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RESEARCH ARTICLE

CORRELATION OF MATERNAL SERUM 25 HYDROXY VITAMIN D WITH NEWBORN ANTHROPOMETRY

Muhammad Iqbal[1*], Yusrawati[2], Hudila Rifa Karmia[2], Joserizal Serudji[2]

[1] *Faculty of Medicine, Andalas University, Dr. M. Djamil Central General Hospital Padang, West Sumatera, Indonesia*

[2]*Sub Division of Fetomaternal Medicine, Obstetrics and Gynecology Department, Faculty of Medicine, Andalas University, Dr. M. Djamil Central General Hospital Padang, West Sumatera, Indonesia*

Correspondence :*Muhammad Iqbal, email : dr.m.iqbal@gmail.com*

Abstract :

Vitamin D deficiency (VDD) is identified as a public health problem in many countries, and pregnant women have been identified as a high-risk group, among whom the prevalence of VDD ranges between 20 and 40%. Vitamin D deficiency causes essential health problems, not only in the mother but also in the baby, because the mother's vitamin D stores are the primary source of vitamin D for the fetus. During pregnancy, severe vitamin D deficiency in mothers has been associated with biochemical evidence of impaired bone homeostasis, congenital rickets, and bone fractures in newborns. This study aims to determine the correlation between umbilical cord blood 25(OH)D levels in term pregnancy and Neonatal anthropometry. This research is analytical research using a cross-sectional approach. The sample in this study amounted to 40 people. Data analysts use people tests. The results of this study obtained an average umbilical cord serum 25(OH)D level of 14.70 ± 4.93. There was no correlation between umbilical cord blood 25(OH)D levels in term pregnancy and neonate anthropometry (p>0.05). The average level of 25(OH)D is included in the insufficiency category. Therefore, it is necessary to increase vitamin D supplementation during pregnancy.

Keywords: 25 hydroxy vitamin D; pregnancy; anthropometry

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INTRODUCTION

Vitamin D deficiency (VDD) is identified as a public health problem in many countries, and pregnant women have been identified as a high-risk group, among whom the prevalence of VDD ranges between 20 and 40%. (1) Vitamin D is a fat-soluble vitamin mainly obtained from consuming fortified milk or juice, fish oil, and dietary supplements. It is also produced endogenously in the skin by exposure to sunlight. Vitamin D that is ingested or produced in the skin must undergo hydroxylation in the liver to become 25-hydroxyvitamin D (25-OH-D), then further hydroxylation, especially in the kidneys, to become the physiologically active 1,25-dihydroxyvitamin D. This active form is essential for increasing calcium absorption from the intestine and allowing normal bone mineralization and growth. During pregnancy, severe maternal vitamin D deficiency has been associated with biochemical evidence of impaired bone homeostasis, congenital rickets, and fractures in newborns (2).

Vitamin D deficiency, defined as serum 25-hydroxyvitamin D lower than 25 nmol/L, occurs in at-risk groups worldwide, especially in the Middle East, China, Mongolia, and India. Risk groups for poor vitamin D status are children, especially those with low birth weight, adolescents, pregnant and breastfeeding women, the elderly, and non-Western immigrants. Vitamin D status can be considered adequate (serum 25-hydroxyvitamin D > 50 nmol/L) in less than 50% of the world's population, at least in winter. (3) Vitamin D deficiency causes essential health problems in mothers and their babies because vitamin D stores in the mother are the primary source of vitamin D for the fetus. The International Association of Endocrinology defines vitamin D levels of 21-29 ng/mL as deficient and <20 ng/mL as deficient in adults. (4)

During pregnancy and breastfeeding, significant changes occur in calcium and Vitamin D metabolism to meet the bone mineralization needs of the fetus. In the first trimester, the fetus accumulates 2-3mg/day of calcium in its skeleton, which doubles in the last trimester. (1) During pregnancy, fetal 25(OH)D levels are entirely dependent on the mother's supply, 25(OH)D levels easily cross the placenta and are activated into 1,25(OH)D in the fetal kidney, 1,25(OH)D can also be synthesized in the placenta to regulate placental metabolism. (4) Vitamin D (VD) plays a vital role in regulating calcium homeostasis, while its pleiotropic actions are attracting increasing research interest. Sufficient VD concentrations have clinical relevance, especially in the context of physiological changes, such as those occurring during pregnancy when maternal VD is the sole source for fetal development. As a result, inadequate VD concentrations in pregnancy are associated with perinatal complications and adverse neonatal outcomes, including preeclampsia, gestational diabetes mellitus, increased cesarean section rates, low birth weight, small for gestational age babies, and poor immunity and bone growth. , allergies, and respiratory infections. (5) There are many problems with vitamin D deficiency in pregnant women, which impact the baby's health. This study aims to determine the relationship between umbilical cord blood 25(OH)D levels in term pregnancy and neonate anthropometry.

