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# Role of Serum Vitamin D in Preeclampsia and Eclampsia

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**Abstract:** ***Aim: To study the association of low serum vit. D. level as a risk factor for preeclampsia and eclampsia, asses the predictive value of hypovitaminosis D for preeclampsia and eclampsia .and to compare the vit.D levels in pregnant women complicated with preeclampsia /eclampsia and with normal pregnancy. Design: observational study. Method: Study was conducted on Department of Obstetrics and Gynaecology, SRN Hospital M. L. N. Medical College, Allahabad. Study was conducted on 150 pregnant women with >20 weeks of gestation with blood pressure more then 140/90 mm of mercury. s.calcium level -measured by random access biochemistry autoanalyzer . Vitamin D Calculation: done by architect plus immunoassay autoanalyzer in pathology department of swarooprani hospital. Result: Mean significant S.vit.D level of cases was significantly lower than controls (P value <0.001). Mean s.calcium level of cases was significantly lower than controls. (P value <0.001). Mean S.vitamin D level was significantly lower in eclamptic patients than preeclampsia. Conclusion: Study shows significant association of low serum vit.D level with preeclampsia and eclampsia considered as modifiable risk factor. Vit D supplementation in early pregnancy should be explored for preventing preeclampsia and promoting neonatal wellbeing. Vitamin D support in patients with a history of preeclampsia in previous pregnancies may decrease the risk of preeclampsia and eclampsia during the current pregnancy.***

**Keywords:** Serum vitamin D, Preeclampsia, eclampsia

## 1. Introduction

Hypertensive disorders complicates 5-10% of all pregnancies, and together they are one of the deadly triad - along with haemorrhage and infection.

Preeclampsia is best described as a pregnancy -specific syndrome that can affect virtually every organ system .an imposing no. of mechanism have been proposed to explain the cause of preeclampsia .currently considered important include –

1) Placental implantation with abnormal trophoblastic invasion of uterine vessels
2) Immunological maladaptive tolerance between maternal ,paternal(placental), and fetal tissues
3) Maternal maladoptation to cardiovascular or inflammatory changes of normal pregnancy.
4) Genetic factors including epigenetic influence.

Inherited predisposing genes and Increased calcium intake in high risk women lowered the risk for preeclampsia patrelli et al (2012) (1). As in our country most of the women having malnutrition or having low calcium intake so are prone for preeclampsia and eclampsia .vit D deficiency common during pregnancy. Vit D boosts the efficiency of intestinal calcium absorption and promotes bone mineralization and growth .this is specially true in high risk groups such as women with limited sun exposure, vegetarians and ethnic minorities –particularly those with darker skin (Williams obstetrics 25th edition p169). Maternal difficiancy can cause disordered skeletal homeostasis ,congenital rickets and fractures in newborn .Recent epidemiological studies have emphasized the role of vit .D deficiency in the development of preeclampsia .according to Xu L et al (2014) (2) vitamin D has been emphasized to play an immunomodulatory and anti-inflammatory role in many systems . Novakovic et al (2009) (3) Vitamin D also has been suggested to play a role in major signal and gene regulations in the development of placental trophoblasts in the placental growth phase. A decrease in the level of vitamin D has been suggested to cause excess activity in Th-1 type cytokines and to decrease immunological tolerance for implantation and to trigger preeclampsia. Immunomodulatory properties of 1.25(OH)2D have been reported to play a key role in the development of immunological tolerance in pregnancy and the presence of a sufficient level of vitamin D has been emphasized to have a role in the management and prevention of PE wamberg et al (2013) (4). Insufficient vitamin D levels has been associated with increased IL-6 concentrations through stress induced kinase, p38 inactivation, and inhibition of inflammatory cytokines of TNF (Tumor Necrosis Factor) alpha as an origin in coronary endothelial cells nonn L et al (2006) (5). Recent invitro studies have demonstrated the improvement of angiogenesis and inhibition of release of adhesion molecules from endothelial cells by vitamin D .Role of vit D deficiency in immunomodulation and placental development has been emphasized in various study. C. w. redman et al (1989) (6) the commonest difficulty is to identify accurately which patients are likely to have fits. Vitamin D supplementation is considered to decrease the risk of both preeclampsia and eclampsia in the patient population at risk for vitamin D deficiency. Vitamin D has been thought to play a potent endocrine suppressor role in renin biosynthesis for the regulation of the renin-angiotensin system (RAS) tanugupta et al (2015) (7).pal et al (2016)(8) for each 1 ng/ml increase in s.vitD ,live birthrate increased by approximately 2%.

