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Manual of HIGH-RISK PREGNANCY



Federation of Obstetrics & Gynaecological Societies of India

Richa Baharani
Pushpa Pandey
Shashi Khare
Sushma Dikhit

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Chapter

3 Nutrition in Pregnancy

Roza Olyai, S Sampathkumari

INTRODUCTION

Nutrition in pregnancy is of vital importance as the intake of nutrients and dietary planning has to provide for the bodily requirements of both the mother and the fetus but also take care of the progressive requirement during gestation and the inadequacy will hamper the fetal development and is capable of causing delivery time problem as well as lifelong ailments for the fetus including imminent casualties. Hence, planning for nutrition for the mothers should start before conception continues through gestation and extends up to the period of lactation. An inadequate or excessive amount of some nutrients may cause malformations or medical problems in the fetus, and neurological disorders and handicaps are some of the risks run by malnourished mothers.[1] About 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 in the early stages of pregnancy such as smoking, alcohol, caffeine, use of certain medications and street drugs can negatively and irreversibly affect the developmental process of the baby.[3] Caffeine is also sometimes said to harm the unborn baby, however, there is not enough evidence to say if this is true.[2] There is also a misconception that the patient should eat for two, whereas in reality a right and balanced intake by the mother ensures the appropriate and normal fetal development. The recommended weight gain during pregnancy is based on pre-pregnancy BMI.

Pre-pregnancy BMI	*BMI (kg/m²) WHO*	*Total wt gain (range/kg)*	*Mean range kg/week*
Under weight	<18.5	2.5–18.0	0.50
Normal weight	18.5–24.9	11.5–16.0	0.40
Overweight	25.0–29.9	7.0–11.5	0.27
Obese	>30.0	5.0–9.0	0.23

Source: Institute of Medicine (IOM) Resource sheet, May 2009

Nutrition is important before pregnancy, to prepare the body for the baby during pregnancy to make sure the baby is safe, after birth for lactation and post-delivery to get her body back to healthier state.

ENERGY REQUIREMENTS

Energy requirement during pregnancy comprises weight gain with protein, fat and water. The increase in BMR relative to pre-pregnancy values are 5.3, 11.4, 25.3% during first, second, third trimester.[4] Main source of energy is from carbohydrates (55–65%) from whole grain, legumes, vegetables and fruits.

PROTEIN REQUIREMENTS IN PREGNANCY

Protein is essential to meet the demand for the growth of the fetus, placenta, uterus, breasts, and blood volume. Adequate energy intake is required along with adequate protein intake to allow protein and amino acid to be used for this function. Additional protein is needed during pregnancy and lactation. Appropriate balancing of legumes with cereals advised to increase protein quality and quantity. Sources of protein include beans, pulses, fish, eggs, meat (but avoid liver), poultry and nuts.

If gestational weight gain of 10 kg additional protein required are 0.5,6.9 and 22.7g/day during first, second and third trimesters.[5] Protein intake should be preferably by natural and not commercial high protein supplements. Recommended safe allowance during lactation are 19 g for 1–6 months and 13 g for 6–12 months.

FAT REQUIREMENTS DURING PREGNANCY

Fat provides energy and fatty acids serve as vehicle for fat soluble vitamins and facilitate absorption. During pregnancy in earlier stage fetus uses fatty acid supplied by mother and in later stage makes its own.[6] The minimum daily energy requirement of fat should be 20%. For this, the diet of pregnant women should contain at least 30 g of visible fat and

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200 mg/day of DHA for optimum adult health and fetal development. Polyunsaturated fatty acids, specifically docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) are very beneficial. 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.

CARBOHYDRATE REQUIREMENTS DURING PREGNANCY

Carbohydrate are either simple or complex and major source of energy (50–60% of total calories) simple is from fruits, vegetables, honey, milk and complex from cereals, millets, pulses and root vegetables.[7] Minimum consumption of carbohydrate is 175 g/day to accommodate fetal brain glucose utilization is recommended by IOM.[8]

WATER REQUIREMENTS DURING PREGNANCY

During pregnancy, most of added weight (6–9 L) is water because the plasma volume increases, 85% of the placenta is water 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/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.[9] Water carries nutrients to cells and waste products away, regulates body temperature and aids digestion.

