

ORIGINAL RESEARCH**To determine the correlation of 25-OH Vitamin D levels between newborns with their mothers in case of sepsis****¹Dr. Ajit Anand Asati, ²Dr. Atul Jain, ³Dr. Ajay Singh Hurmale**¹Assistant Professor, Department of Pediatrics, Bundelkhand Medical College, Sagar, Madhya Pradesh, India²Associate Professor, Department of Pathology, Bundelkhand Medical College, Sagar, Madhya Pradesh, India³Assistant Professor, Department of Anaesthesia, Bundelkhand Medical College, Sagar, Madhya Pradesh, India**Corresponding author**

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Abstract

Background: The neonates' vitamin D levels need to be adequately sufficient. This is of the utmost importance. The immunomodulatory effects of vitamin D on immunological function are well established. It was hypothesized that it could play a part in the proper operation of the innate immune system by generating antimicrobial peptides in epithelial cells, neutrophils, and macrophages. This would be an important step in protecting the body against pathogens.

Aims and Objective: To determine the correlation of 25-OH Vitamin D levels between newborns with their mothers in case of sepsis.

Materials and methods: All infants presenting with symptoms and test evidence consistent with early onset sepsis in the first 72 hours of life were considered cases. All newborns less than 72 hours old who remained in the post natal unit with their mothers and showed no evidence of clinical/laboratory infection were included as controls. There were a total of 110 moms and their newborns analysed in this study: 55 in the case group and 55 in the control group.

Results: In Group 1, 83.33% newborns have deficiency level, whereas only 12.5 % have insufficient level while only 4.1% newborns have sufficient levels . while in group 2 (92.85%) newborns had deficiency, (7.1%) has insufficient levels while in Group 3 , 47% newborns have deficiency level and only (4.1%) had sufficient levels of 25-OH Vitamin D levels born to a mother with deficient 25-OH Vitamin D levels. This observation is statistically Significant (p-0.010)

Conclusion: According to the findings of this research, a very high incidence of hypovitaminosis D was found among pregnant women, and a strong association existed between the 25(OH) D levels of pregnant women and their unborn children.

Keywords: vitamin D, neonatal, sepsis

Introduction

The neonates' vitamin D levels need to be adequately sufficient. This is of the utmost importance. The immunomodulatory effects of vitamin D on immunological function are well

established. [1] It was hypothesised that it could play a part in the proper operation of the innate immune system by generating antimicrobial peptides in epithelial cells, neutrophils, and macrophages. This would be an important step in protecting the body against pathogens. [1-7], Moreover, it is responsible for the regulation of important target genes that are related with the healthy implantation of the placenta. Vitamin D plays a direct role in the production of antimicrobial peptides such as cathelicidin. These antimicrobial peptides are produced upon activation of up-regulated vitamin D receptors, require 25(OH)D as a substrate for production, and may play an important role in preventing infection during pregnancy or early childhood [1]. Vitamin D also plays a direct role in the production of calcitonin gene-related peptides (CGRPs), which are involved in the regulation

It would seem that vitamin D has systemic anti-microbial actions, which might be quite useful in the treatment of both acute and chronic illnesses. Several research have provided evidence to support the hypothesis that there is a connection between vitamin D and the immunological function of neonates. [2,8] Early vitamin D insufficiency has been connected with an increased risk of prenatal growth restriction[1,3], infection[4], and impaired neurodevelopment[4] in later life. This relationship has been supported by a significant amount of research. Recent research has shown that an insufficient amount of vitamin D is a significant risk factor for neonates and children getting illnesses such as TB, acute lower respiratory tract infections, pneumonia, and influenza. It has been shown that the amount of vitamin D in neonates is directly tied to the level of vitamin D in the mother, and that maternal hypovitaminosis makes babies more susceptible to developing early-onset sepsis. This will be the first research of its type to investigate the antimicrobial impact of vitamin D in early onset sepsis and its link with vitamin D levels in both mothers and newborns. In the study that was conducted by Cetinkaya et al. [3,] the researchers came to the conclusion that lower levels of vitamin D were related with an increased risk of early onset neonatal sepsis in newborns. According to the findings of a research that Sachan and colleagues carried out in northern India, there is a significant frequency of vitamin D insufficiency among pregnant women and the babies that they give birth to in northern India.

Aims and Objective

To determine the correlation of 25-OH Vitamin D levels between newborns with their mothers in case of sepsis.