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METHOD

This research was an analytical study using a cross-sectional approach to determine the relationship between 25 hydroxy vitamin D levels in umbilical cord blood and infant anthropometry. This research was carried out from July to December 2023 at RSUD Dr. M. Jamil Padang. The population in this study were all TM III pregnant women who gave birth at RSUD Dr. M. Jamil Padang. The sample in this study was part of the population that met the inclusion and exclusion criteria, with a total sample of 40 people. Inclusion criteria are term pregnancy and baby's weight ≥ 2500 grams; Exclusion criteria for mothers with chronic diseases and babies with congenital abnormalities. Sampling was carried out sequentially. The instruments in this study were a spectrophotometer with the Enzyme-Linked Immunoabsorbent Assay (ELISA) method to check levels of 25 hydroxy vitamin D in umbilical cord blood, a baby scale to check the baby's weight, check the baby's body length with a microtoise and check the baby's head circumference with a measuring tape. The statistical test in this research is the Person correlation. This research has been approved by the ethical commission of the Faculty of Medicine, Andalas University, with number 618/UN.16.2/KEP-FK/2023

RESULTS

The research subjects were of healthy reproductive age, most were multiparous, and most had above normal body weight. The average umbilical cord serum 25(OH)D levels is included in the insufficiency category, body weight, body length and head circumference are within normal limits as can be seen in table 1.

Tabel 1. Maternal Characteristics, Umbilical Cord Serum 25(OH)D Levels, newborn anthropometry

Characteristic	N	%	Mean	SD
Age				
20-35	36	90		
>35	4	10		
Parity				
Nullipara	10	25		
Multipara	30	75		
Body mass index				
Underweight	2	5		
Normal	13	32.5		
Overweight	11	27.5		
Obesity I	12	5		
Obesity II	2	5		
Umbilical Cord Serum 25(OH)D Levels (ng/ml)			14.70	4.93
Apgar Score				
Normal	38	95		
Mild-moderate asphyxia	2	5		
Weight			3059	303.92
Length			48,22	1,85

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Head circumference	33,02	1,64

In table 2, it can be seen that there is no relationship between umbilical cord serum 25(OH)D levels and anthropometry of newborn babies.

Table 2. Correlation between Umbilical Cord Serum 25(OH)D Levels with newborn anthropometry

Variable		Serum 25(OH)D Levels
Weight	r	0,092
	ρ	0,570
Length	r	-0,039
	ρ	0,812
Head circumference	r	- 0.091
	ρ	0,578

