The Second Trimester

Weeks 13 to 24

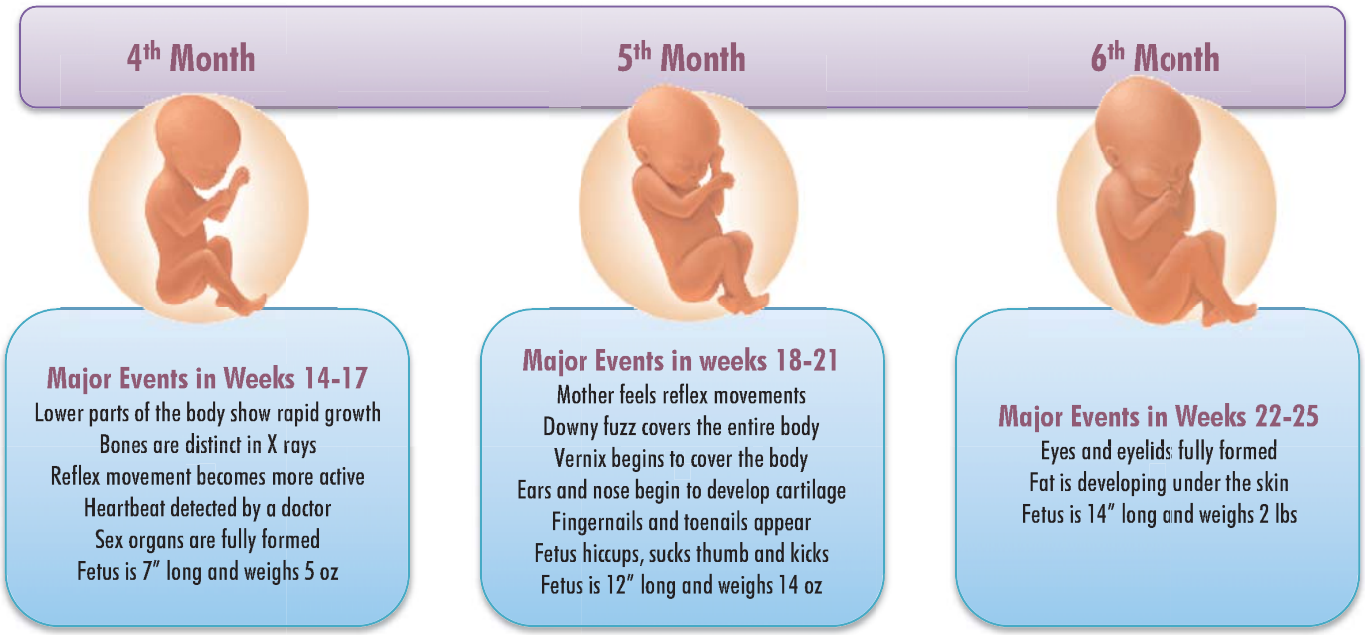


Figure 7. Fetal development in the 2nd trimester

Well-Earned Rest for Mom

During the second trimester of pregnancy mom's physiology has usually adapted to the demands of pregnancy. The ruckus of the first trimester is quietly fading and mom's physical indispositions usually improve.

Baby is Growing

At three months, the fetus is about two inches long and although still mostly transparent, the face is becoming more human like. At four months, baby is 4.5 inches long with a heart that is now pumping over 20 liters of blood per day. Sex is identifiable and reflexes such as swallowing begin to appear. By the end of the 5th month, hair begins to grow, eyebrows and eyelashes appear and organs mature. This is an exciting time for mom who begins to notice fetal movement. By the end of the second trimester, the fetus weighs around two pounds, reaches 11-14 inches in length and can now open his or her eyes.

The Uncertainties of the Second Trimester

The main complications experienced in the second trimester are placental abruption and an incompetent cervix. Monitoring for pregnancy-induced hypertension and anemia is also important during this period.

