

Original Research Article

Prevalence of vitamin D deficiency in patients of hypertensive disorders of pregnancy and normal pregnant women

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ABSTRACT

Background: The aim of this study was to compare vitamin D level in normal pregnant women and patients of hypertensive disorders of pregnancy and to study the prevalence of vitamin D deficiency in patients of hypertensive disorders of pregnancy and normal pregnant women.

Methods: 50 women affected by hypertensive disorders of pregnancy and 50 normal pregnant women more than 20 weeks of gestation, admitted to the ward or to labour room in the Obstetrics and Gynaecology Department, of Mahatma Gandhi Medical College and Hospital were enrolled in the study. Assessment of serum 25 hydroxy vitamin D was done by chemiluminescent immunoassay method.

Results: Serum vitamin D levels were low in women with hypertensive disorders of pregnancy with mean serum vitamin D level 13.66 ± 7.358 ng/ml as compared to normal normotensive pregnant women 21.14 ± 8.241 ng/ml, which is statistically significant ($p=0.001$). Mean vitamin D level in study population was 17.40 ± 8.634 ng/ml. The prevalence of vitamin D deficiency in hypertensive disorders of pregnancy group was very high 88% compared to 50% in normal normotensive pregnant women group. The difference was statistically significant ($p=0.001$). vitamin D deficiency was found among 69% in study population.

Conclusions: Vitamin D levels are deficient in patients of hypertensive disorders of pregnancy as compared to normal pregnant women. There is increased prevalence of vitamin D deficiency with hypertensive disorders of pregnancy suggesting that vitamin D deficiency can be a risk factor for the development of hypertensive disorders of pregnancy.

Keywords: Hypertensive disorders of pregnancy, Gestational hypertension, Pre-eclampsia, Eclampsia, Vitamin D

INTRODUCTION

Hypertensive disorders of pregnancy are the most common medical complication of pregnancy and its association with vitamin D deficiency is worth discussing. Hypertensive disorders accounts for potential maternal and perinatal risks and outcome. It includes gestational hypertension, preeclampsia, eclampsia, chronic hypertension, preeclampsia superimposed on chronic hypertension.

Preeclampsia (PE) is a disease specific to pregnancy affecting many bodily systems. This is characterized by high blood pressure and proteinuria after the 20th week of pregnancy. This increases maternal and fetal mortality and morbidity. Different factors such as angiogenetic, endothelial dysfunction, syncytiotrophoblastic microparticles and inflammatory activation play an important role in the progression of preeclampsia.¹

Apart from known risk factors such as stress, obesity, diabetes, and advanced age, low anti-oxidants, variations

in trace metals and electrolyte disturbances have been linked with the pathogenesis of pre-eclampsia.^{2,3} Knowledge of risk factors is important as treatment can be directed towards these for reducing the morbidity and mortality associated with this disorder.

Epidemiological studies have shown the importance of vitamin D deficiency in the development of preeclampsia.⁴ The importance of vitamin D deficiency in immunomodulation and placental development has been highlighted in various studies. So, they put the emphasis on vitamin D deficiency regarding its probable role in the physiology of preeclampsia.⁵

Vitamin D (sunshine vitamin) is a pro-hormone which plays significant role in bone metabolism via regulation of calcium and phosphate homeostasis, in addition to its neuromuscular functions. Vitamin D deficiency (VDD) is a global health care issue, with billion carrying deficiency or insufficiency around the world. In pregnancy, vitamin D status is important for maternal and fetal health. It is highly useful to assess vitamin D deficiency in mothers so that strategies can be implemented to prevent vitamin D deficiency in pregnancy and lactation.

So, the aim of present study to evaluate the serum vitamin D levels in normal pregnant women and patients of hypertensive disorders of pregnancy and to study the prevalence of vitamin D deficiency in patients of hypertensive disorders of pregnancy and normal pregnant women.

METHODS

This case control study, was carried out on a total number of 100 women of gestational age more than 20 weeks, 50 women affected by hypertensive disorders of pregnancy (gestational Hypertension, mild and severe Pre-eclampsia, eclampsia) and 50 normal normotensive pregnant women, who admitted to the ward or to labour room in the Obstetrics and Gynaecology Department, of Mahatma Gandhi Medical College & Hospital, Jaipur from January 2019 to March 2020.

For statistical significance and comparison, these were divided into two groups.

Group A (case group)- cases in group A further divided into gestational Hypertension, mild pre-eclampsia, severe pre-eclampsia, eclampsia after 20 weeks gestation.

Group B (control group)- control group consisted of 50 normotensive pregnant women of gestational age more than 20 weeks.

