

# Vitamin D Efficiency for Prevention of Pregnancy Complications

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**Abstract** When studying the level of vitamin D in the risk group for pre-eclampsia development pregnant women, reliably low rates were found in relation to pregnant women with physiological course of pregnancy without complications. Dependence of preeclampsia development in at-risk pregnant women on prophylactic vitamin D intake have been studied too. We have hypothesized that pregnant women having taken vitamin D have a more favorable course of pregnancy, which in turn affected the state of newborns. Therefore we have found that hypoxia of the fetus was observed 2 times less in the group of pregnant women who were taking vitamin D since 20 weeks than women who were not taking vitamin D.

**Keywords** Vitamin D deficiency, Pregnancy complications, Pre-eclampsia

At present, vitamin D deficiency is considered to be a global health problem affecting a wide range of acute and chronic diseases [1,2].

Over the past ten years, the physiological role of 25 (OH) 2D3 has been widely studied, but data on its role in human reproduction are limited. Since vitamin D receptors have been found in reproductive tissues, including the ovaries, uterus, placenta, testicles and pituitary gland, vitamin D association with many reproductive health outcomes is requested [5,6]. Vitamin D induces more than 3000 genes, many of which play a role in fetal development. 26 of them have a wide range of proven biological actions, including inhibition of cell proliferation and induction of final differentiation, inhibition of angiogenesis and renin production, stimulation of insulin production and production of macrophages, apoptosis induction [3,8].

Hypertension during pregnancy and especially preeclampsia (PE) are the most studied pregnancy complications. PE syndrome is defined as the occurrence of hypertension and proteinuria after 20 weeks of pregnancy, and with a prevalence of 3-5% of all pregnancies worldwide, it is the leading cause of maternal mortality and perinatal morbidity and mortality [4,7].

**Purpose of the study:** to evaluate the role of vitamin D during gestation in pregnant women at risk for pregnancy complications.

The study enrolled 90 pregnant women with 18-22 weeks gestation period. The age gradation was from 19 to 40 years, the average age was  $27.9 \pm 1.5$  years.

Based on cohort observation we identified a risk group for PE development consisting of 60 pregnant women.

Vitamin D was determined in all cases. Vitamin D was determined by ELISA method on Elecsys-2010 (Switzerland). M.Hollick (2005) criteria were used to evaluate serum vitamin D status. Vitamin D level is considered to be sufficient at 25(OH)D level in serum over 30 ng/ml. Vitamin D deficiency means a decrease in serum concentration of 25(OH)D below 20 ng/ml (50 nmol/l); vitamin D deficiency is the concentration of 25(OH)D in serum preserved in the range of 21-29 nanograms/ml.

All pregnant women were prescribed calcium 1.5 g and vitamin D in a dose of 1500 units. During observation 30 pregnant women did not take vitamin D (comparison group), and 30 followed the prescription of a gynecologist (main group); 30 patients with physiological course of pregnancy were included in the control group.

Vitamin D level was administered again at admission for childbirth.

Statistical processing of the study results was performed using Statistica for Windows packages (version 6.1) using parametric and non-parametric statistics (Student, Mann - Whitney criteria).

## 1. Materials and Methods

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## 2. Research Results

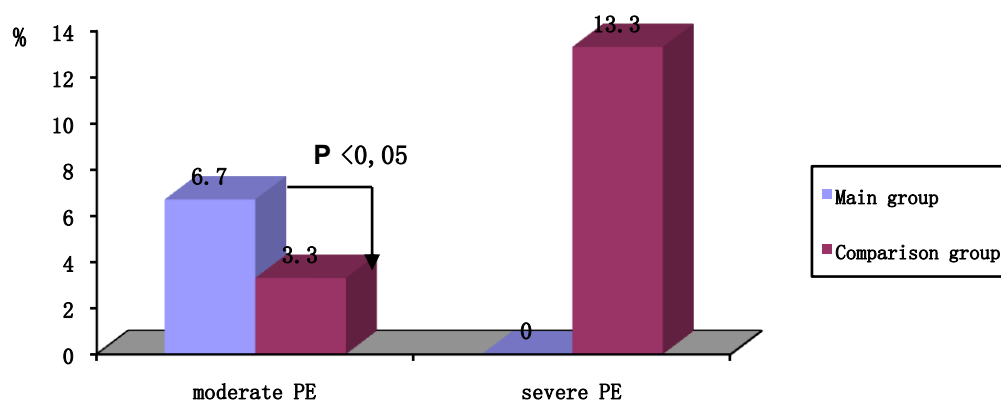
Based on our studies, we found that in PE risk pregnant women, vitamin D was significantly decreased with respect to the control group (Table 1).

