

To Study Cord Blood Vitamin D Levels in Term v/s Preterm Neonates at Birth

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Abstract

Background: The vitamin D play important role in neonatal period and prevention of sepsis and morbidities in neonatal period. The Indian population is increasingly being discovered to be vitamin D deficient. Present study aimed to assess the cord blood Vitamin D levels in term and preterm neonates at birth.

Material and Method: This prospective observational study was conducted among the neonates born in the hospital and the cord blood sample was obtained for estimation of the cord blood vitamin D. Vitamin D levels as estimated by the chemiluminescence immunoassay (CLIA) method. Serum levels of Vitamin D was classified according to severity: Sufficient->30ng/ml; Insufficiency-20-30ng/ml; Deficiency-<20ng/ml. All the data was entered in excel sheet and analysed using SPSS v21 operating on windows 10. A p-value of <0.05 was considered statistically significant.

Results: In present study total of 100 neonates are include among them 50 were term and 50 were preterm neonates in the study. The mean vitamin D level was found to be significantly lower among the preterm neonates compared to the term neonates.(p<0.05) The vitamin D deficiency was seen in 32% of preterm in comparison to 4% in term pregnancy, this was statistically significant finding. (p<0.05)

Conclusion: Present study documented a significant lower mean vitamin D level among the preterm neonates at birth compared to the term neonates. The study highlights the requirement of the vitamin D among the preterm neonates compared to term neonates.

Keyword: Vitamin D, Neonates, Preterm, Morbidity.

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Introduction

Vitamin D deficiency is a significant health problem in individuals irrespective of gender, race, geography and age.[1,2] The vitamin D play important role in neonatal period and

prevention of sepsis and morbidities in neonatal period. The Indian population is increasingly being discovered to be vitamin D deficient. The effects of vitamin D

deficiency begin at the intrauterine stage. The fetal brain system, foetal lung development, and foetal skeletal development are all significantly influenced by vitamin D.[3-6]

The various effects of vitamin D deficiency are with severe maternal vitamin D deficiency, the fetus rarely may develop rickets in utero with manifestation at birth (role in causation of rickets). Direct effects on neonatal immune system effecting both innate and adaptive immunity. Play a role in fetal skeletal development, tooth enamel formation and general fetal growth and development.[7-9] The causes for the vitamin D deficiency at birth may include; Vitamin D status of pregnant mothers (20-40 years) showed that 20% of the mothers had VDD and 24% had vitamin D insufficiency. Vitamin D crosses the placenta during the last trimester of pregnancy. If the mother has VDD, less vitamin D will be transported across the placenta with resultant low vitamin D stores at birth.[9-13] There are paucity of the status of the cord blood vitamin D among the newborn and the effect on the neonatal growth and outcome. Hence this study was aimed to assess the cord blood vitamin D levels in term and preterm neonates at birth.

Material & Method

This prospective observational study was conducted among the neonates born in the hospital and the cord blood sample was obtained for estimation of the cord blood vitamin D. neonates with major congenital malformation, babies requiring the resuscitation at birth and gestational age less than 28 weeks were excluded. Vitamin D levels as estimated by the chemiluminescence immunoassay (CLIA)

method. Serum levels of Vitamin D was classified according to severity: Sufficient- >30ng/ml; Insufficiency-20-30ng/ml; Deficiency-<20ng/ml.

Statistical analysis: All the data was entered in excel sheet and analysed using SPSS v21 operating on windows 10. The data was summarised as mean, standard deviation, frequency and percentage. The summarised data was represented using tables, figures, bar diagram and pie charts. The continuous data between the groups was analysed using unpaired t-test and categorical data was analysed using chi-square test. a p-value of <0.05 was considered statistically significant.

Results

In present study total of 100 neonates are include among them 50 were term and 50 were preterm neonates in the study. Among the mothers, 72% were multi para and 38% were primipara. The mode of delivery, was seen with 70% with normal vaginal delivery and 30% by LSCS, among which 24% were emergency LSCS and 6% were elective. In the study, birth weight of newborn was significantly lower in the preterm pregnancy compared to term pregnancy. (p<0.05) The APGAR score at 1min and 5min was significantly lower among the newborn born with preterm pregnancy compared to term pregnancy.(p<0.05) The gestational age among the participants was 50 with term and 50 were preterm pregnancy. The mean vitamin D level was found to be significantly lower among the preterm neonates compared to the term neonates.(p<0.05) The vitamin D deficiency was seen in 32% of preterm in comparison to 4% in term pregnancy, this was statistically significant finding. (p<0.05)

Table 1: Showing the demographic details of the study participants

		Frequency	Percent
Gender	Boy	55	55.0%
	Girl	45	45.0%
Mode of delivery	EL LSCS	6	6.0
	EM LSCS	24	24.0

	NVD	70	70.0
Parity	Multi	72	72.0
	Primi	28	28.0

Table 2: Mean comparison between the groups

	Preterm		Term		p-value
	Mean	SD	Mean	SD	
Vitamin D	28.66	7.58	40.52	6.31	0.01*
Birth weight	2.51	0.29	3.21	0.25	0.001**
APGAR 1min	5.70	1.30	7.31	1.10	0.001**
APGAR 5min	7.72	1.31	9.31	1.10	0.001**

*p<0.05 is considered statistically significant.