Inclusion criteria

Patients of gestational hypertension, pre-eclampsia (mild and severe), eclampsia, as per standard definition after 20 weeks gestation with singleton pregnancy.

Exclusion criteria

History of essential or preexisting hypertension, history of renal disease, history of diabetes, history of thyroid disease, history of any metabolic disorder before or during pregnancy, any other medical illness.

All patients were subjected to detailed history taking, general physical examination, systemic examination, obstetric examination.

Data collection proforma were included demographic and other data, i.e., age, weight, occupation, socio economic status, literacy status, dietary habit, religion, gravidity and gestation age.

Blood pressure was recorded by standard sphygmomanometer. Systolic blood pressure was recorded at phase I (appearance) of korotkoff sound and diastolic blood pressure at phase V (disappearance) of korotkoff sound. The BP of each participant was recorded three times and average noted. Their blood samples were taken and sent for complete blood count (CBC), kidney function tests (KFT), liver function tests (LFT), prothrombin time / international normalized ratio (PT/INR), 25 (OH) vitamin D level. Assessment of serum 25- hydroxy vitamin D was done by using chemiluminescent immunoassay (CLIA) method.

Urine examination was done by urine routine and dipstick method and reading were noted (proteinuria >300mg/24hours or >+1 dipstick considered as preeclampsia). According to endocrine society clinical practice guideline, reference value of maternal vitamin D level.⁶

If >30 ng/ml was regarded as normal, 21-29 ng/ml insufficient, 10-20 ng/ml deficient and <10 ng/ml severe deficiency.

Statistical analysis

The data was coded and entered into Microsoft excel spreadsheet. Analysis was done using Statistical package for social science (SPSS) version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. Descriptive statistics included computation of percentages, means and standard deviations. The unpaired t-test (for quantitative data to compare two independent two groups) and ANOVA test were used for quantitative data comparison of all clinical indicators. Chi-square test and fisher exact test were used for qualitative data whenever two or more than two groups were used to compare. Level of significance was set at $p \leq 0.05$.

RESULTS

Out of the 100 pregnant women in the study population, 50 women (case group) were hypertensive and 50 women

(control group) were normotensive. In present study, the mean age of the case group was 25.50±4.20 years as compared to 25.80±3.65 years in control group. On statistical analysis, the p-value was not significant. The majority of study population came from urban areas (53%) belonged to hindu religion (84%) were illiterate (36%) and were from lower middle socio-economic status (Table 1).

The mean maternal gestational age in present study was 35.20±3.534 weeks in the case group as compared to 35.52±3.819 weeks in the control group. On statistical analysis, the p-value was 0.66 (not significant). This shows that the two groups of present study were similar in terms of gestational age at which serum vitamin D levels were measured (Table 1).

Table 1: Baseline characteristics of study population in case and control groups.

Demographic parameters	Cases	Controls	P value	Statistical significance	
Mean maternal Age (years)	25.50±4.200	25.80±3.653	0.7	Non-significant	
Residence	Rural	24(48%)	23(46%)	0.84	Non-significant
	Urban	26(52%)	27(54%)		
Religion	Hindu	40(80%)	44(88%)	0.27	Non-significant
	Muslim	10(20%)	06(12%)		
Literacy status	Literate	31(62%)	33(66%)	0.56	Non-significant
	Illiterate	19(38%)	17(34%)		
Socio- economic status	Upper	4(8%)	7(14%)	0.81	Non-significant
	Upper- middle	13(26%)	14(28%)		
	Lower- middle	23(46%)	20(40%)		
	Upper- lower	8(16%)	6(12%)		
Lower	2(4%)	3(6%)			
Mean maternal gestational age (weeks)	35.20±3.534	35.52±3.819	0.66	Non-significant	
Mean Systolic BP (mm Hg)	157.8±11.7	113.2±7.538	0.001	Significant	
Mean Diastolic BP (mm Hg)	100.9±8.743	77.08±4.86	0.001	Significant	

Table 2: Comparison of mean vitamin D level between group A (case) and group B (control).

	Mean vitamin D level (in ng/ml)	Std. Deviation	Minimum	Maximum	P value	Statistical significance	
Vitamin D level (in ng/ml)	Group A (Case)	13.66	7.358	4	36	0.001	Significant
	Group B (Control)	21.14	8.241	6	37		
	Total	17.40	8.634	4	37		

Table 3: Prevalence of vitamin D deficiency in group A (case) and group B (control).