## 2. Material and method

Cases are selected from the patients who are attending obstetrics and gynaecologyopd or are admitted in department of medicine and obstetrics and gynaecology in srn hospital and kamla Nehru associated hospital prayagraj as a case of preeclampsia and eclampsia in 1 year duration.

**Inclusion criteria**
All the nonhypertensive, nonproteinuric pregnant women between 15_34 year of age was included in the study

**Exclusion criteria**
- Pregnant women less than 18 years of age and >34 years of age
- Patients with preexisting renal disease .
- Patients with preexisting hypertension .
- Patients with preexisting diabetes mellitus ,heart disease .

Detailed history clinical examination and relivant laboratory investigation were done as per the performa.

Following investigation were done –CBC, S. Urea creatinine, S. Calcium, s. vitamin D, Urine Routine Microscopy, 24 hour urine protein, fundus examination, liver function test, 60 cases and 60 age and sex matched healthy controls were selected. Control were screened for eclamptic risk factors and assessed for serum vitamin D level.

Methodology prospective study done between July 2014 to August 2015 and data gathered on demographic characteristics, age, gestational age (>20 week), underlying disease, presenting signs and symptoms ,blood pressure on admission ,laboratory finding.

**Measurement of blood pressure**

Hypertension is diagnosed when 2 blood pressure readings of ≥ 140/90 mm of mercury are noted 6 hour apart within a week. measurement of blood pressure with an appropriate sized cuff placed on the right arm at the level of heart in sitting position, ideally women should rest for 10 minutes.

S. vitamin D level and S.calcium level were done in central pathology of swarooprani hospital .

S.calcium level measurement -measured by random access biochemistry autoanalyzer procedure

Wavelength: 660 nm

Temperature: 37 degree centigrade

Read against reagent blank

| | Blank | Calibrator | Test |
|---|---|---|---|
| reagent | 300µl | 300µl | 300 µl |
| Distilled water | 6 µl | - | - |
| calibrator | - | 6 µl | - |
| Sample | - | - | 6 µl |

Mix ,wait 4 minutes 30 sec.and then read then absorbance (A)

## 3. Calculation

$\frac{Asample}{Acalibrator} \times n$ where n=calibrator concentration

Vitamin D Calculation :done by architect plus immunoassay autoanalyzer in pathology department of swarooprani hospital .
Principle of the procedure; architect vit. D assay a quantitative delayed 1 step competitive immunoassay to determine the presence of vitamin D in human serum and plasma using CMIA technology with flexible assay protocol,referred to as chemiflex.

1) Sample, assay diluent and paramagnetic anti-vit.D coated microparticles are combined .vit.D present in the sample is displaced from the vit.D binding protein and binds the anti-vit D coated microparticles ,forming an antigen antibody complex.
2) After incubation, a conjugate containing acridinium-labeled vit. D is added to the reaction mixture and binds to unoccupied binding sites of the anti-vit.D coated microparticles.
3) After further incubation and washing, pretrigger and trigger solutions are added to the reaction mixture.
4) The resulting chemiluminescent reaction is measured as relative light units (RLUs). Relationship between the amount of vit. D in sample and RLUs detected by the architect isystem optics .

Results are calculated automatically based on previously established calibration curve.

## 4. Result

**Table 1:** Mean serum vitamin D in cases and controls

| | No. of patients | Mean S. Vit D | +/- Sd |
|---|---|---|---|
| Cases | 60 | 12.65 | 5.112 |
| Controls | 60 | 51.15 | 16.357 |

Mean significant S.vit.D level of cases was significantly lower than controls (P value <0.001).Early pregnancy maternal 25(OH)D less than 37.5 nmol/liter was associated with a fivefold increase in the odds of preeclampsia, independent of race/ethnicity, season, sample gestational age, pre pregnancy BMI, and education. At delivery, maternal 25(OH)D concentrations remained 15 % lower in women with overt preeclampsia compared with non-preeclamptic controls.

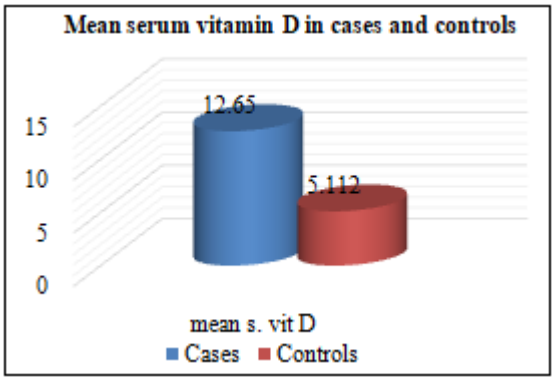

**Table 2:** Mean serum calcium in cases and controls

| | Mean serum Calcium | +/-Sd |
|---|---|---|
| Cases | 7.65 | 0.732 |
| Controls | 8.87 | 1.186 |