Materials and Methods

This study is in the form of a prospective observational inquiry, and it was conducted between September 2017 and July 2018, with the results being presented in July 2018. The N.I.C.U. of C.R. Gardi Hospital (C.R.G.H) and the affiliated hospital of R. D. Gardi Medical College in Ujjain are both serving as study sites at the present time. This research included all of the babies who had satisfied the criteria for early-onset sepsis and had been hospitalised to the Neonatal Intensive Care Unit (NICU) at the Department of Pediatric Medicine at R D Gardi Medical College in Surasa Ujjain. The NICU is located in the city of Surasa Ujjain. The newborns who had not displayed any signs of clinical or laboratory infection, who were younger than 72 hours old, and who had remained in the same room as their mothers in the post-natal ward at the Department of Obstetrics and, RDgard Medical college in Surasa Ujjain were the ones who were infected. This facility is located in Surasa Ujjain. These kids were a part of the group that served as the control. There were a total of 110 mothers that participated in this study, with 55 women serving as participants in the case group and 55 mothers serving as participants in the control group. In addition, this research included 110 neonates, with each group receiving participation from 55 infants.

Methodology

A proven and tested Proforma was used to record the exhaustive history, clinical observations, and investigations that were performed. We obtained a comprehensive prenatal history from the mother or legal guardians of the baby, as well as from the medical records of the mother. This history included information on the mother's age, religion, and risk factors. Complete birth and postnatal histories of newborns were gathered. Information covered their ages, gestational ages, genders, feeding techniques, pre-lacteal feeds, and the symptoms that they were presenting with. A complete physical examination was performed on the patient, which included taking their pulse and breathing rate, as well as their body temperature, capillary refill time, colour, and oxygen saturation. The age of this pregnancy was determined by taking into account the woman's most recent menstrual cycle as well as the New Ballard Score. Blood cultures and vitamin D levels were taken from each of the patients who were chosen. On the 2 millilitres of blood that was obtained using peripheral venepuncture, tests for haemoglobin, total leukocyte count, direct leukocyte count, C-reactive protein, electrolytes, and random blood sugar were carried out. When it was determined that it was necessary to do so, chest X-rays, lumbar punctures, microscopy of urine, testing of urine for fungus, culture of urine, and arterial blood gas analysis were also carried out.

Blood was extracted without any risk of contamination by following the guidelines that had been set. In order to properly inoculate blood and Macconkey agar using the standard approach, 0.5 millilitres of blood was supposed to be mixed with 10 millilitres of citrated glucose broth. Following forty-eight and seventy-two hours, the colonies were analysed.

The vitamin D assays were carried out with the assistance of the MAGLUMI 25-OH VITAMIN D Kit, which was manufactured by Snibe diagnostics. The MAGLUMI fully-auto chemiluminescence immunoassay (CLIA) analyzer was used in the conducting of the tests at the Kothari Diagnostic Center in Bhopal.

