

MATERNAL AND UMBILICAL CORD 25(OH)D LEVELS AT DELIVERY AND IDENTIFICATION OF FACTORS AFFECTING THE CORRELATION

A prospective observational study from a northern Emirate

INTRODUCTION

In the United Arab Emirates, up to 69% of pregnant women was shown to have 25(OH)D < 30nmol/L with low awareness of the importance, also in well-educated women¹.

¹Izzeldin H, Taha Z, Ihab T, Salah B, Hisham S, Amanda A, et al. Risk Factors for Maternal Vitamin D Deficiency within the United Arab Emirates. J Pregnancy Child Heal. 2016 Sep 30;3(5):1–8.

AIM

We aimed to describe the maternal and umbilical cord levels of 25(OH)D at delivery and to investigate if obesity, diabetes, amount of supplementation, and delivery mode influenced the maternal level and the correlation between maternal and umbilical cord blood levels. Secondary aim was to study certain risks associated with 25(OH)D levels < 50nmol/L.

METHODS

A prospective observational study from a tertiary hospital recruiting from September to December 2021. All women admitted for labor were asked to participate. 25(OH)D was analyzed in maternal serum at admission, respectively, in cord blood at delivery and analyzed directly. ANOVA, Fisher’s exact test, multiple linear regression, Pearson’s correlation, and binary logistic regression was used when appropriate.

RESULTS

303 women were enrolled and 237 had complete maternal/umbilical cord blood samples. 138 (47.7%) of women were diagnosed with deficiency whereas only 34 fetuses (13.8%) were deficient. The mean difference between maternal and cord blood 25(OH)D was negative in 91% of cases (-16.27nmol/L, SD=13.36). The correlation between maternal/umbilical cord levels was excellent (r = 0,906, p<0,000). After dividing into subgroups of maternal 25(OH) D levels, BMI, diabetes yes/no and delivery-mode the correlation was consistent, although the correlation coefficients in the subgroups of maternal 25(OH)D levels were lowered for all groups. Of factors studied, only the supplementation dose affected the maternal 25(OH)D level. 25(OH)D <50nmol/L was not associated to an increased risk for diabetes, preterm labor, preterm-rupture-of-membranes or low Apgar-score.

CONCLUSION

We found a higher 25(OH)D level in cord blood with robust correlation to maternal levels. Of the studied factors only supplementation dose had significant impact on the maternal level. 25(OH)D <50nmol/l were not associated to increased risk for preterm-labor, preterm-rupture-of-membranes, diabetes, or low Apgar-score.

Table 1.

Maternal and fetal characteristics divided accordingly to different levels of maternal 25-hydroxy-vitamin-D (25(OH)D) at labor.

	Group I Maternal 25(OH)D <25nmol/L n = 64	Group II Maternal 25(OH)D 25nmol/L to < 50nmol/L n = 74	Group III Maternal 25(OH)D > 50nmol/L n = 151	P value	
	Mean ± SD Median (IQR)	Mean ± SD Median (IQR)	Mean ± SD Median (IQR)		
Maternal age	29.8 ± 6.25 28 (25;35)	30.2 ± 5.18 29 (26;34)	30.9 ± 6.24 31 (27;36)	0.373 [†]	
Gestational week at delivery	38.1 ± 1.9 38 (37;40)	38.4 ± 3 39 (38;40)	38.2 ± 2.2 39 (37;39)	0.773 [†]	
Maternal level of 25(OH)D (nmol/L)	17.5 ± 4.9 18.1 (14.1;21.3)	37.2 ± 7.53 36.8 (30.9;44.1)	81.8 ± 23.68 78.1 (64.8;93.2)	0.001 [†]	
Fetal weight	3068 ± 582 3098 (2820;3453)	3077 ± 690 3097 (2800;3473)	3036 ± 592 3100 (2740;3365)	0.879 [†]	
Umbilical cord blood 25(OH)D (nmol/L)	28.1 ± 0.9 28 (20.8;34)	49.4 ± 12.2 49.2 (40.5;56)	98.1 ± 26.3 95.3 (81.4;112)	0.001 [†]	
Umbilical cord blood Ca ²⁺	1.41 ± 0.08 1.41 (1.36;1.46)	1.42 ± 0.11 1.44 (1.37;1.5)	1.41 ± 0.08 1.41 (1.36;1.46)	0.603 [†]	
	n (%)	n (%)	n (%)		
Maternal BMI	< 25 25-30 ≥30	12 (19.4) 23 (37.1) 27 (43.5)	7 (9.5) 23 (31.1) 44 (59.5)	42 (27.8) 40 (26.5) 69 (45.7)	0.014 [‡]
Nationality	Middle east Northern Africa/sub-Sahara Asia	36 (56.3) 8 (12.5) 20 (31.5)	38 (51.4) 17 (23) 19 (25.7)	91 (60.3) 24 (15.9) 36 (23.8)	0.409 [‡]
Daily exposure to sunlight	None 0-30 min 30 - 60 min > one hour	38 (66.7) 18 (31.6) 1 (1.8) 0	37 (59.7) 22 (35.5) 3 (4.8) 0	73 (58.4) 49 (39.2) 1 (0.8) 2 (1.6)	0.462 [‡]
Maternal Diabetes	No Yes	52 (81.3) 12 (18.8)	53 (71.6) 21 (28.4)	101 (66.9) 50 (33.1)	0.101 [‡]
Delivery mode	Vaginal delivery Cesarean section	48 (76.2) 15 (23.8)	47 (63.5) 27 (36.5)	99 (65.6) 52 (34.4)	0.22 [‡]
AS ≤ 7 at 5 min		1 (1.6) 2 (2.7)	2 (2.7)	2 (1.4)	NA

SD: standard derivation, IQR: interquartile range, BMI: body mass index, IU: international units, AS; Apgar score, [†] One-way ANOVA, [‡] Fischers exact test.

Table 2.

Correlation between the maternal and umbilical cord blood level of 25(OH)D.

		n	r	p
All cases		237	0.906	< 0.001
Maternal level of 25(OH)D	<25nmol/L 25-49.5nmol/L ≥50nmol/L	53 58 126	0.697 0.576 0.698	< 0.001 < 0.001 < 0.001
Delivery mode	Normal vaginal delivery Elective CS first stage CS second stage	176 18 24 12	0.922 0.908 0.945 0.644	< 0.000 < 0.000 < 0.000 0.024
Diabetes	No Yes	173 64	0.916 0.875	< 0.000 < 0.000
BMI	18.5-24.9 25-29.9 30-34.9 >35	50 69 66 47	0.866 0.96 0.868 0.925	< 0.001 < 0.001 < 0.001 < 0.001

r; Pearson’s correlation coefficient, CS; cesarean section, BMI; body-mass-index

Fig. 1

The mean maternal - umbilical cord 25(OH)D level across the levels in maternal blood.

