

Study of the Prevalence of Pre-Eclampsia in Vitamin D Supplemented and Non-Supplemented Primigravida Women at a Tertiary Care Centre in Rajasthan

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ABSTRACT

Introduction: Vitamin D deficiency is common during pregnancy. Vitamin D deficiency is associated with a higher risk of pregnancy complications such as gestational diabetes, preeclampsia, preterm birth, and low birth weight, neonatal hypocalcaemia, poor postnatal growth, bone fragility, and increased incidence of autoimmune diseases. The daily recommended amounts for pregnant women range from 600 to 2000 international units (IU). Vitamin D deficiency affects the function of genes for transcription like vascular endothelial growth factor (VEGF). The serum concentration of 25-hydroxycholecalciferol-25(OH)D level is reduced in pregnant women with preeclampsia. Approximately 10% to 15% of maternal death is directly associated with preeclampsia or eclampsia in low- and middle-income countries whereas it was approximately one per 100,000 live births in developed countries. It also related to life-threatening unfavourable outcomes in both mother (e.g., placental abruption, preterm delivery and haemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome, etc.) and foetus (e.g., preterm birth, stillbirth, low birth weight, and small for gestational age, etc.)

Materials and Methods: The study was set up to be conducted in the Department of Obstetrics & Gynaecology, Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur, Rajasthan (India) from Jan 2019 to Dec 2019. Subjects with pre-existing calcium and parathyroid condition, requiring chronic diuretics or cardiac medication, having chronic HTN, active thyroid disease. 400 pregnant women of 16-20 weeks gestation were included in the study. Study group comprised of 200 pregnant women of 16-20 weeks gestation who received vitamin D supplementation (irrespective of vitamin D level) in the form of oral cholecalciferol sachet 60,000IU weekly till 10 weeks along with routine iron, folic acid and calcium supplementation. Control group comprised of 100 pregnant women of 16- 20 weeks who received only routine iron, folic acid and calcium supplementation (irrespective of vitamin D level). At first antenatal visit a detailed history was obtained and thorough examination and routine antenatal investigations of all the subjects was done. Role of vitamin D supplementation and Maternal outcome in terms of preeclampsia, GDM, preterm labour, Mode of delivery and foetal outcome in terms of LBW, NICU admission, tetany of the two groups was compared.

Results: At term the prevalence of preeclampsia among supplemented group and not supplemented group was compared. 350 (87.50%) patients out of 400 were in the age group of 21-30 years out of which 178 were vitamin D supplemented and 172 were not vitamin D supplemented. 30 (7.50%) were in the age group of 30 years out of which 12 patients were supplemented with vitamin D and 18 patients were not vitamin D supplemented. 20 (5%) were in the age group >30 years out of which 7 patients were supplemented with vitamin D and 13 patients were not vitamin D supplemented. Out of 400 patients, 300 (75%) were from lower socioeconomic class out of which 151 patients were vitamin D supplemented and 149 patients were not supplemented with vitamin D, 75 (18.75%) were from lower middle class out of which 34 were supplemented with vitamin D and 41 patients were not supplemented with vitamin D and 25 (6.25%) patients were upper middle class out of which 15 were supplemented with vitamin D and 10 patients were not supplemented with vitamin D. The p-value was 0.361 making this correlation statistically insignificant.

Conclusion: Vitamin D deficiency is the most common among all the pregnant women across the Indian subcontinent. This study concludes that the supplementation of vitamin D in pregnant women plays a significant role among pregnant women in an effort of preventing pre-eclampsia. In the supplemented group the incidence of pre-eclampsia was less compared to non-supplemented group.


Keywords: Vitamin D, Deficiency, Pregnancy Complication, Cholecalciferol.

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INTRODUCTION

Vitamin D deficiency is common during pregnancy. Vitamin D deficiency is associated with a higher risk of pregnancy complications such as gestational diabetes, preeclampsia, preterm birth, and low birth weight, neonatal hypocalcaemia, poor postnatal growth, bone fragility, and increased incidence of autoimmune diseases.¹ Preeclampsia means elevated blood pressure with proteinuria with or without utero-placental dysfunction after 20 weeks of gestation period.² The daily recommended amounts for pregnant women range from 600 to 2000 international units (IU).³ Vitamin D deficiency affects the function of genes for transcription like vascular endothelial growth factor (VEGF). The serum concentration of 25-hydroxycholecalciferol-25(OH)D level is reduced in pregnant women with preeclampsia.⁴ Vitamin D plays a key role in pregnancy and adequate levels of vitamin D aids in the prevention and management of preeclampsia. At present there is no evidence in the literature to evaluate the effectiveness of vitamin D supplement intake has lower incidence in developing preeclampsia. Hence, this study designed to evaluate the incidence of preeclampsia in vitamin D supplemented and non-supplemented primigravida women.

