the 150 μg per day recommended for nonpregnant adults.⁵ Similarly, WHO and ICCIDD guidelines suggest an iodine intake of 200 to 300 μg per day for pregnant and lactating women.³ Given the decrease in median urinary iodine concentration in the United States and the importance of iodine during pregnancy, the American Thyroid Association (ATA)⁶ and the Neurobehavioral Teratology Society⁷ recommend that all US women who are pregnant, lactating, or planning a pregnancy should ingest dietary supplements containing 150 μg of potassium iodide per day. The Endocrine Society has recently advocated that all daily prenatal multivitamins should contain 150 to 200 μg .⁸ The addition of 150 μg of potassium iodide does not pose a risk, even for women who are iodine replete, because a total iodine intake of as much as 500 to 1100 μg per day is considered safe in pregnancy. Nevertheless, 49% of the different types of prenatal multivitamin brands marketed in the United States contain no iodine⁹ and it is estimated that only 20% of pregnant women in the United States use iodine-containing supplements.¹⁰

The Iodine Conundrum

Many pregnant women in the United States do not receive iodine supplementation during pregnancy or lactation despite current recommendations. The adverse effect of severe iodine deficiency has been well described, along with the beneficial effects of iodine supplementation programs on obstetric outcomes and infant health and development. However, the data regarding iodine supplementation in mildly iodine deficient pregnant women are less robust. Studies suggest that such supplementation is associated with increased maternal urine iodine concentrations, decreased maternal and neonatal thyroid volumes, and decreased neonatal thyroglobulin (a marker of iodine sufficiency). Two of the 3 prospective studies assessing the effects of iodine supplementation for mildly iodine deficient pregnant women have demonstrated improvements in child cognition but all are limited due to lack of randomization and small sample sizes.¹⁰

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The iodine status of pregnant and lactating women in the United States over the next decade is difficult to predict. Nevertheless, recent trends in the United States suggest that median urinary iodine levels will remain constant at best, or may decline further. Public health efforts to limit salt intake to decrease cardiovascular risk, in conjunction with increasing use of kosher salt and sea salt (neither of which contain iodine), may adversely affect median urinary iodine levels. Furthermore, decreasing use of iodate conditioners in bread products and iodophor cleansers in the dairy industry may exacerbate the problem.

The Public Health Conundrum Concerning Iodine and Pregnancy

Median urinary iodine levels in pregnant women have experienced a 50% decline. Many pregnant women in the United States, for whom adequate iodine status is essential for the neurocognitive health of the developing fetus, already have iodine levels less than the lower limit of normal as recommended by the WHO and ICCIDD. The effect of mild maternal iodine insufficiency on fetal health has been shown but studies in this area are limited. However, a randomized placebo-controlled interventional trial in which some pregnant women do not receive iodine is unethical because increased iodine intake during pregnancy is already recommended by the WHO, ICCIDD, the ATA, the Endocrine Society, and the American Congress of Obstetricians and Gynecologists.

What are the appropriate next steps? The status quo can be maintained in which iodine supplementation is recommended, but provided in only 50% of prenatal vitamins. The alternative is for relevant medical organizations (the ATA, Endocrine Society, American Congress of Obstetricians and Gynecologists, the Council for Responsible Nutrition, and others) to work collaboratively with pharmaceutical and vi-

tamin manufacturers to ensure that all prenatal multivitamins contain 150 µg of potassium iodine. In the interim, clinicians should recommend only those prenatal vitamins that contain iodine. The path seems clear. It is time for all prenatal vitamins to contain iodine.

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