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Role of vitamin D in preeclampsia: Our experience

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Abstract

Aim: To assess the vitamin D status in preeclamptic and normal healthy pregnant women and to find out its association with preeclampsia.

Materials and Methods: Prospective case control study included 50 women with preeclampsia and 50 normotensive pregnant women. Serum vitamin D estimation was done. Correlation between vitamin D deficiency and preeclampsia was analysed statistically.

Results: Prevalence of vitamin D deficiency was comparable in both groups. Mean vitamin D level was statistically low in preeclampsia group. Severity of vitamin D deficiency did not correlate with the severity of preeclampsia. Age, parity and BMI were similar in both the groups. Gestational age and birth weight were statistically low in preeclampsia group. Cesarean section was significantly high in preeclampsia women.

Conclusion: Vitamin D deficiency is significantly associated with preeclampsia. Further studies are needed to document the role of vitamin D supplementation in prevention of preeclampsia.

Keywords: Vitamin D, preeclampsia, eclampsia, pregnancy

Introduction

Preeclampsia is a multisystem disorder unique to pregnancy. Preeclampsia characterised by hypertension and proteinuria, complicates about 5-15% of pregnancies and is the major contributor of maternal and perinatal morbidity and mortality [1]. Etiopathogenesis of preeclampsia is inconclusive and so far no effective preventive therapy is available. Multiple factors such as genetic factor, angiogenic factor, abnormal placentation, inflammatory activation, oxidative stress and immunological factors leading to endothelial dysfunction play a key role in the pathogenesis of preeclampsia [2]. Vitamin D deficiency is very high even among pregnant women with deeply pigmented skin in India and all over the world [3]. Major role of vitamin D is in the bone formation and calcium homeostasis. Recently vitamin D receptors are reported in all the other tissues. The role of vitamin D in immunomodulation and placental development is reported in various studies. Increased production of inflammatory cytokines like TNF- α is reported in pregnancies complicated by vitamin D deficiency. 1, 25(OH) vitamin D stimulates the activity of T regulatory cells, which are important in supporting placental implantation through favourable immune response [4]. Vitamin D is reported to promote angiogenic properties in endothelial progenitor cells and mediates endothelial function and dysfunction in cell models [5]. This explains the possible role of vitamin D in the pathogenesis of preeclampsia. But the role of vitamin D supplementation and dosage in prevention of preeclampsia is controversial [6].

Materials and Methods

Study Design: Prospective case control study done at Institute of Obstetrics & Gynaecology, Chennai from September 2016 to February 2017.

Subjects: 50 pregnant women diagnosed as preeclampsia and 50 healthy normotensive pregnant women chosen as controls were included in the study.

Exclusion Criteria: Multiple pregnancy, chronic hypertension, diabetes mellitus, renal disease.

Methods: Pregnant women with blood pressure more than 140/90 mm Hg with proteinuria (more than 300 mg/1 in 24 hrs urine) on 2 or more occasions at least 6 hrs apart, after 20 weeks of gestation were diagnosed as preeclampsia. Healthy normotensive pregnant women admitted in labour room were selected as control for this study.

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After getting informed consent, data regarding name, age, symptoms, parity, height and weight were recorded. Details regarding previous pregnancy outcome were recorded. Venous blood samples for 25(OH)Vitamin D estimation were collected after 12 hr overnight fasting, protected from light, centrifuged and stored at - 20 ° C until analysis. 25(OH) Vitamin D estimation was done using Chemiluminiscent Immunoassay (CLIA). Value of 25(OH) 0Vitamin D ≤ 20 ng/ml was the cut off

to define Vitamin D deficiency. Categorical variables were compared using the Pearson Chi-Square test. Quantitative data was expressed as mean ± SD (standard deviation). Categorical variables were expressed as number (No) and percentages (%). P value < 0.05 was considered as significant. Outcome of this pregnancy in both groups was compared.