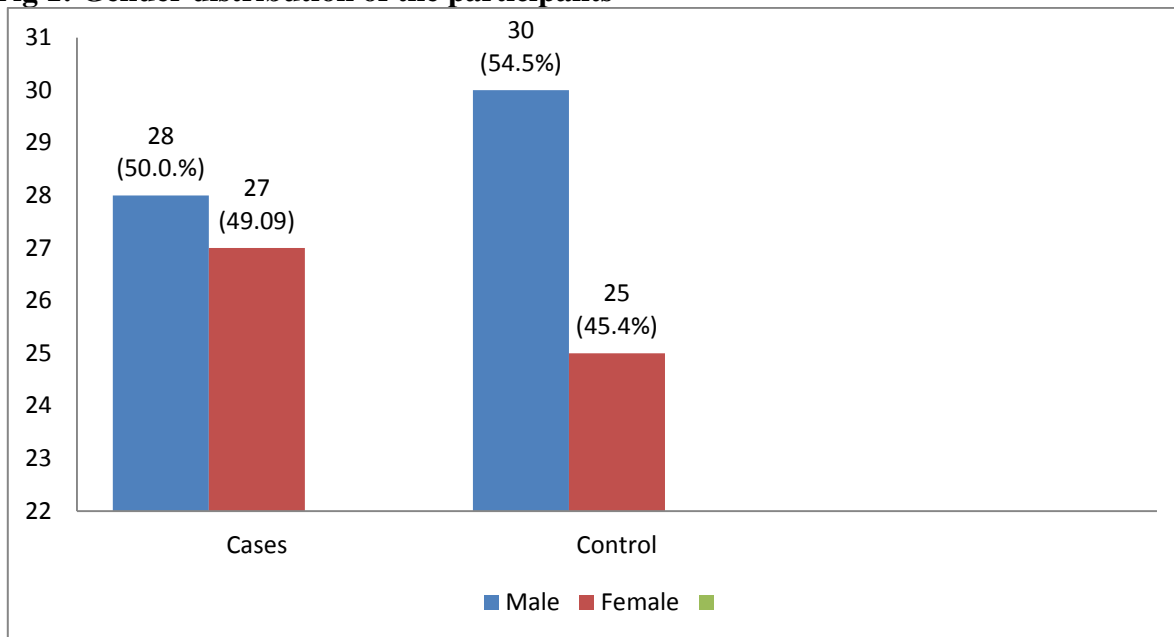
Statistical analysis

The mean and standard deviation of the continuous data were represented, while the percentage (%) was used to describe the categorical data. Histograms were used to do an analysis on the variables that made up the research. The independent samples t test and the chi-squared test were used to analyse the differences between moms who had enough levels of 25(OH)D and those who had insufficient levels. These tests were used for continuous variables and categorical variables, respectively. In order to conduct an initial univariate analysis of the association between the 25(OH)D status of the mother and the infant, the Pearson correlation coefficient was used. Multiple linear regression was used to investigate the effect that potential confounding factors had on the association between maternal and neonatal levels of 25(OH)D. Using the use of multiple linear regression, we were able to identify the nature of the relationship that exists between maternal and newborn anthropometric measures (weight, length, and head circumference). A statistic was deemed statistically significant if its P value was less than 0.05

Results

Total 110 newborns were enrolled out of which 55 were cases and 55 were control. Out of 55 cases, 28(50.90%) were Males and 27 (49.09%) were Females and in control 30 (54.5%) were Males and 25 were Females (45.4%).

Fig 1: Gender distribution of the participants



Majority of population in the present study were Hindu in both cases 46(83.6%) and control 45(81.8%), showing Hindu predominance in this area.