**Table 1.** Vitamin D rates at 20 pregnancy weeks pregnant control group and PE risk group

Groups	Vitamin D level	Data reliability, P<
Control group, n = 30	19,82±1,5	0,05
Main group, n = 30	12,76±1,1	
Comparison group, n = 30	13,21±1,2	

There is a more favorable course of pregnancy in the main

group of pregnant women. With further observation, moderate PE in this group of pregnant women developed in 6.7% (2 pregnant women) of cases, while severe PE was not recorded. In the comparison group in 16.7% of cases the development of PE was noted, which is 2.5 times higher with respect to the main group ( $P<0.05$ ), of which severe PE was registered in 3.3% of cases (1 pregnant) and moderate PE in 13.3% (4 pregnant) (Fig. 1).

**Figure 1.** Percentage of PE development among the surveyed pregnant women, depending on the use of vitamin D

All pregnant women were given birth at terms from 37 to 41 weeks, all were retested. The pregnant women of the main group had vitamin D level of  $21,1\pm1,7$  ng/ml ( $p<0,01$ ) at

admission to obstetrical department, while in the comparison group its level was 1,7 times lower (Table 2).

**Table 2.** Vitamin D rate at the period of labor in both study groups

Groups	Initial data	Pregnant without PE	Pregnant with PE	P<, to initial data	P<, к CG
Main group, n=30	12,76±1,1	21,1±1,7	18,52±1,7	0,05	-
Comparison group, n=30	13,21±1,2	12,32±1,2	11,2±1,1	-	0,01
Control group, n=30	19,82±1,5				

When analyzing the outcomes of labor, we found that 23 women (75.9%) ( $p<0.05$ ) of the main group had a physiological course of labor. We revealed a prolonged course of labor due to weakness of labor forces in 4 (13.2%), hypoxia of fetus in labor process in 2 (6.6%).

The following complications occurred during childbirth: premature abruption of normally located placenta in 1 (3.3%), persistent weakness of labor forces in 1 (3.3%), threatening fetal asphyxia 2 (6.6%).

In the postpartum period, hypotonic bleeding was recorded - in 3 (9.9%), chorioamnionitis and endometritis in 2 (6.6%) ( $p<0.05$ ).

3 patients (9.9%) had labor surgically in the planned order, 4 (13.2%) - in the emergency order, according to the indications in 1 (3.3), 2 (5.8%) had premature abruption of the normally located placenta, 1 (3.3%) had persistent weakness of labor forces, threatening fetal asphyxia in 2 (6.6%).

When assessing the condition of newborn children of patients who took vitamin D from 20 weeks of pregnancy, it was found that 25 children (82.5%) were born in the normal

condition ( $p<0.01$ ). Cerebral ischemia of the 1st degree was observed in 4 (13.2%) ( $p<0.01$ ); cerebral ischemia of the 2nd degree in 1 (3.3%); cerebral ischemia of the 3rd degree was not observed. Fetal growth delay syndrome of the 1st degree was observed in 5 (16.5%); fetal growth delay syndrome of the 2nd degree was not observed. Hyperhigh excitability syndrome was found in 2 (6.6%), intraventricular hemorrhage (IVH) - in 2 (6.6%), kefalohematoma - in 1 (3.3%), hyperbilirubinemia - in 4 (13.2%), intrauterine infection (IUI) - in 3 (9.9%).

In PE risk patients who did not take vitamin D, 19 children (62.7%) ( $p<0.01$ ) were born in satisfactory condition, 6 (19.8%) ( $p<0.01$ ) were born with the 1st degree cerebral ischemia, 3 (9.9%) - had 2nd degree cerebral ischemia and 1 (3.3%) - had the 3rd degree cerebral ischemia. Fetal growth delay syndrome of the 1st degree was observed in 10 (33%); fetal growth delay syndrome of the 2nd degree was observed in 1 (3.3%). Hyper-excitability syndrome was found in 5 (16.5%), IVH - in 3 (9.9%), kefalohematoma - in 4 (13.2%), hyperbilirubinemia - in 7 (23.1%), congenital infections- in 8 (26.4%).

Comparative analysis of the state of newborns revealed that fetal hypoxia was twice as rare as in the control group in patients who took vitamin D from 20 weeks.

### 3. Conclusions

Thus, it can be proved that vitamin D deficiency is a risk factor for the development of PE, an increase in vitamin D-level confirms the presence of polyorganic failure, which is also a risk factor for obstetric complications. The increased endothelion level in the serum causes an increase in blood pressure. As experts from the World Health Organization (2010) emphasized, the maternal status of vitamin D is very important in the prevention of complications during pregnancy.

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