Multiple micronutrient supplements taken with iron and folic acid can improve birth outcomes for women in low income countries. 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. Undernourished women can benefit from having dietary education sessions and, balanced energy and protein supplements.

IRON REQUIREMENTS DURING PREGNANCY

Anemia is a serious health problem affecting all segments of population. About 50% of women do not have adequate iron stores for pregnancy.[10] 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. Iron deficiency leads to perinatal death, preterm delivery, low birth weight, fetal death and in later stage leads to disturbance in cognition, behavior and motor development.

Iron requirements are:

- *ACOG and AAP*: 27 mg of ferrous iron daily.
- *Ministry of Health and Family Welfare, India*: 100 mg of elemental iron + 500 µg of folic acid at least for 100 days in II half of pregnancy.
- *WHO*: 60 mg of iron + 500 µg folic acid.

Daily requirement of iron in pregnancy is:

- 0.8–1 mg in the 1st trimester
- 4–5 mg in the 2nd trimester
- More than 6 mg in the 3rd trimester

The total requirement during lactation is 1.27 mg/day. Pregnant women should take plant foods like green leafy vegetables, legumes, dry fruits, whole egg, meat, poultry, fish, *amla*, guava and citrus fruits. *Salads* along with meals also to be advised. So, iron rich diet and prophylactic tablets should be taken to avoid deficiency. Vitamin C will increase iron absorption.

FOLIC ACID REQUIREMENTS DURING PREGNANCY

Folate is a vitamin B that helps to prevent neural tube defects, serious abnormalities of the brain and spinal cord. The synthetic form of folate found in supplements and fortified foods is known as folic acid. Folic acid supplementation has been shown to decrease the risk of preterm delivery. 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 throughout the pregnancy, and 0.5 mg/day while breastfeeding. Fortified cereals are great sources of folic acid. Leafy green vegetables, citrus fruits, and dried beans and peas are good sources of naturally occurring folate. Chronic and severe forms of folic acid deficiency lead to abnormal hemopoiesis and megaloblastic anemia.

CALCIUM REQUIREMENTS DURING PREGNANCY

Calcium is essential for strong bones and teeth. Calcium also helps in circulatory, muscular and nervous systems function. Normally calcium in bone plays a role in maintaining blood level even in the face of dietary calcium inadequacy. Blood Ca level is maintained within narrow limits by the interplay of vitamin D and several hormones such as parathyroid hormone (PTH), thyrocalcitonin, Cortisol and gender steroids by controlling absorption, excretion and turnover.

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Pregnancy needs 1000 mg/day of calcium. Dairy products are the best absorbed sources of calcium. Non-dairy sources include broccoli and kale. Many fruit juices and breakfast cereals are fortified with calcium. Pregnant and lactating women should take 5 servings of milk and milk products.

VITAMIN D REQUIREMENTS

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.[11] For this reason, there is a growing movement to recommend supplementation with 1000 mg of vitamin D daily throughout pregnancy. Vitamin D is necessary to prevent rickets, a disease causing weak bones.

MAGNESIUM REQUIREMENTS

Magnesium is an important cofactor of many regulatory enzymes. Magnesium is an essential mineral required for regulation of body temperature, nucleic acid and protein synthesis and in maintaining nerve and muscle cell electrical potentials. Magnesium supplementation during pregnancy may be able to reduce fetal growth restriction and pre-eclampsia, and increase birth weight.

Magnesium requirement for pregnant and lactating women is 310 mg/day.

SODIUM REQUIREMENTS

On the basis of average weight gain of 11 kg, of which 70% is water, sodium requirement is 750 mmol (sodium in ECF 145 mmol/L). Sodium need not be restricted during pregnancy, excessive use is not recommended. A diet primarily of natural foods can be safely salted "to taste." Pregnant women should avoid processed or "junk" foods that are high in sodium. Excessive intake of salt can cause high blood pressure (hypertension) and may lead to excessive weight gain. WHO recommends 5 g of salt/day. 1 g of sodium chloride contains 39% sodium. There is no place for dietary sodium restriction in the prevention or treatment of hypertension in pregnancy.

POTASSIUM REQUIREMENTS

Potassium is another very important mineral for both the pregnant and breastfeeding women. Not only does potassium help to maintain the fluid and electrolyte balance but potassium sends important nerve impulses, helps in muscle contraction, maintains blood pressure stable and normal and helps in the release of energy from protein, fat, and carbohydrates.