Results

Table 1: Vitamin D level

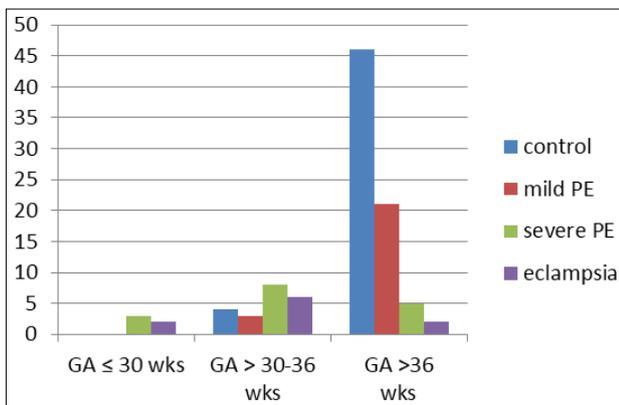
Vitamin D (ng/ml)	Preeclampsia	Controls	p value
	No. of cases	No. of cases	
<20(deficient)	37(74 %)	32(64 %)	0.27
>20(normal)	13(26 %)	18(36 %)	
Mean vitamin D	16.97 ± 2.70	19.74 ± 3.82	0.004

Table 2: Vitamin D status & severity of preeclampsia

Vitamin D (ng/ml)	mild preeclampsia	Severe preeclampsia	eclampsia	p value
	No. of cases	No. of cases	No. of cases	
<20(deficient)	20(40 %)	10(20 %)	7(14 %)	0.32
>20(normal)	4(8 %)	6(12 %)	3(6 %)	

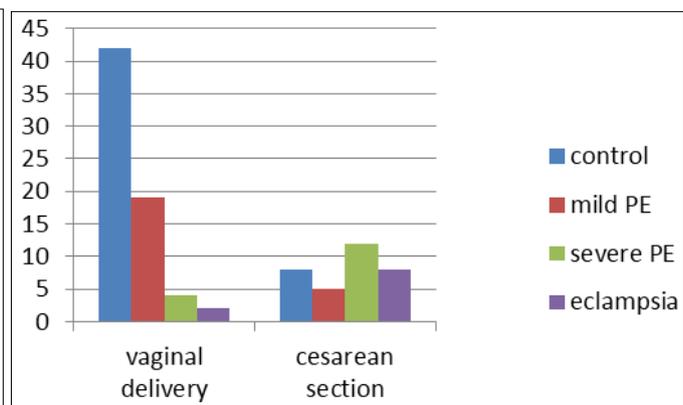
Table 3: Demographic pattern

Maternal characteristics		Preeclampsia (N=50)	Controls (N=50)	p value
Age(years)	20-25	24(48%)	20(40%)	0.20
	26-30	20(40%)	30(60%)	
	31-35	6(12%)	0(0%)	
Pre pregnancy BMI (kg/m2)	<18.5	2(4%)	1(2%)	0.79
	18.5-24.9	20(40%)	18(36%)	
	25-29.9	22(44%)	22(44%)	
	≥30	6(12%)	9(18%)	
Gravida	Primi	28(56%)	38(76%)	0.08
	Multi	12(24%)	8(16%)	
	BOH	10(20%)	4(8%)	
Education standard	<12	19(38%)	23(46%)	0.41
	≥12	31(62%)	27(54%)	
Socio economic status	Low	21(42%)	24(48%)	0.50
	High	29(58%)	26(52%)	