		Vitamin D level (in ng /ml)			Total	
		Deficient (<20)	Insufficient (21-29)	Sufficient (>30)		
Groups	Group A (case)	N	44	2	4	50
		%	88.0%	4.0%	8.0%	100.0%
Groups	Group B (control)	N	25	18	7	50
		%	50.0%	36.0%	14.0%	100.0%
Total		N	69	20	11	100
		%	69.0%	20.0%	11.0%	100.0%

The mean Systolic BP of case and control group was 157.8±11.7 mmHg and 113.2±7.538 mmHg. The mean Diastolic BP of case and control group was 100.9±8.74 mmHg and 77.08±4.86 mmHg. p value was 0.001 proving that the mean values of systolic BP and diastolic BP were significantly higher in the case group compared to the control ones (Table 1).

Serum vitamin D levels were low in women with hypertensive disorders of pregnancy with mean serum vitamin D level 13.66±7.358 ng/ml as compared to normal normotensive pregnant women 21.14±8.241 ng/ml. On comparing the vitamin D levels between the both groups, it was observed that the difference between two groups was highly significant with the p-value of

0.001. Mean vitamin D level in overall study population was 17.40 ± 8.634 ng/ml (Table 2) and (Figure 1).

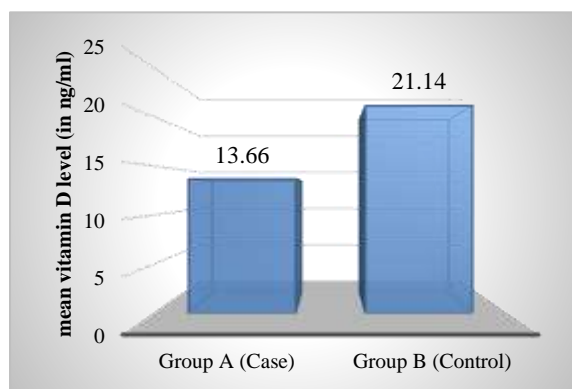


Figure 1: Comparison of mean vitamin D level between group A (case) and group B (control).

In present study, 25 of the candidates of control group had deficient vitamin D levels (mean vitamin D <20 ng/ml) and 44 of the candidates of case group had deficient vitamin D levels (mean vitamin D <20 ng/ml). So, the prevalence of vitamin D deficiency in hypertensive disorders of pregnancy group was very high 88% compared to 50% in normal normotensive pregnant women group. The difference between both groups was statistically significant ($p=0.001$). Vitamin D deficiency was found among 69% in overall study population (Table 3).

DISCUSSION

Maternal vitamin D deficiency is a widespread public health problem that is prevalent during pregnancy. Vitamin D acts in various physiological processes as vascular health, immune function, metabolism and function of the placenta.⁷ Vitamin D has wide functions during pregnancy, including the effects on placental function and inflammatory response.⁸

Our study showed that serum vitamin D levels were low in women with hypertensive disorders of pregnancy with mean serum vitamin D level 13.66 ± 7.358 ng/ml as compared to normal normotensive pregnant women 21.14 ± 8.241 ng/ml. These findings were in accordance with Mehmood et al who found that serum 25(OH)-D concentration was significantly lower in cases (pre-eclampsia, eclampsia and gestational hypertension) compared to controls. 6.78 ng/ml in cases and 9.43 ng/ml in controls ($p=0.002$).⁹

This association was also accordant with findings of Bakacak et al, who found that vitamin D levels were found to be significantly lower in the eclamptic and preeclamptic groups compared to healthy pregnant women ($p<0.001$).¹⁰

Our results confirm the findings of previous studies, Tabesh et al, Aghajafari et al, Wei et al and Sadin et al in which lower serum 25(OH)-D concentration was reported in patients with preeclampsia compared to healthy pregnant controls.^{4,11-13}

In contrast to present study, a study conducted by Umar et al, it was observed that the difference of vitamin D level between the two groups was not found significant.¹⁴

In present study, the prevalence of vitamin D deficiency was 88% in the case group as compared to 50% in the control group. The difference was statistically significant ($p=0.001$). Prevalence of vitamin D deficiency was found among 69% in overall study population as compared to Bodnar et al (65%) and Ullah et al (78.19%).^{15,16}

In contrast to present study, in the study conducted by Goel P et al it was seen that all women (100%) in group 1 had vitamin D deficiency as compared to 92% in group 2 but this was not statistically significant.¹⁷

CONCLUSION

Our study showed that serum vitamin D levels were low in women with hypertensive disorders of pregnancy as compared to normal normotensive pregnant women. Prevalence of vitamin D deficiency was significant in women with hypertensive disorders of pregnancy as compared to normal normotensive pregnant women. So, it is suggested that maternal serum vitamin D level should be estimated in early pregnancy in all high-risk women. Supplementation of vitamin D in early pregnancy can effectively prevent pre-eclampsia and thus improve pregnancy outcome and bring down maternal morbidity and mortality.

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