Beneficial Nutrients during the Second Trimester

Calcium for the Prevention of Pregnancy Induced Hypertension

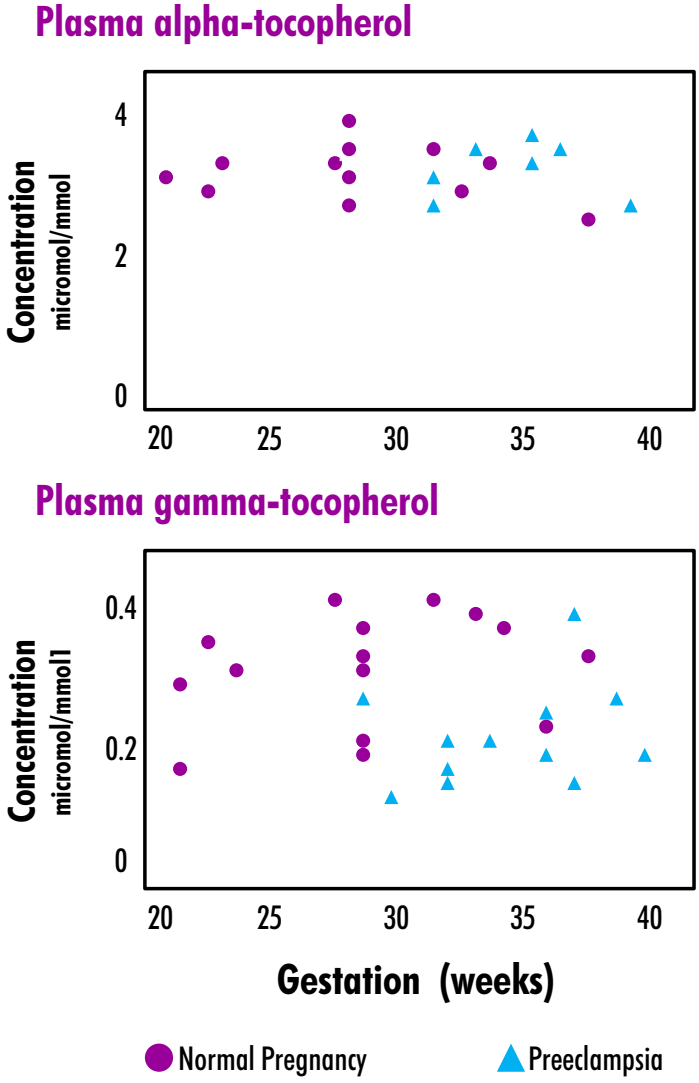
Pregnancy induced hypertension and preeclampsia are closely related. Both conditions are exclusive to pregnancy and affect five to eight percent of all pregnancies.[105] Preeclampsia is characterized by elevations is blood pressure, edema and the presence of protein in the urine. Preeclampsia may progress to eclampsia a serious condition where seizures are present. Despite medical treatment, preeclampsia and eclampsia may be fatal to child and mother.

In patients that are at risk for the development of preeclampsia, calcium supplementation may help reduce blood pressure and may prevent preterm labor.[106] A meta-analysis involving a total of 2412 patients showed that supplementation with calcium lead to a drop of 1.27 mmHg in systolic blood pressure[107] and the latest report suggests that calcium supplementation may halve the risk of preeclampsia.[108] In addition, calcium is beneficial for the infant as shown by a trend towards lower blood pressure in children whose mother had supplemented with calcium during pregnancy.[109]

Tocopherol Levels in Pre-Eclampsia vs. Normal Pregnancy

Vitamin E is much more than α-tocopherol. Although α-tocopherol is found in the greatest quantity in the serum, the seven other molecules, which together form the vitamin E complex, have several important health functions. α-tocopherol is often incapable of accomplishing those roles (see: Introducing Vitamin E "Complex", The Holistic Lifestyle). A paragon also expressed in pregnancy.

Interestingly enough, whereas most nutrient levels diminish as pregnancy progresses, α-tocopherol levels naturally increase as pregnancy progresses.[110] Although the etiology of preeclampsia remains poorly understood, it has been suggested that oxidative damage to the vascular system may play a significant role in the pathology of the condition which is precisely why research efforts between Japanese and Swedish scientists looked at the relationship between α and γ tocopherol levels in normal pregnancy versus preeclamptic conditions.[111] The results: α-tocopherol levels did not significantly differ between normal and preeclamptic pregnancies; conversely, γ-tocopherol levels were significantly lower in preeclamptic women versus women having normal pregnancies (see Graphs 10 and 11). Furthermore, γ-tocopherol levels were significantly lowered in pregnant versus non-pregnant women.

