

ORIGINAL ARTICLE

Role of Vitamin D for the Prevention of Pre-Eclampsia in Pregnant Women: A Randomized Controlled Trial

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ABSTRACT

Aim: The goal of this study was to determine the role of vitamin D supplements in preventing pre-eclampsia during pregnancy.

Study design: Randomized controlled trial

Place and duration: This study was conducted at District health quarters hospital Jamshoro @kotri /Bilawal Medical College hospital Kotri, Pakistan from March 2020 to March 2021.

Methodology: Pregnant women between the ages of 18 and 35 years with a single pregnancy, normal blood pressure, and a gestational period of 24 ± 1 week were enrolled and were allocated into 2 groups that is group A and B. Vitamin D was not given to Group A. Group B, the study group members received vitamin D 25,000 IU orally (Cap OPT-D) every two weeks for up to 36 weeks, regardless of vitamin D status. Women were visited every two weeks for prenatal checkups during the follow-up phase (28th to 36th week) to investigate any signs or symptoms of pre-eclampsia.

Results: In both groups, no significant difference has been observed in mean age ($P=0.57$), gestational age ($P=0.48$), and Body Mass Index ($P=0.81$). At 28 ± 1 weeks, all female's blood pressure was normal. At 36 weeks, 24.44% ($n=11$) of women in group A (control group) had blood pressure greater than 140/90mm, compared to only 6.66% ($n=3$) of women in group B (study group). There was a significant difference ($X^2= 5.41$, $P=0.019$).

Conclusion: This study concluded that pregnant females who take vitamin D supplements have low chances of pre-eclampsia.

Keywords: Deficiency, Hypertension, Pregnancy, Pre-Eclampsia, Supplement, Vitamin D

INTRODUCTION

Every day, hundreds of maternal deaths worldwide occur from preventable pregnancy-related factors; the condition is most prevalent in low- and middle-income nations. (1) During pregnancy, blood pressure-related abnormalities, such as hypertension, hypotension, pre-eclampsia, eclampsia, etc., are the main factors responsible for maternal death and morbidity, resulting in 14% of all maternal mortalities. (2, 3)

Vitamin D is highly crucial during gestation because insufficient levels of vitamin D in pregnant females can lead to different issues, including low birth weight, pre-term birth, and an increased risk of maternal co-morbidities. (4) However, clinical investigations on the link between low vitamin D levels and poor pregnancy consequences such as pre-eclampsia, gestational diabetes, low birth weight, early labour, and cesarean delivery have yield mixed results. (5, 6)

Vitamin D insufficiency is a global problem, with occurrence ranging from 18% to 84 percent depending on location, ethnicity, and habits. (7, 8). In a cross-sectional investigation, the vitamin D status of gravid and non-pregnant women was compared in Pakistan. This study reported that 89% of the females during pregnancy had vitamin D deficiency, and 33.4% of them were severely deficient. On the other hand, 54% of the non-pregnant women were Vitamin D deficient. This study found a significant difference ($p < 0.001$). (9)

Pre-eclampsia is a pregnancy-related condition defined by new-onset hypertension and proteinuria after 20 weeks. (10) Pre eclampsia, is a dangerous condition that affects pregnancies and can only be treated by delivering the placenta. Pre-eclampsia has been linked to a decrease in 1,25 dihydroxy vitamin D levels. Pre-eclampsia is hypothesized to develop due to aberrant angiogenesis and immune adaptation after implantation and trophoblastic invasion in the first trimester of pregnancy. Vitamin D has been shown to alter the transcription and activity of genes involved in trophoblastic invasion and angiogenesis, both of which are important for implantation, as well as fetal allograft immunologic tolerance. (11) Because there is currently insufficient data to prove the benefit of the use of vitamin D during gestation, this study was carried out to find out the impact of vitamin D supplements during gestation on the incidence of pre-eclampsia.

METHODOLOGY

This randomized controlled trial was performed at District health quarters hospital Jamshoro @kotri /Bilawal Medical College hospital Kotri, Pakistan from March 2020 to March 2021. Permission was taken from the ethical review committee of the institute. After written and informed consent, Ninety pregnant women attending the Obstetrics and Gynecology department were chosen for the study. The pregnant women were separated into two groups.

Pregnant women between 18 to 35 years, with a single pregnancy, Normal blood pressure, and Gestational period of 24 ± 1 week were included in the study. Women with a history of chronic disease, medicines affecting bone, vitamin D, or calcium metabolism in the last 6 months, such as antiepileptic, antitubercular drugs were excluded. Irrespective of vitamin D levels, iron, calcium, and folic acid supplementation were given to both groups. However, Vitamin D supplements of 25,000 IU orally cholecalciferol (Cap OPT-D) every two weeks for up to 36 weeks was given to group B. Vitamin D was not given to Group A.