Table 3: Comparison of vitamin D status with the gestational age of pregnancy

	Preterm		Term		Chi-square (p-value)
	Frequency	Percent	Frequency	Percent	
Sufficient	14	28.0	34	68.0	12.635 (0.01)*
Insufficient	20	40.0	14	28.0	
Deficient	16	32.0	2	4.0	

*p<0.05 is considered statistically significant.

Discussion

Vitamin D is a member of a group of fat-soluble secosteroids which are mainly important for the homeostasis of calcium, phosphate and magnesium. The hypothesis agreed with the substantial evidence is the transfer of the maternal vitamin D to fetus and the fetoplacental unit uptake and synthesising the vitamin D. The low birth weight category is associated with the perinatal complications which are attributable to the preterm delivery, IUGR or both. There include birth asphyxia, hypothermia, hypoglycemia, neonatal sepsis and other long term neurological sequelae among the other complications. Perinatal mortality for the low birth weight tends to be much higher when compared to the normal birth weight.

In study by Mohapatra JN *et al.*, there is significant association of cord blood vitamin D with the newborn anthropometry. The interquartile range for the median cord Vitamin D level was 13.0 to 18.8 ng/dl. 162

infants (80.6%) and 26 newborns (13%) had vitamin D deficiencies, respectively. 96.5% (157) of the newborns of the vitamin D-deficient babies had a crown-heel length of less than 50 cm, and 92.6% (151) of the vitamin D-deficient babies were low birth weight (LBW) (p 0.001). The majority of the neonates in the study lacked sufficient vitamin D, and there was a link between vitamin D insufficiency and LBW and shorter crown-heel length.[6] Even during pregnancy, the placenta and foetal kidney express 1-hydroxylase, which is activated by prolactin and placental lactogen, while the maternal renal hydroxylase still does the majority of the work. Maternal blood calcium levels decline during pregnancy due to a reduction in serum albumin, although ionised calcium levels stay stable. All these effects indicate the vital importance of vitamin D during gestation and the potential role of its deficiency on adverse maternal-fetal outcomes.

In another study, the neonates' cord blood, there were 20.2 and 69.1% more cases of vitamin D deficiency (25OHD 12 ng/mL) and insufficiency (25OHD 12-20 ng/mL), respectively. Vitamin D levels in the mother's blood and cord blood were significantly correlated ($r = 0.86$; $P 0.001$). Low maternal 25OHD levels and the absence of vitamin D supplements during pregnancy were risk factors for vitamin D insufficiency in cord blood. Vitamin D insufficiency is quite common in newborn Thai children. Prenatal treatment should include routine implementation of adequate prenatal vitamin D supplementation.[14] Some studies also documented that the incidence of newborn vitD insufficiency was increased in women with elevated PTH levels and lowered in cord blood calcium levels. Neonatal vitD insufficiency was linked to an 8.91-fold increased likelihood of not taking vitamin D supplements throughout pregnancy (OR = 8.91, 95% CI = 1.521-9.429, $p < 0.001$). Neonatal and maternal vitD levels were typically lower in the plateau group than in the non-plateau group. Prenatal vitamin D supplementation has been shown to significantly lower the risk of vitamin D insufficiency in newborns. [15] Rai S *et al.*, documented the correlation between maternal and cord blood serum levels of vitamin D3. [16]

In similar to present study by Monangi *et al.*, documented Mean (SD) serum 25(OH)D at birth was 46.2 (14.0) nmol/L with lower concentrations in infants born <28 weeks than at 28–32 weeks gestation, $p = 0.02$. Serum 25(OH)D was <50 nmol/L in 63% of mothers, 64% of infants at birth and 35% of infants at discharge. They concluded that Serum 25(OH)D <50 nmol/L was widespread in parturient women and in EPTIs at birth and at discharge. Optimising maternal vitD status during pregnancy and improving postnatal vitD intake may enhance infant vitD status during hospitalisation.[17] Study by Burris

HH *et al.*, documented the mean cord plasma 25(OH)D level was 34.0 ng/ml (range: 4.1–95.3 and SD: 14.1). Infants born before 32 wks' gestation had increased odds of having 25(OH)D levels below 20 ng/ml in unadjusted (odds ratio (OR): 2.2; 95% confidence interval (CI): 1.1–4.3) and adjusted models (OR: 2.4; 95% CI: 1.2–5.3) as compared with more mature infants. Concluded that Infants born in <32 wks' gestation are at higher risk than more mature infants for low 25(OH)D levels. Further investigation of the relationships between low 25(OH)D levels and preterm birth.[18]

Also some documented the overall association was when the maternal 25(OH)D level was less than 15 ng/mL. 15.4% of children had a level that was less than 25% of their mother's 25(OH)D cord blood level, which is less than half of the average child's level. Maternal level and winter birth were related to the level being less than 25%. Children with undetectable levels had higher rates of race and lower rates of being firstborn. These findings imply that once their own 25(OH)D levels drop, moms may lower their contribution to the foetus' 25(OH)D supply. [19] The present study documented the presence of low vitamin D level among the cord blood samples of the newborn with preterm delivery compared to the newborn with term pregnancy.

Conclusion

There is a significant lower mean vitamin D level among the preterm neonates at birth compared to the term neonates. The study highlights the requirement of the vitamin D among the preterm neonates compared to term neonates.

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