The current recommendation for pregnant women is 4,700 mg of potassium per day. About 5,100 mg/day when breastfeeding. Needed potassium can be received from beans, lentils, peas, milk, yogurt, bananas, tomato sauce, orange juice, broccoli, cooked green soybeans, cantaloupe, potatoes, spinach, watermelon, sweet potatoes, mushrooms, carrot juice, canned clams, prunes, etc.

IODINE REQUIREMENTS

Iodine is essential for healthy brain development in the fetus and young child. A woman's iodine requirements increase substantially during pregnancy to ensure adequate supply to the fetus. Most foods are relatively low in iodine content. To ensure that everyone has a sufficient intake of iodine, WHO and UNICEF recommend universal salt iodization as a global strategy. Intake of iodine during pregnancy has been increased from 200 to 250 μg/day.

ZINC

Zinc supplements have reduced preterm births by around 14% mainly in low income countries, and it also helps in growth and neurobehavioral development, antioxidant protection and membrane stabilization The World Health Organization does not routinely recommend zinc supplementation for pregnant women. Recommended dietary allowance (RDA) for zinc is 12 mg/day.[12] Fortified cereals and red meat are good sources of this nutrient. Oyster is a rich source of zinc but not used in pregnancy.

THIAMINE

The recommended daily allowance (RDA) for thiamine during pregnancy is 1.4 mg/day regardless of a woman's age. Thiamine, also known as vitamin B_1 enables converting carbohydrates into energy. It is essential for baby's brain development and aids the normal functioning of mothers' nervous system, muscles, and heart.

RIBOFLAVIN

Riboflavin, or vitamin B_2, is an essential vitamin that helps your body to produce energy, promotes growth, good vision, and healthy skin. It is important for baby's bone, muscle, and nerve development. National Research Council (NRC) recommends additional intake of 0.3 mg/day in pregnancy and lactation. Pregnant women: 1.4 mg per day. Milk, bread products, and fortified cereals are all good sources of riboflavin.

NIACIN

Pregnancy and breastfeeding: Niacin and niacinamide are safe for pregnant and breastfeeding women when taken in the recommended amounts. The recommended amount of

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niacin for pregnant or breastfeeding women is 30 mg/day for women under 18 years of age, and 35 mg for women over 18. Found in many foods including yeast, meat, fish, milk, eggs, green vegetables, beans, and cereal grains. Niacin and niacinamide are also found in many vitamin B complex supplements with other B vitamins.

PYRIDOXINE

The recommended dietary allowance (RDA) of pyridoxine (vitamin B_6) for pregnant women is 1.9 mg/day regardless of age. Pyridoxine has been reported to inhibit lactation at large doses. The RDA of pyridoxine (vitamin B_6) for lactating women is 2 mg/day, regardless of age, to ensure a vitamin B_6 concentration of milk of 130 ng/mL. Vitamin B_6 is contained in many foods including meat, poultry, fish, vegetables, and bananas. It is thought that B_6 may play a role in the prevention of pre-eclampsia, where the mother's blood pressure is high with large amounts of protein in the urine or other organ dysfunction, and in babies being born too early (preterm birth). Vitamin B_6 may be helpful for reducing nausea in pregnancy. Vitamin B_6 as oral capsules or lozenges resulted in a decreased risk of dental decay in pregnant women in one trial.

VITAMIN B_{12}

Deficiency of vitamin B_{12} leads to abnormal hemopoiesis leading to megaloblastic anemia as in the case of folic acid deficiency. Neurological manifestation can also occur.

RDA recommendation of B_{12} by ICMR for pregnant women is 1.2 µg/day and for lactating mother is 1.5/day.

VITAMIN C

Vitamin C, also known as ascorbic acid, is essential for tissue repair, wound healing, bone growth and repair, and healthy skin. Vitamin C also helps your body fight infection, and it acts as an antioxidant, protecting cells from damage. Citrus fruits are especially high in vitamin C, but leafy greens and many other fruits and vegetables are excellent sources. RDA for pregnant women is 40 mg/day and lactating women is 80 mg/day.