Fig 2: Religion distribution of the participants

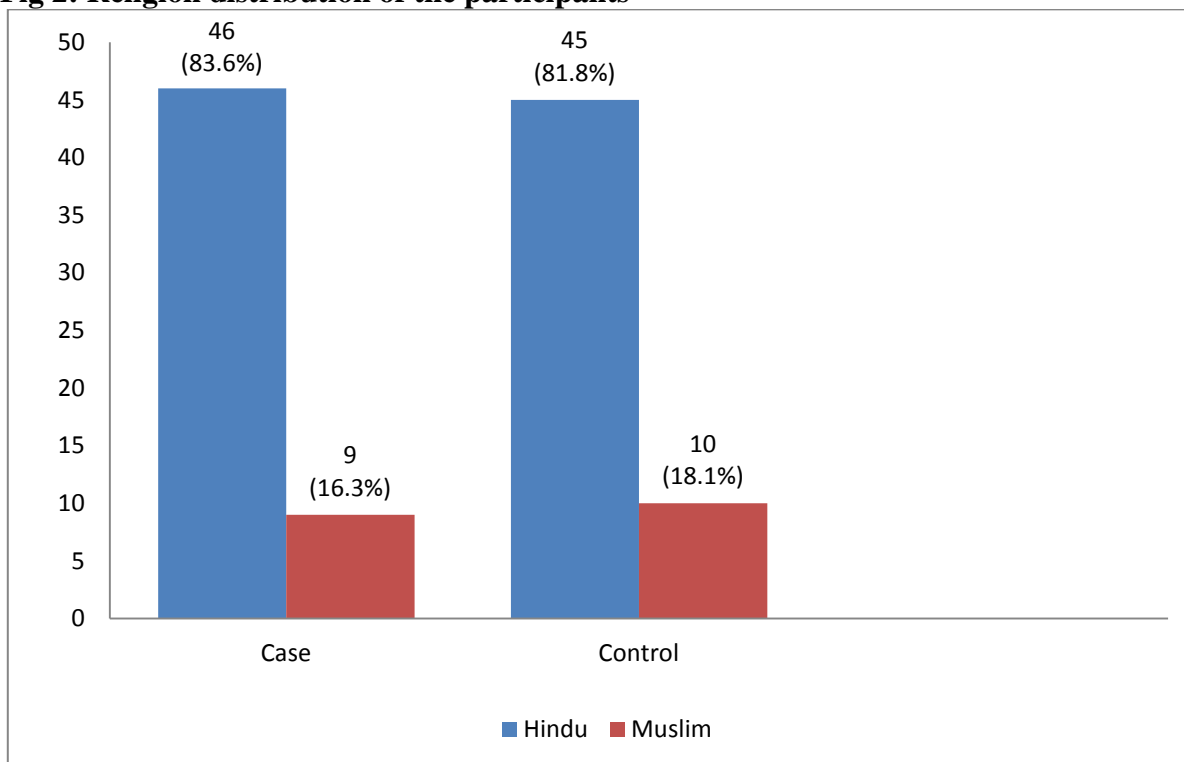


Fig 2: Religion distribution of the participants

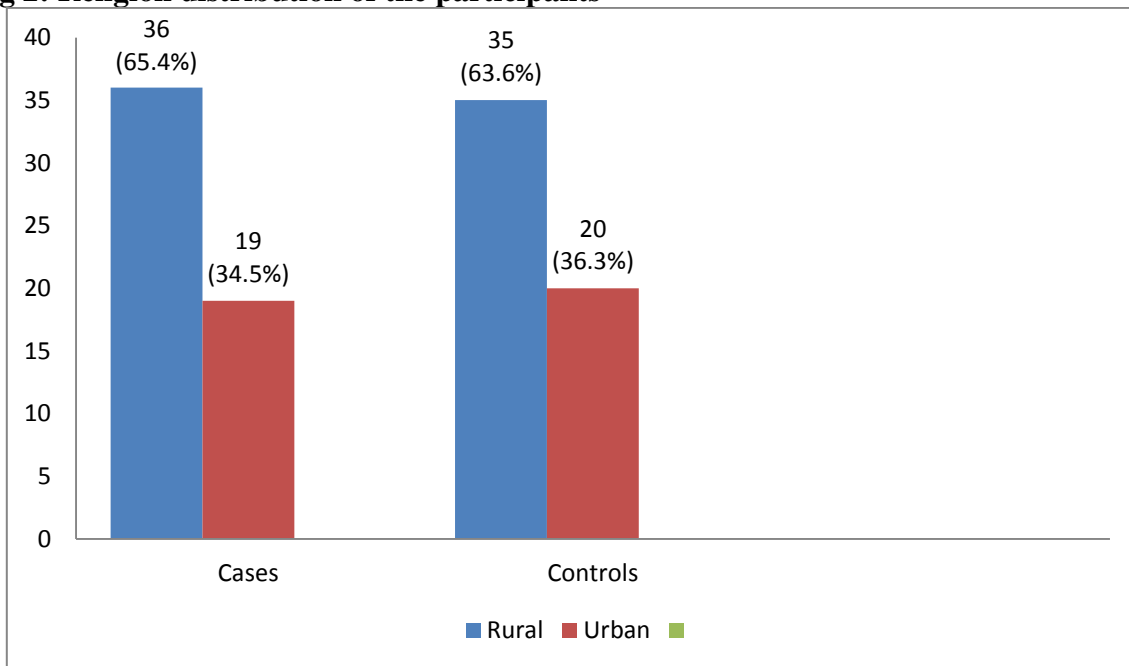


Fig 3 shows that in present study maximum population belonged to rural area in both cases 36(65.4%) and control 35(63.6%) as RD Gardi Medical College is situated in rural area.(Surasa village)