Preeclampsia is a new onset of high blood pressure with proteinuria with/without end-organ or utero-placental dysfunction after 20 weeks of gestation. It is one of the major contributing causes of maternal-foetal morbidity and mortality worldwide.² Globally, 4.6% and 1.4% of all pregnancies developed preeclampsia and eclampsia, respectively.⁵ The incidence in developed countries was approximately 3.4%⁶, whereas it was varied from 1.8% to 16.7% in developing countries.^{7,8} Approximately 10% to 15% of maternal death is directly associated with preeclampsia or eclampsia in low- and middle-income countries⁹ whereas it was approximately one per 100,000 live births in developed countries.¹⁰ It also related to life-threatening unfavourable outcomes in both mother (e.g., placental abruption, preterm delivery and haemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome, etc.) and foetus (e.g., preterm birth, stillbirth, low birth weight, and small for gestational age, etc.)¹¹

MATERIALS AND METHODS

The study was set up to be conducted in the Department of Obstetrics & Gynaecology, Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur, Rajasthan (India) from Jan 2019 to Dec 2019. Ethical clearance was obtained from IEC prior to the commencement of the study. A written informed consent was taken from all the recruited patients. Women with the following criteria were excluded from the study: Gestational age 20 weeks, Subjects residing outside Delhi, multigravidae, multiple pregnancy. Subjects having hypertension, family history of hypertension, liver disease, renal disease, renal calculi, inflammatory bowel disease, secondary osteoporosis, rheumatoid arthritis, morbid obesity, treatment with ATT or anti-epileptic drugs in previous 6 months, taking vitamin D or calcium supplementation in previous 1 year, diabetes, family history of diabetes. Subjects with pre-existing calcium and parathyroid condition, requiring chronic diuretics or cardiac medication, having chronic HTN, active thyroid disease. 400 pregnant women of 16-20 weeks

gestation were included in the study. They were randomly assigned into two groups that is study group and control group. Study group comprised of 200 pregnant women of 16-20 weeks gestation who received vitamin D supplementation (irrespective of vitamin D level) in the form of oral cholecalciferol sachet 60,000IU weekly till 10 weeks along with routine iron, folic acid and calcium supplementation. Control group comprised of 100 pregnant women of 16- 20 weeks who received only routine iron, folic acid and calcium supplementation (irrespective of vitamin D level). At first antenatal visit a detailed history was obtained and thorough examination and routine antenatal investigations of all the subjects was done. Role of vitamin D supplementation and Maternal outcome in terms of preeclampsia, GDM, preterm labour, Mode of delivery and fetal outcome in terms of LBW, NICU admission, tetany of the two groups was compared.

All the data was entered in Microsoft excel sheet and various variables were compared by applying chi-square test as a test of significance for nominal and numerical variables with the help of computer using SPSS 20.0 software. Statistical significance was considered if p value was < 0.05.

RESULTS

At term the prevalence of preeclampsia among supplemented group and not supplemented group was compared. 350 (87.50%) patients out of 400 were in the age group of 21-30 years out of which 178 were vitamin D supplemented and 172 were not vitamin D supplemented. 30 (7.50%) were in the age group of 30 years out of which 12 patients were supplemented with vitamin D and 18 patients were not vitamin D supplemented. 20 (5%) were in the age group >30 years out of which 7 patients were supplemented with vitamin D and 13 patients were not vitamin D supplemented. Out of 400 patients, 300 (75%) were from lower socioeconomic class out of which 151 patients were vitamin D supplemented and 149 patients were not supplemented with vitamin D, 75 (18.75%) were from lower middle class out of which 34 were supplemented with vitamin D and 41 patients were not supplemented with vitamin D and 25 (6.25%) patients were upper middle class out of which 15 were supplemented with vitamin D and 10 patients were not supplemented with vitamin D. The p-value was 0.361 making this correlation statistically insignificant.

Table 2 shows that out of 400 patients, 70(17.5%) patients developed pre-eclampsia and out of 70 patients, 40 patients were vitamin D supplemented and 30 patients were not vitamin D supplemented. 330 (82.5%) did not develop pre-eclampsia out of which 160 were supplemented with vitamin D and 170 were not supplemented with vitamin D. Majority of patients who developed pre-eclampsia belonged to vitamin D non supplemented group. The p-value was 0.0004 making this correlation statistically significant.

Table 3 Management of pre-eclampsia in study and control group is depicted in out of 400 patients, 60 (83.3%) patients were managed with oral medication out of which 15 patients were supplemented with vitamin D and 45 patients were not supplemented with vitamin D. 12 patients (16.7%) required intravenous labetalol all of them were not vitamin D supplemented. The p-value was 0.001 making this correlation statistically significant.