VITAMIN A

It is well known that vitamin A is an essential nutrient for normal cellular function, including reproduction and development. 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. Intake of large amounts, or, conversely, a deficiency, of retinol has been linked to birth defects and abnormalities. 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

Dose: *Pregnant women:* 19 years and older: about 770 µg RAE of vitamin A (approximately 2,565 IU) per day, pregnant, 18 and younger: 750 mg (2,500 IU).

Breastfeeding women: *19 and older:* 1,300 µg RAE (4,330 IU) Breastfeeding, 18 and younger: 1,200 µg RAE (4,000 IU).

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.

In spite of many nutrients, pregnant women are advised to take fruits, vegetables, greens, milk and needed tablets of folic acid, iron, B_{12} and calcium.

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.

IMPORTANT POINTS

- About 23.8% of babies worldwide are estimated to be born with lower than optimal weights at birth due to lack of proper nutrition.
- Recommended weight gain during pregnancy is based on prepregnancy BMI.
- Protein is essential to meet the demand for the growth of the fetus, placenta, uterus, breasts, and blood volume.
- Protein intake should be preferably by natural and not commercial high protein supplements.
- Polyunsaturated fatty acids, specifically docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) are very beneficial.
- Iron rich diet and prophylactic tablets should be taken to prevent anemia.
- Calcium is essential for strong bones and teeth. Calcium also helps in circulatory, muscular and nervous systems function.
- Deficiency of vitamin B_{12} leads to abnormal hemopoiesis leading to megaloblastic anemia as in the case of folic acid deficiency.
- Alcohol should be avoided entirely during pregnancy, given the relatively unknown effects of even small amounts of alcohol during pregnancy.

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Richa Baharani MD FICOG Dip Endoscopy is Senior Consultant, Department of Obstetrics and Gynecology, Jabalpur Hospital and Research Center, Jabalpur, Madhya Pradesh, India. She has been President, JOGS (2015–16), Vice President, AMPOGS-RPWS (2015–17). During her presidential tenure, she received FOGSI-Mylan Smriti Award, FOGSI Dr DK Tank RCH Trophy for her society. She has wide clinical experience of several years and has keen interest in academics, research and innovation. She believes in empowering women in skill and knowledge. Her fields of special interest are management of high-risk pregnancy, pelvic floor surgery, endoscopic surgery. She believes that learning is a never-ending process.

Pushpa Pandey MD is a Senior Consultant, Department of Obstetrics and Gynecology, Bombay Hospital and Research Center, Jabalpur, Madhya Pradesh, India. She has received National Women Empowerment Award (2015) by FOGSI. She has keen interest in holistic health care of pregnant women. She actively participates in the project on '*Divine Garbh Sanskar for Pregnant Women*' to make fetus physically and mentally healthy and instill *sanskars* from womb. She has authored three books on *Gita, Stress-Free Living* and *Save Girl Child*.

Shashi Khare MBBS MS FICOG FICMCH is Dean, Sukh Sagar Medical College and Hospital, Jabalpur, Madhya Pradesh, India. She was a Former Dean, Professor and Head, Department of Obstetrics and Gynecology, Netaji Subhash Chandra Bose (NSCB) Medical College, Jabalpur, Madhya Pradesh, India. She was a Faculty of Medicine, Rani Durgawati University, Jabalpur. She has 40 years of teaching experience for undergraduates, 35 years for postgraduates and has been an examiner in various universities for MBBS, DGO, MS, DNB and PGDMCH. She has received Bharat Vidya Shiromani Award and Life-time Achievement Award (GRMC). She has authored textbooks, MCQs (Obs and Gyn), and book on *Divya Garbh Sanskar*.

Sushma Dikhit MS MRCOG is an alumnus of Gajra Raja Medical College, Gwalior, Madhya Pradesh, India. She is member of the Royal College of Obstetricians and Gynaecologists (RCOG), London, UK. She is working as Senior Consultant and Head, Department of Obstetrics and Gynecology, Max Superspecialty Hospital, Ghaziabad, Uttar Pradesh, India. Earlier, she was Head, Department of Obstetrics and Gynecology, Pushpanjali Crosslay Hospital, Ghaziabad. She has very keen interest in managing high-risk pregnancies. She has contributed a lot to safe motherhood at hospital and community level. She has presented many scientific papers at national and international scientific forums.

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