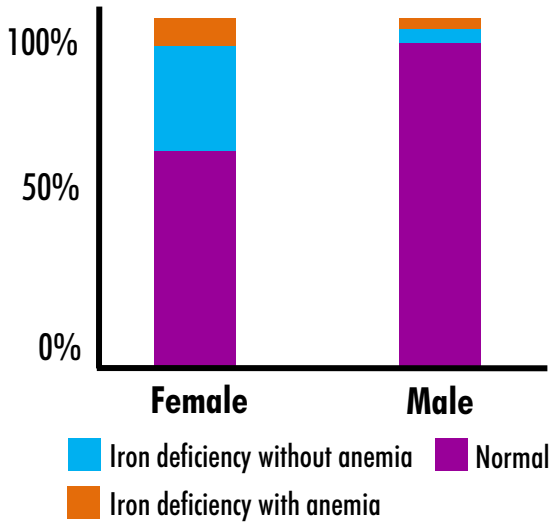


Graphs 10 & 11. Plasma levels of Alpha and Gamma-tocopherol in normal and pre-eclamptic pregnancy. Source: Ishihara (2004)

The Importance of Iron

After folate, iron is quite possibly the most significant nutrient of pregnancy. Iron deficiency is one of the most common deficiencies especially in women and children. The rates are alarming; in the United States between 1988 and 1994, nine percent of toddlers and nine to 11% of women of childbearing age were iron deficient.[112] In certain specific groups deficiencies are even more frequent. For example, the rates of iron deficiency in recreationally active women reached 29% (see graph 12).[113] However, pregnant women worldwide faired worse than all others groups with anemia, which affects 50-70% of women during pregnancy.[114] The consequences of iron deficiency, especially during rapid development, are

disconcerting. Infants are especially susceptible to iron deficiency because of the rapid growth they undergo which explains why iron requirements during pregnancy almost double (see Dietary Reference Intakes, Table 1b). The consequences of iron deficiency are dire, infants with inadequate iron status scored six to15 points lower on mental development test scores, six to 17 points lower on motor test scores, had poorer locomotor skills and had longer looking times on visual recognition memory tests.[115] The unfortunate news is that most studies report that developmental deficits persist even after iron has been replenished.[116] During infancy, the hippocampus (essential for the formation of new memories) and the cortical brain region (necessary for higher brain function such as though and action) are at their peak phase of development. Animal studies have shown that if iron stores are insufficient to support myelin, synapse and dendrite formation, permanent metabolic changes may occur. It appears that iron deficiency impedes and interferes with the arrangement of proteins in the brain, leading to metabolic and structural changes.[117]



Graph 12. Prevalence of iron deficiency with and without anemia as determined by serum ferritin. Source: Sinclair (2005)

Gestational iron deficiency also negatively affects emotional and behavioral attributes. Studies demonstrated that babies born to iron deficient mothers are more irritable.[118] Also, newborns with lower hemoglobin and serum iron levels at birth have lower levels of alertness and soothability which can not be explained by variations in family demographics, low birth weight, gestational age, maternal diabetes or neonatal illness.[119]

The importance of iron is not limited to higher brain function. Higher maternal dietary iron intakes reduced the risk of spina bifida in pregnant Dutch women[120], while iron deficiency anemia leads to low birth weight and premature babies.[121-122] Higher umbilical venous blood iron levels also corresponded with higher placental weights (bigger placentas allow for better transfer of nutrients between mother and child).[123]

Folate Deficiency may predispose to Placental Abruption

The association between folate deficiency and placental abruption remains tentative but several studies have demonstrated that folate deficiency increases the incidence of placental abruption while other studies did not find a significant connection.[124] The mechanism through which folate and placental abruption are related is unknown but may be related to homocysteine levels.

Homocysteine and Placental Abruption

Two studies have shown that women with placental abruption were significantly more likely to have higher levels of homocysteine either when fasting or in post methionine states.[125]