Table 1: Socio-economic status in vitamin D supplemented and non-supplemented group

SES	Vit – D supplemented	Vit – D non-supplemented	Total	P - value
Lower class	151 (75.5%)	149 (74.5%)	300 (75%)	0.361
Lower middle class	34 (17%)	41 (20.5%)	75 (18.75%)	
Upper middle class	15 (7.5%)	10 (5%)	25 (6.25%)	
Total	200 (100%)	200 (100%)	400 (100%)	

Table 2: Cases of pre-eclampsia in vitamin D supplemented and non-supplemented group

SES	Vit – D supplemented	Vit – D non-supplemented	Total	P - value
No	160 (80%)	170 (85%)	330 (82.5%)	0.0008
Yes	40 (20%)	30 (15%)	70 (17.75%)	
Total	200 (100%)	200 (100%)	400 (100%)	

Table 3: Management of pre-eclampsia in vitamin d supplemented and non-supplemented group

SES	Vit – D supplemented	Vit – D non-supplemented	Total	P - value
Oral	15 (25%)	45 (75%)	60 (83.3%)	0.002
I/V	0 (0%)	12 (16.7%)	12 (16.7%)	
Total	200 (100%)	200 (100%)	72 (100%)	

DISCUSSION

Since the Vitamin – D deficiency is almost epidemic in the Indian subcontinent, All the patients who were included in the study were assumed to be vitamin D deficient, with a prevalence rate ranging between 70%–100% in the general population. In India, most of the widely consumed food items such as dairy products are rarely fortified with vitamin D. Hospital present in the area where majority of Muslim population resides are the places Vit-D deficiency is more prevalent. Hence deficiency of vitamin D is more prevalent in burka wearing women who are devoid of exposure to sunshine. The mean age in our study is estimated to be around 25.5 years among supplemented group and 24.5 years among non-supplemented group. The distribution of age was comparable to those findings observed by *Sachan et al (2002)*¹² (mean age 24.0 years) and *F Xiang et al (2013)*¹³ (mean age 26.4 + 3.1 years). Our study centres narrowed to women mostly belongs to the lower socioeconomic class where early marriage is prevalent and hence early age of conception is observed which is reflected in our study results.

Our findings also suggest low literacy rate in the study participants. Patients with low education level are mostly unaware about the importance of sun exposure and Vit – D enriched food sources. *et al 2010-2011*¹⁴ concluded in their study that vitamin D concentration was higher in better educated women. *Vandevijvere S et al 2012*¹⁵ also found that the risk of vitamin D deficiency was significantly higher for less educated women. The results of these studies are comparable with our study.

Out of 400 patients, 6(1.5%) patients developed eclampsia and all of them belong to vitamin D non-supplemented group. The p-value was 0.252 making this correlation statistically insignificant. Likewise, *Haugen et al in 2009*¹⁶ conducted a study which showed that nulliparous women who developed pre-eclampsia had low concentrations of vitamin D in serum sample in mid pregnancy.

*Baker et al 2010*¹⁷ conducted a bounded case-control study among pregnant women which included those women with singleton pregnancies in the absence of any chronic medical illnesses. From an overall cohort of 3992 women included, 51 cases of severe pre-eclampsia were matched by race/ethnicity with 204 women delivering at term with uncomplicated pregnancies. Maternal mid-gestation deficiency of vitamin D was related with greater risk of severe preeclampsia. The result of this was almost similar with our study. *Sablok et al*¹⁸ found out the prevalence rate of vitamin D deficiency in pregnant women and to evaluate the effect of supplementation with cholecalciferol in enhancing vitamin D levels in pregnant women and evaluate its correlation with foeto-maternal outcome. The intervention group were received supplementation of vitamin D in dosages depending upon 25(OH)-D levels. 40% patients in group A and 20.3% patients in group B developed pre-eclampsia. This study observations were comparable to our study. *Hypponen et al 2013*²⁰ study suggests that low maternal serum 25 hydroxy vitamin D concentrations increases pre-eclampsia risk and that vitamin D supplementation lowers this risk. The result of this study was comparable with our study. *De-Regill M et al*¹⁹ suggested that women who received vitamin D supplements may have a lower risk of pre-eclampsia than those receiving no intervention or placebo. The results obtained from this study was almost identical with our study.

CONCLUSION

Vitamin D deficiency is the most common among all the pregnant women across the Indian subcontinent. This study concludes that the supplementation of vitamin D in pregnant women plays a significant role among pregnant women in an effort of preventing pre-eclampsia. In the supplemented group the incidence of pre-eclampsia was less compared to non-supplemented group.

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