

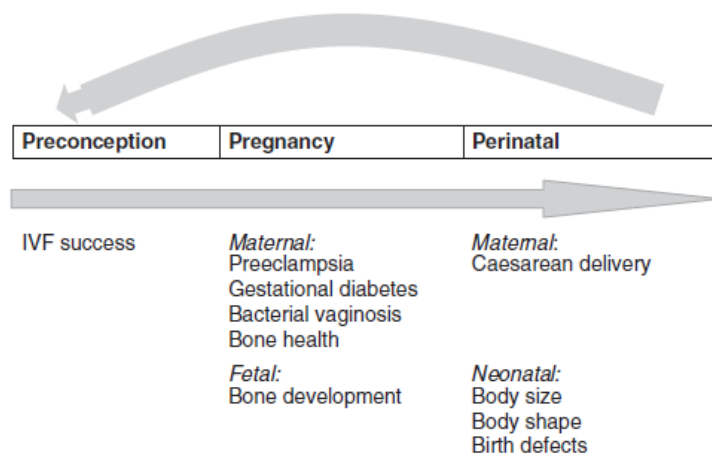
### It's not just about healthy bones!

It's true the primary function of Vitamin D is in its role in maintaining calcium and phosphorus homeostasis and promoting bone mineralization, but Vitamin D is increasingly being recognized for the vast array of other important functions as well.

- **Calcitropic functions** of Vitamin D:
  - Physiological regulation of calcium transport and bone mineralization by increasing intestinal calcium absorption
  - Suppressing parathyroid secretion
  - Promoting mineralization of the skeleton
- **Non-calcitropic actions** of Vitamin D:
  - Improvement of myocardial contractility
  - Reduction of inflammation through inhibition of pro-inflammatory Th17 cells
  - Modulation of many genes encoding proteins that regulate cell proliferation, differentiation, and apoptosis
  - Insulin production in the pancreas

### Why should pregnant women be concerned about Vitamin D?

During pregnancy and fetal development, many physiological changes in the maternal body require for higher Vitamin D requirements. However, approximately **two in three pregnant women in the United States have suboptimal vitamin D status**, with an even higher prevalence of Vitamin D deficiency among black and Mexican-American women [1]. Maternal Vitamin D requirements can increase up to four- to five-fold to facilitate the availability of extra calcium required for fetal skeletal growth [2]. But there is also growing evidence linking Vitamin D status with other obstetric outcomes throughout preconception to birth.



**Figure 1.** Manifestation of reviewed possible major outcomes related to vitamin D status related to pregnancy and birth.

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#### ➤ **Preconception and fertility:**

- **IVF:** In humans, a prospective cohort study has shown that higher 25(OH)D levels in both serum and follicular fluid (FF) predicted the success of in vitro fertilization techniques [3].
- **PCOS:** Difficulties with fertility is common in many women with polycystic ovarian syndrome (PCOS), a condition characterized by hyperandrogenic chronic anovulation, arrested follicular development, and metabolic disturbances such as insulin resistance [4]. Treatment with vitamin D and calcium has been demonstrated to normalize menstrual cycles in some women with PCOS. [4]

**Vitamin D: From Pre-conception to Birth**➤ **During pregnancy:**

- **Pre-eclampsia:** In a nested case-control study, maternal serum 25(OH)D concentration of 37.5 nmol/L during early pregnancy (0-22 wk gestation) was associated with a fivefold increase in the odds of developing pre-eclampsia and the risk of pre-eclampsia more than doubled for each 50 nmol/L decrease in maternal 25(OH)D level [5].
- **Gestational diabetes mellitus (GDM):** Gestational diabetes affects 3–8% of all pregnancies depending on the population studied [6]. Each 5 ng/mL (12.5 nmol/L) decrease in plasma 25(OH)D was associated with a 29% increase in the odds of developing GDM in a nested case-control study.
- **Maternal bone health:** overall maternal bone loss of between 2-5% occurs during pregnancy, increasing needs for Vitamin D and calcium [2].

➤ **Perinatal**

- Women with 25(OH)D levels of 37.5 nmol/L were almost four times more likely to have a **caesarean section** compared with women with levels 37.5 nmol/L, after adjustment for race, age, education level, insurance status, and alcohol use.

**So how much Vitamin D should be supplemented during pregnancy?**

The dose for individuals may differ depending on many factors such as ambient UVB, skin pigmentation, high-latitude locations. **However, Vitamin D supplementation is highly recommended to reach serum 25(OH)D levels of 75–110 nmol/L**, which was identified to provide optimal benefits without increasing risks in general [7]. Although for pregnant and lactating women, optimal serum 25(OH)D levels have not yet been clearly defined, numerous studies and scientific evidence support that supplementation is crucial for a healthy pregnancy.

- A 2009 review has recommended that women at risk of vitamin D deficiency should monitor Vitamin D level at the beginning of gestation and at midgestation, so that vitamin D deficiency can be corrected. [8]
- The Canadian Pediatric Society has recommended a daily dose of 2000 IU in pregnant and lactating women [9].
- Many studies conclude that vitamin D supplementation of 4000IU/day for pregnant women is safe and most effective in achieving sufficiency in all women and neonates [10]
- An RCT on vitamin D supplementation resulted in a 50% reduction in preterm delivery, 25% reduction in infections of the mother, and 30% reduction in co-morbidities such as diabetes mellitus, hypertension, and preeclampsia [11]

**Potential interactions with medications [12]**

Vitamin D supplements have the potential to interact with several types of medications. A few examples are provided below. Individuals taking these medications on a regular basis should discuss vitamin D intakes with their healthcare providers

- **Steroids**

Corticosteroid medications such as prednisone, often prescribed to reduce inflammation, can reduce calcium absorption and impair vitamin D metabolism. These effects can further contribute to the loss of bone and the development of osteoporosis associated with their long-term use

- **Other medications**

Both the weight-loss drug orlistat (brand names Xenical® and alli™) and the cholesterol-lowering drug cholestyramine (brand names Questran®, LoCholest®, and Prevalite®) can reduce the absorption of vitamin D and other fat-soluble vitamins. Both phenobarbital and phenytoin (brand name Dilantin®), used to prevent and control epileptic seizures, increase the hepatic metabolism of vitamin D to inactive compounds and reduce calcium absorption.

**Take-home Message: “No Woman should be Vitamin D Deficient! Ever!”**

Even though further clinical trials will be needed to fully evaluate the effects of vitamin D supplementation in pregnancy, women should not be vitamin D deficient throughout the life cycle. Therefore women at risk of vitamin D deficiency should be monitored and appropriately supplemented not only before, during and after pregnancy, but anytime throughout her life!

**Vitamin D: From Pre-conception to Birth****References**

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