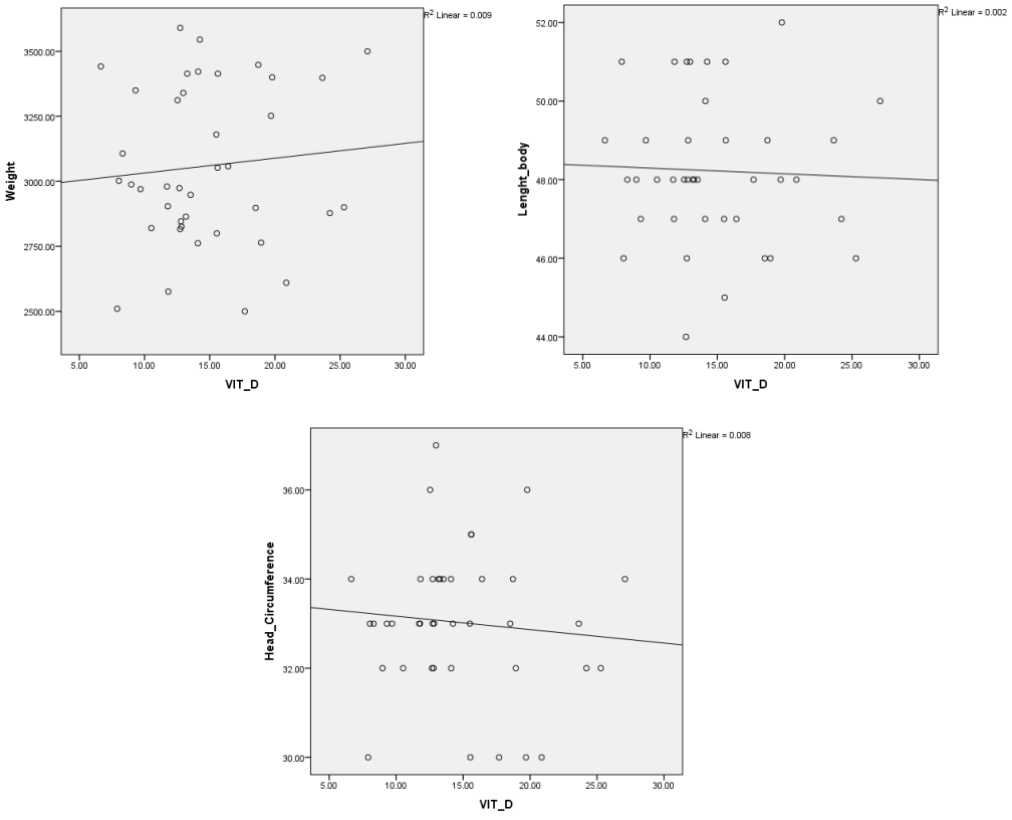

Figure 1. Correlation between Umbilical Cord Serum 25(OH)D Levels with newborn anthropometry

DISCUSSION

This study showed no significant correlation between umbilical cord serum 25(OH)D levels and the anthropometry of newborn babies. The results of the analysis of Umbilical Cord Serum 25(OH)D levels and newborn baby weight showed no significance (p=0.570). The study of Umbilical Cord Serum 25(OH)D Levels and the body length of newborn babies proved that it was not significant (p=0.812). The results of the analysis of Umbilical Cord Serum 25(OH)D levels and newborn baby head circumference showed no significance (p=0.578). The results of this study are in line with research conducted by Rabbani et al. in 2020; there was no significant relationship between 25(OH)D and body weight (p=0.8), body length (p=0.3), and head circumference of newborn babies (p = 0.6). (6)

Research conducted by Rajuddin et al. stated no correlation between maternal vitamin D levels and the birth weight of newborn babies (p=0.185). (7) Wierzejska et al., 2018 stated that no relationship was found between maternal vitamin D concentration and umbilical cord blood and neonatal anthropometric measurements at birth (body weight, body length, head, and chest circumference) ($p > 0.05$). (8) no significant relationship exists between serum vitamin D levels in umbilical cord blood and birth weight (p=0.711). (9) Vitamin D is essential for bone health in regulating metabolism, calcium, and phosphorus absorption. However, the effects of vitamin D are not limited to mineral homeostasis and maintenance of bone health. Vitamin D receptors (VDR) in other tissues and organs suggest that vitamin D physiology extends beyond bone homeostasis (10).

In this study, the average umbilical cord serum 25(OH)D level was 14.70 ± 4.93. Pregnant women in Indonesia have serum vitamin D levels of 40.59 nmol/L, below the threshold for serum 25(OH)D deficiency (<50 nmol/L). (11) Vitamin D requirements may be more significant in pregnancy, as evidenced by the physiologically higher levels of 1,25-dihydroxy vitamin D in the second and third trimesters. While 1,25(OH)2D levels do not directly impair 25 hydroxy vitamin D concentrations, the increase in physiologically active metabolites, increased intestinal calcium absorption, and increased fetal calcium requirements (250 mg/day in the third trimester) all point to the importance of vitamin D in pregnancy. (12)

During pregnancy and breastfeeding, significant changes occur in calcium and Vitamin D metabolism to meet the bone mineralization needs of the fetus. In the first trimester, the fetus accumulates 2-3 mg/day of calcium in its skeleton, which doubles in the last trimester. (1) During pregnancy, fetal 25(OH)D levels are entirely dependent on the mother's supply, and 25(OH)D levels easily cross the placenta. They are activated into 1,25(OH)D in the fetal kidneys, and 1,25(OH)D can also be synthesized in the placenta to regulate placental metabolism. (4) Vitamin D deficiency during pregnancy has been associated with an increased risk of several conditions that affect the mother and fetus or newborn, including premature birth (if vitamin D deficiency occurs in the middle of

pregnancy). (11) Prevention of vitamin D deficiency requires moderate exposure to sunlight, consumption of fish, fortification of foods with vitamin D, and use of vitamin D supplements. (4)

CONCLUSION

The mean serum 25(OH)D level in umbilical cord blood is included in the insufficiency category. There was no significant correlation between umbilical cord blood 25(OH)D levels in term pregnancy and neonate anthropometry. This study has several limitations that could bias the research results, namely, the sample size is too small, and this study limits term pregnancies. The low mean serum 25(OH)D in umbilical cord blood requires vitamin D supplementation in pregnant women

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CONFLICT INTEREST

None

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