p- value - 0.0001

Fig 1



p- value - 0.0001

Fig 2

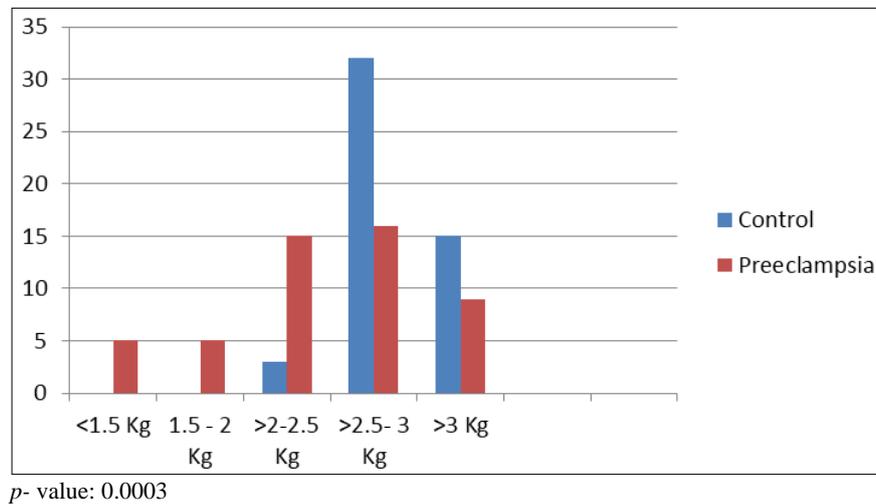


Fig 3

Prevalence of vitamin D deficiency in our study is 69%. About 37% of preeclamptic and 32% normotensive women had vitamin D level $< 20\text{ng/ml}$. No statistical difference was observed ($p > 0.05$). Mean vitamin D level in preeclamptic women was 16.97 ± 2.70 and in controls it was 19.74 ± 3.82 . This low vitamin D level in preeclamptic women was statistically significant ($p < 0.05$) (Table-1). 20 women (40%) with mild preeclampsia, 10 (20%) with severe preeclampsia and 7 (14%) with eclampsia had hypovitaminosis D. In women with vitamin D level $> 20\text{ng/ml}$, 6 (12%) had severe preeclampsia and 3 (6%) had eclampsia. No correlation with vitamin D level and severity of disease was observed ($P > 0.05$) (Table-2). All the women in control group and 88% of preeclamptic women were in the age group of 20-30 yrs ($p > 0.05$). 76% of controls and 56% of preeclamptics were primipara ($P > 0.05$). About 44% of women were overweight in both groups ($p > 0.05$). Socioeconomic and education status were comparable in both groups ($p > 0.05$) (Table-3). Gestational age at delivery was comparable between mild preeclampsia and controls ($p > 0.05$). Gestational age was significantly lower in severe preeclampsia and eclamptic women when compared to controls ($p < 0.05$) (Figure -1). Vaginal deliveries were comparable in controls and mild preeclampsia ($p > 0.05$). Cesarean section was significantly more in severe preeclampsia and eclampsia ($p < 0.05$) (Figure-2). Birth weight was not significantly different between controls and mild preeclampsia ($p > 0.05$). Birth weight was significantly low in severe preeclampsia and eclampsia ($p < 0.05$) (Figure-3).

Discussion

Prevalence of vitamin D deficiency in this study is 69% as compared to Bodnar *et al.* [7] (65%) and Ullah *et al.* [8] (78.19%). Mean vitamin D level was significantly low in preeclampsia women in our study. Mean vitamin D was significantly lower in preeclampsia group at mid trimester and when adjusted for other parameters decline in serum concentration of vitamin D $< 30\text{ng/ml}$ doubled the risk of preeclampsia [7]. Vitamin D deficiency was associated with 3-5 fold increase in risk of preeclampsia [8]. Similar observations were reported by others [9, 10, 11, 12]. Contrary to this many reports by others observed similar vitamin D level in controls and preeclamptic women [13, 14]. But the severity of vitamin D deficiency did not correlate with severity of preeclampsia in our study. Similar observation was made by Singla R *et al.* [15] On the contrary positive correlation between hypovitaminosis D and severity of preeclampsia is reported by others [7, 8]. In our study no statistical difference was

seen with age, parity and BMI as reported by M. Bakacak *et al.* [9]. Preeclamptic women were older and heavier [7]. Eclamptic women were nulliparous and underweight [8]. Gestational age at birth and birth weight were low and cesarean rate was high in preeclamptic women in our study. No statistical difference was observed between preeclampsia and eclampsia. This observation is in agreement with Murat Bakacak *et al.* [9]. Role of vitamin D supplementation in prevention of preeclampsia is doubtful. Haugen *et al.* [16] in a large prospective study found the risk of preeclampsia to be decreased by 27 % in patients who received vitamin D in a dose of 400 to 600 IU/ day. Contrary to this Marya *et al.* [17] found no significant difference in both groups with or without vitamin D (1200 IU/ day). J.M. Purswani *et al.* [18] in a systematic review of literature on vitamin D and preeclampsia observed that clinical trials did not show an independent effect of vitamin D supplementation in prevention of preeclampsia.

Conclusion

Our study shows that vitamin D deficiency in pregnancy is associated with preeclampsia. Majority of the published data also support this finding. But role of vitamin D supplementation in prevention of preeclampsia is not proven beyond doubt. Further studies are needed to document the adequate dose of vitamin D supplementation to prevent preeclampsia for promoting maternal and fetal well being.

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethical committee

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