Mean s. calcium level of cases was significantly lower than controls. (P value <0.001)

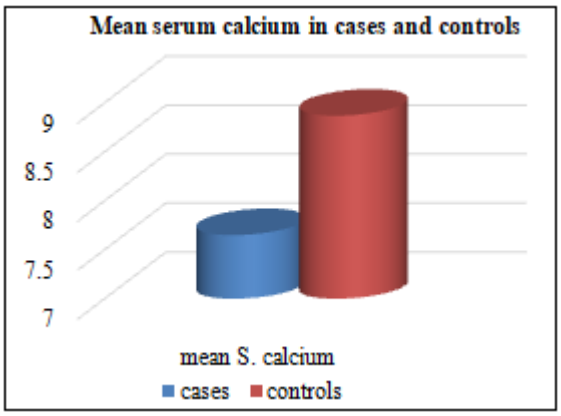


**Table 3:** Mean S.vit D in gestational hypertensives

| Eclampsia status | Mean S.Vit D | +/-Sd | No. of patients |
|---|---|---|---|
| Eclampsia | 9.67 | 1.435 | 12 |
| Pre-eclampsia | 13.40 | 5.429 | 48 |
| Total | 31.90 | 22.788 | 120 |

Mean S.vitamin D level was significantly lower in eclamptic patients than preeclampsia.

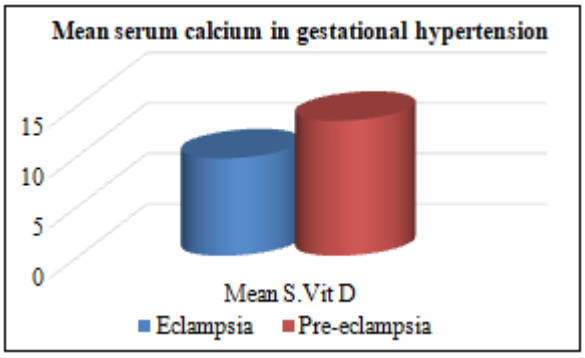


**Table 4:** Age-wise distribution of mean vit D

| Age | Case | | Control | | |
|---|---|---|---|---|---|
| | Mean S. VIT D | +/-Sd | Mean S. VIT D | +/-Sd | P value |
| 20—24 | 11.20 | 4.780 | 40.60 | 9.180 | <0.001 |
| 25-29 | 12.68 | 5.442 | 56.68 | 17.456 | <0.001 |
| 30-34 | 13.69 | 4.423 | 43.54 | 9.404 | <0.001 |

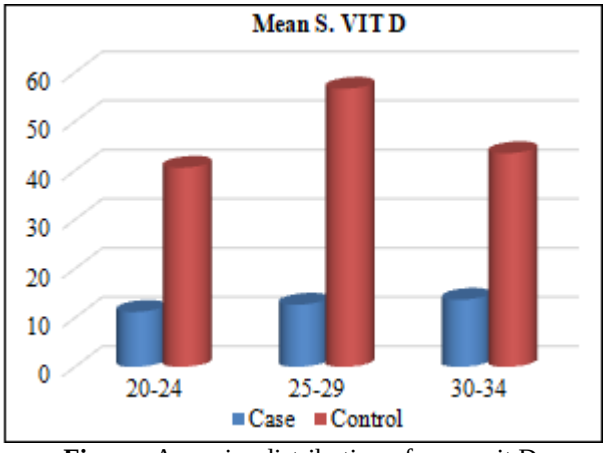


**Figure:** Age wise distribution of mean vit D

## 5. Discussion

In our study age of preeclampsia constitutes of 20-34 years with mean age of 26.9 ±3.4 eclampsia was found in 20% of patients. Which was similar to the observation of AM Baker et al(2010)(9). Maximum no. of cases are occurs in 26-30 weeks of gestation 29 patients (48.3%) while 20 patients are in gestational age group 21-25 weeks, 11 patients in between 30-32 weeks of gestation. Lowered vitamin D <20 were found in 54 patients ,90%,all cases were in <35 weeks. Low vitamin D was also found in study by lai Xu et al (2014)(10) in 30% of preeclampsia patients.

## 6. Conclusion

Study shows significant association of low serum vit.D level with preeclampsia and eclampsia considered as modifiable risk factor vitamin D supplement patients with a history of preeclampsia in previous pregnancies may decrease the risk of preeclampsia and eclampsia during the current pregnancies

## 7. Compliance with Ethical Standards

**Conflict of interest –** Dr. Rita Shukla,Dr.ramona perhar, Dr Meenakshi Devi declare that they have no conflict of interest.

**Informed Consent**–Informed consent was obtained from all individual participants included in the study.

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