At the first antenatal appointment, all of the participants had a thorough general physical examination and a systemic and obstetric examination. Women were contacted for antenatal checkups every two weeks during the follow-up phase to look for any signs of pre-eclampsia. SPSS version 21 was used for data entry and statistical analysis. The chi-square test and the student t-test were used. 0.05 was used as the significant level.

RESULTS

In the current study, 90 patients' data were analyzed. In Group A, which was the control group, the mean age of the females was 24.57 ± 4.12 , and in Group B, which was the Study group, the mean age was found 24.66 ± 4.09 . The difference of age in both groups as per student T-Test was insignificant ($P > 0.05$). Similarly, no significant difference was observed in Gestational age ($P = 0.48$) and Body Mass Index ($P = 0.81$) in both groups.

At 24 ± 1 weeks, all women were in the normal blood pressure range, and proteinuria was either nil or traces were observed in both groups. At 36 weeks, 24.44 (n=11) women in group A (control group) had blood pressure greater than 140/90mm, while only 6.66% (n=3) women in group B (Study group) had blood pressure greater than 140/90mm. The difference in Pre-Eclampsia status in both groups is significant ($X = 5.41, P = 0.019$). (As shown in Table 2). Proteinuria was evident in 11 women in the control group at 36 weeks. In three females of the study group, proteinuria was observed who also had high blood pressure.

Table 1: Demographic characteristics of study participants

Variable	Group A	Group B	P-Value
Mean Age in Years (Mean \pm SD)	24.57 ± 4.12	24.66 ± 4.09	0.57
Gestation Age in weeks (Mean \pm SD)	32.43 ± 2.94	33.11 ± 3.03	0.48
Body Mass Index (BMI)	21.12 ± 2.13	20.79 ± 2.43	0.81

Table 2: Pre-eclampsia status in both groups

Pre-Eclipsa Status	Group A (Control) n (%)	Group B (Study) n (%)	Chi-Square	P-Value
Pre-Eclampsia Diagnosed	11 (24.44)	3 (6.66)	5.41	0.019
Pre-Eclampsia NOT Diagnosed	34 (75.55)	42 (93.33)		
The chi-square statistic with Yates correction is 4.1447. The p-value is .041764				

DISCUSSION

According to the current study's findings, Pre-Eclampsia is linked with VIT-D deficiency. Females who were on Vitamin D supplements reported significantly less Pre-Eclampsia than those who were not given Vitamin D supplements. Our study findings agree with the results of a recent study performed in India, which reported that Vitamin D supplements reduce the chance of Pre-Eclampsia. (12)

All of the individuals in this study were presumed to have a deficiency of vitamin D, as it is common in Pakistan, with prevalence rates ranging from 70% to 100% in the general population, according to a systematic review. (13) In our study, the average age of the study group was 24.66 ± 4.09 years, whereas the non-supplemented group was 24.57 ± 4.12 years. Similar mean age groups were observed in previous studies. (12, 14)

Sablok et al. observed a significant prevalence of vitamin D deficiency during pregnancy in Indian women and investigated the impact of cholecalciferol supplementation on vitamin D levels in pregnant women, as well as the link between vitamin D levels and fetal-maternal outcomes. (15)

Vitamin D supplementation was given to the intervention group at dosages based on their 25(OH)-D levels. According to the findings presented in a recent study performed in Pakistan, vitamin D supplementation of 4000 IU/day was more effective than 2000 IU/day and 400 IU/day in eliminating vitamin D deficiency in pregnant women and improving serum 25(OH)D levels in mothers and their neonates. (16)

According to a study, Pre-eclampsia risk is increased by deficiency of 25 hydroxyvitamin D concentrations, and vitamin D supplementation reduces this risk. Women who consumed vitamin D supplements had a lower risk of pre-eclampsia than women who did not take vitamin D supplements or were given a placebo. (17) The findings are consistent with previous research, which has indicated that vitamin D is protective against the development of pre-eclampsia in pregnant women. However, it is suggested that pregnant women receive routine vitamin D treatment throughout their pregnancy in order to lower the risk of pre-eclampsia.

CONCLUSION

According to the findings, vitamin D supplementation plays a substantial effect in preventing pre-eclampsia in pregnant women. Pregnant women who take vitamin D supplements have a lower incidence of pre-eclampsia.

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