Fig 4: Weight distribution of the participants

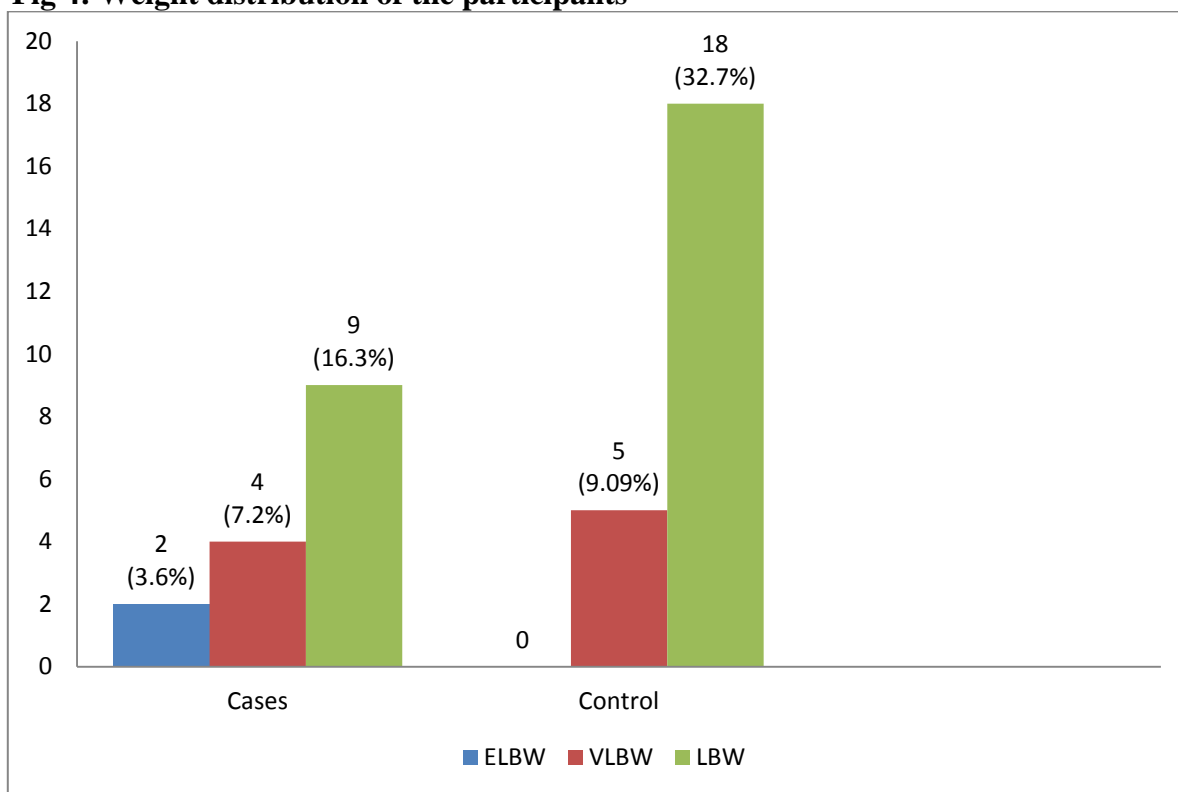


Fig 4 shows that there are only 2 ELBW (3.6%) in cases and nil in control, while VLBW are 4 (7.2%) in cases and 5(9.09%) in controls.

Fig 5 shows that maximum mothers in our study populations in both cases 37(67.2%) and controls 32 (58.1%) belonged to age group 20-30 years.

Mean maternal age in study group is 24.4 years and 26.1 years in control group.

Fig 5: Age distribution of the participants

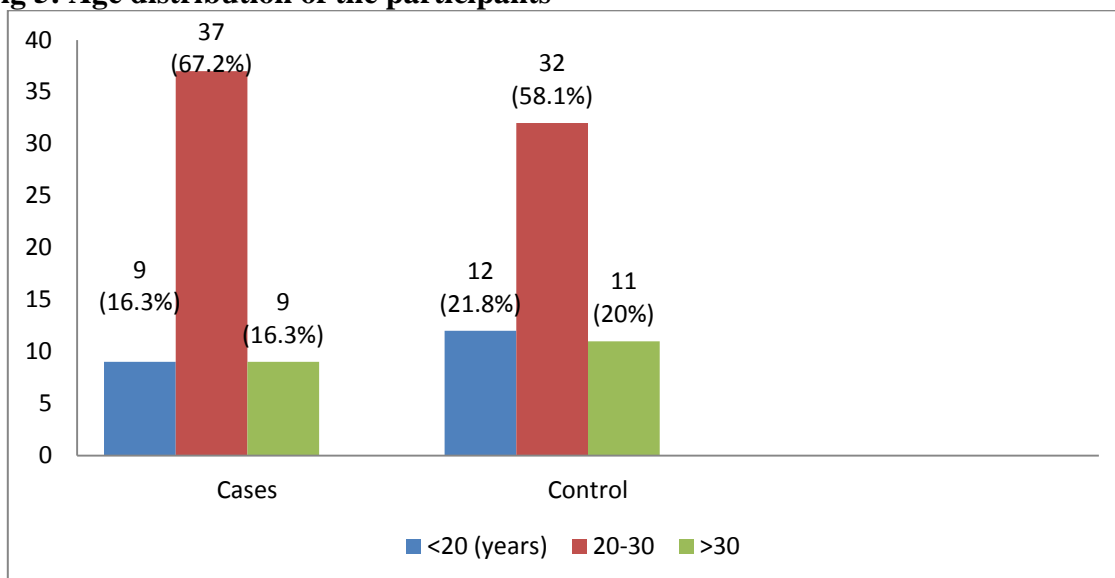


Table 1: Correlation of 25-OH Vitamin D levels between newborns with their mothers in study group

