



# Maternal 25 Hydroxyvitamin D Level is Inversely Associated with Glycated Hemoglobin in Thai Gestational Diabetes

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## ABSTRACT

Studies suggest that vitamin D deficiency in pregnancy may increase the risk of developing gestational diabetes (GDM). This study was to identify 25 Hydroxyvitamin D (25 OHD) level in Thai pregnant women with GDM and non-GDM.

This study was conducted in 198 pregnant women at the tertiary care medical center in Bangkok, Thailand from October 2010 to July 2011. Serum 25OHD level were evaluated during the 75g OGTT in pregnancy.

The 198 pregnant women had a mean age of 32.1±5.9 years and a mean maternal 25OHD level was 34.3±8.3 ng/dl. Only 3.1% of patients had 25OHD deficiency (<20ng/dl), 22.3% had 25OHD level 20to29 ng/dl and 74.6 % had 25OHD level≥30ng/dl. In our study, 70 patients (34.8%) had GDM. The patients with GDM had 25OHD levels significantly lower than non-GDM (32.3±10.3 vs 35.5±6.7ng/dl, p=0.004). In regression analysis adjusted for age, body mass index (BMI), family history of diabetes and trimester, maternal 25 OHD level was inversely associated with lnHbA1c ( $\beta$  =-2.127, 95% CI; -3.783,-0.472, p=0.001) in GDM. In contrast, there were no associated of glycemic parameters with 25OHD levels in women without GDM.

## METHODS

### Material and Method Study Design;

This prospective study was conducted in 197 pregnant women at Rajavithi hospital, a tertiary care medical center in Bangkok during October 2010 to July 2011. The plasma 25 hydroxyvitamin D concentration and HbA1c level during the 75g OGTT in GDM and non GDM were evaluated. The International Association of Diabetes and Pregnancy Study Groups (IADPSG) recommendation were used for diagnosing GDM in this study.

### Biochemical measurement

Serum 25OHD was measured using the DiaSorin enzyme immunoassay reagents and procedure. Serum fasting plasma glucose, 1 hr and 2hr glucose level after 75g OGTT and HbA1c were measured. We categorized plasma 25OHD according to the Institute of Medicine (IOM) criteria 2011. Vitamin D deficiency< 20ng/dl, Vitamin D insufficiency 20-29ng/dl and Vitamin D sufficiency≥ 30ng/dl

### Statistical analysis

Results of continuous data were presented by mean ± SD, category data present by proportion (%). A statistically significant difference was considered at a p-value less than 0.05. Difference in clinical characteristics between the two groups was tested using a student T-Test by continuous data and chi square ( $\chi^2$ ) in category data. Pearson and Spearman correlation analysis was use to test for bivariate linear relationships between 25OHD and other normal distribution variables. Regression model analyze affected variables that probably in change of 25OHD with glycemic parameters. All statistic analyses were carried out using the statistical software SPSS version 17.0.

## RESULTS

Table 1. Baseline characteristic of Thai pregnant

	GDM N=69	Non GDM N=129	P value
Age(years)	32.8±5.68	31.6±6.1	0.161
BW(kg)	62.2±16	55.5±14.83	0.011*
Height(m)	1.56±.06	1.54±.054	0.104
Pre-pregnancy BMI(kg/m <sup>2</sup> )	26.3±6.93	23.3±5.70	0.004*
Systolic BP(mmHg)	116.5±11	113.7±9.53	0.099
Diastolic BP(mmHg)	73.0±10.3	69.7±8.4	0.029*
OGTT fasting(mg/dl)	90.4±26.14	76.3±5.65	<0.001*
OGTT 1hr(mg/dl)	196.6±35	141.1±21.93	<0.001*
OGTT 2hr (mg/dl)	168.7±38.80	126.8±118.56	<0.001*
HbA1c(%)	5.79±0.94	5.33±0.37	<0.001*
25 OHD (ng/dl)	31.82±9.93	35.70±6.80	0.004*

Table 2. Regression model for association of glycemic parameter with maternal 25 OHD (ng/ml)

Model*	GDM			Non-GDM		
	$\beta$	95% CI	P value	$\beta$	95% CI	P value
A. Fasting PG	-0.27	-0.503,-0.029	0.295	0.05	-0.235,0.332	0.733
B. 1hr OGTT	-0.12	-0.270,0.035	0.125	0.04	-0.038,0.107	0.159
C. 2hr OGTT	-0.08	-0.210,0.051	0.221	0.02	-0.073,0.107	0.120
D. ln HbA1c	-2.24	-3.285,-1.200	0.031*	0.13	-0.497,0.461	0.677

\*association of FPG and ln HbA1c in 25OHD level with GDM after adjustment for age, BMI, family history of DM and trimester of OGTT test

## RESULTS

Table 3. Relationship of 25 hydroxyvitamin D with variables of interest in bivariate analyses

Variable	GDM(N=69)		Non-GDM(N=129)	
	Correlation coefficient	P value	Correlation coefficient	P value
Maternal age	0.275	0.022*	0.181	0.040*
Weight	-0.118	0.394	-0.105	0.293
Height	0.091	0.512	-0.039	0.695
BMI	-0.361	0.007**	-0.101	0.314
Trimester @ OGTT	0.087	0.520	0.108	0.274
Fasting PG	-0.240	0.047*	0.032	0.717
1 hr OGTT	-0.166	0.172	0.091	0.305
2 hr OGTT	-0.074	0.546	-0.077	0.388
ln HbA1c	-0.392	0.001**	0.001	0.994
Fasting insulin ( $\mu$ U/ml)	-0.122	0.404	0.225	0.020*
HOMA-IR	-0.134	0.357	0.133	0.175
ln HOMA- $\beta$	0.104	0.473	0.124	0.202
Fx DM†	0.018	0.897	0.017	0.866
Smoking †	0.154	0.248	-0.058	0.555
Alcohol†	0.114	0.395	0.025	0.803

\*Pearson' correlation method (p<0.05)  
 \*\* Pearson' correlation method (p<0.01)  
 †spearman' correlation method

## CONCLUSION

Our study provides data indicating that vitamin D insufficiency and deficiency are found in approximately 25 % of our Thai pregnant women and 41 % (data not shown) among Thai GDM women living in Bangkok. Those with GDM have lower concentration of 25OHD compared to the non GDM group significantly. Pre-pregnancy BMI was found to be inversely associated with 25OHD status. And lastly, HbA1c in the GDM group were inversely associated with 25OHD level after adjusted propable factors that can change 25OHD level. Such evidence from this study had show relation of vitamin D status and impaired glucose parameters in both pregnant with GDM and non GDM.

This study further demonstrate an association between vitamin D concentrations and HbA1c and suggestion that this may relate to  $\beta$ -cell function.

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