Mother	Newborns			Total	P - value
	Deficiency (n=41)	Insufficient (n=7)	Sufficient (n=7)		
Deficiency (n=24) (43.6%) Group 1	20 (83.33%)	3(12.5%)	1(4.1%)	24 (100%)	0.010
Insufficient (n=14)(25.4%) Group 2	13 (92.85%)	1(7.1%)	0	14 (100%)	
Sufficient (n=17)(30.9%) Group 3	8(47%)	3(17.6%)	6(35.2%)	17 (100%)	
Total(n=55)	41	7	7	55	

Group1- Deficiency (<20ng/ml)

Group2- Insufficient (20-30 ng/ml)

Group3 – Sufficient (>30 ng/ml)

This table shows that in Group 1, 83.33% newborns have deficiency level, whereas only 12.5 % have insufficient level while only 4.1% newborns have sufficient levels . while in group 2 (92.85%) newborns had deficiency, (7.1%) has insufficient levels while in Group 3 , 47% newborns have deficiency level and only (4.1%) had sufficient levels of 25-OH Vitamin D levels born to a mother with deficient 25-OH Vitamin D levels.

This observation is statistically Significant (p=0.010)

Discussion

The dependence of newborns on maternal reserves of vitamin D is reflected in the high level of correlation between maternal and cord blood levels of 25-hydroxy vitamin D3, and these observations were consistent with previous reports.[9,10] Newborns

concentrations of 25-OH cholecalciferol depend on and correlate with the maternal serum levels as the fetus has no endogenous production of 25-OH cholecalciferol and depends on transplacental transfer^[11]. This occurs mainly in the third trimester, and therefore preterm infants are at increased risk of 25-OH vitamin D deficiency than full term neonates and this is in agreement with a previous report that concluded that preterm birth before 32 completed weeks of gestation is an independent risk factor for low 25-OH vitamin D levels at birth.[12] When maternal 25-OH cholecalciferol levels were correlated with 25-OH cholecalciferol levels of newborns it was found that among 24 mothers (group 1) who had deficient levels of 25-OH cholecalciferol, (n=20) 83.33% of newborns had deficient levels of 25-OH cholecalciferol while (n=3)12.5% had insufficient levels and only 1(4.1%) of newborns had sufficient levels and this observation is found to be highly statistically significant ($P<0.010$). Among 14 mothers (group 2) who had insufficient levels, 92.85% (n=13) of newborns had deficient levels and only 1 (7.15%) newborn had insufficient levels of 25-OH cholecalciferol. This observation is found to be highly statistically significant ($P<0.010$). Among 17 mothers (group 3) who had sufficient levels, 47%(n=8) and 17.6%(n=3) of their newborns had deficient and insufficient levels respectively, suggesting causes other than maternal 25OH cholecalciferol deficiency. Only 35.2% had sufficient levels. This observation is found to be highly statistically significant ($P<0.010$). Present study concludes that maternal and neonatal 25OH cholecalciferol levels were lower in newborns admitted with early onset sepsis compared with the control group($p<0.001$). 25-OH D deficiencies in newborns might be due to maternal deficiency and can be a predisposing factor rather than sequelae to early onset neonatal sepsis as we mentioned before.

From a case-control study from Turkey conducted by Cizmeci et al[2] it was found that cord blood levels of the infants with early onset sepsis were significantly lower than the control group (median 12.6ng/ml (3.1-78.9)vs. 21ng/ml (5-118)($p=0.038$).

Although this study does not correlate between maternal and newborns 25OH cholecalciferol level in the study group and control group which present study does.

Vitamin D insufficiency has been linked to increased susceptibility to infectious diseases in pediatric population. It has been demonstrated that vitamin D has potent immunomodulatory properties showing its effects particularly on cells of the innate immune system. Walker et al[13] found that vitamin D concentrations in plasma has effect on both TLR2/1- and TLR4-induced antimicrobial pathway thus decreasing both gram positive and gram negative sepsis. Decreased cord blood plasma concentrations of vitamin D was found to correlate with diminished TLR-mediated induction of cathelicidin, which encodes for an antimicrobial peptide. This peptide possesses antimicrobial activity against gram positive and gram negative pathogens.

Conclusion

According to the findings of this research, a very high incidence of hypovitaminosis D was found among pregnant women, and a strong association existed between the 25(OH) D levels of pregnant women and their unborn children.

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