

Prevalence of Vitamin- D Deficiency among Women with Gestational Diabetes Mellitus

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ABSTRACT:

Objective: To determine the frequency of vitamin D₃ deficiency among women with Gestational Diabetes mellitus visiting tertiary care hospital.

Materials and Methods: This descriptive case series study was carried out in Obstetrics and Gynecology department at Dr. Ziauddin Hospital Karachi for a period of six months. 136 GDM women with age 18 to 30 years having singleton pregnancy and gestational age of 24-40 weeks were enrolled. Patients were offered according to ADA (American Diabetic Association) recommendations, 1 hour 50gm Oral Glucose Challenge Test, without any preparation or fasting. Then 1 hour later plasma glucose measurements were done. If values were >140 mg/dl or 7.8mmol/l then 3 sample 75g Oral Glucose Tolerance Test (WHO criteria) was offered (to diagnose GDM) on next visit. The mothers were advised not to have breakfast on the day of the diagnostic test. Then fasting blood glucose sample was taken. Afterwards hourly samples were taken till 2 hours. If one reading was raised then diagnosis was established as impaired glucose intolerance and if two readings were raised then diagnosis was confirmed as gestational diabetes mellitus. Estimation of vitamin D levels by Electrochemiluminescence technique was done in diagnosed GDM women.

Results: Mean age of the patients was 26.46 ± 2.91 years. Mean gestational age of the patients was 33.03 ± 6.14 weeks. There were 57 (41.90%) primiparous and 79 (58.1%) multiparous patients. Frequency of vitamin D deficiency was found in 84 (61.80%) patients with GDM.

Conclusion: The frequency of vitamin D₃ deficiency was found higher among women with GDM visiting tertiary care hospital.

Keywords: Prevalence, Vitamin D deficiency, GDM, Tertiary care hospital

INTRODUCTION:

Vitamin D is well known for its primary physiological role of regulation of calcium homeostasis in maintaining bone health. However, mounting evidence indicates that vitamin D is also involved in controlling body composition, energy homeostasis, insulin sensitivity, and immune function. Low levels of vitamin D during pregnancy or breast feeding can have an adverse effect on the baby's growth and development. Studies have shown the prevalence of vitamin D deficiency (defined as <50 nmol/L) or insufficiency (<75-80 nmol/L) during pregnancy.^{1,2} One study suggested that 63.3% mothers are affected.³

Low levels of vitamin D during pregnancy or breast feeding can have an adverse effect on mother and baby's health and wellbeing. Infants born to mothers with hypovitaminosis D have increased risk of symptomatic hypocalcaemia, small for gestational age and larger fontanelle, suggestive of impaired ossification of skull bones.⁴ In addition, vitamin D deficiency has been linked to other adverse effects on pregnancy, such as diabetes

mellitus, preterm deliveries, bacterial vaginosis, pre-eclampsia⁵ and small-for-gestational-age babies.⁶ Gestational diabetes mellitus (GDM) is hyperglycemia with onset or first recognition during pregnancy. Although the symptoms of GDM are similar to type 2 diabetes mellitus, it is often diagnosed through prenatal screening, rather than reported symptoms.⁷ It has also been suggested that vitamin D deficiency may play a role for the occurrence of GDM.⁸ The prevalence rates of GDM vary by region. Vitamin D and Lifestyle Intervention for Gestational Diabetes Mellitus Prevention research group indicated that although the prevalence rates differed by regions in Europe (ranges 2.0-6.0%), lower prevalence rates of GDM were found in Northern or Atlantic seaboard parts of Europe (< 4%); while higher prevalence rates (> 6%) predominated in South or Mediterranean seaboard regions.⁹ The prevalence of a low vitamin D in pregnancy in USA is reported to be 59%, Ireland 20.8%, Australia 80.5%. United Arab Emirates 40% and in Pakistan 69.9%.^{10, 11} There are several studies that suggest a relationship between vitamin D deficiency and GDM risk, however their results appear mixed and inconclusive.^{12, 13, 14, 15} The rationale of this study is to determine the current burden of vitamin D deficiency in GDM women during pregnancy at Dr. Ziauddin tertiary care hospital Karachi, so that the preventive strategy can be planned and implemented along with early detection of gestational diabetes mellitus in order to reduce the severity and complications associated with GDM.

MATERIALS AND METHODS:

This is a descriptive non-probability consecutive case series study conducted in Obstetrics and Gynecology department at Dr. Ziauddin Hospital Karachi for a period of six months. The sample calculation was done using

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Received: 11-01-16

Revised: 23-02-16

Accepted: 25-02-16

the raosoft software for "Sample size calculation" by using the proportion (Vitamin D and Lifestyle Intervention for Gestational Diabetes Mellitus Prevention research group indicated that although the prevalence rates differed by regions in Europe (ranges 2.0-6.0%) 8 with 95% confidential interval an 8.5⁴ of margin of error, the sample size stands to be n=128). All pregnant women diagnosed as GDM carrying a singleton pregnancy between gestational age 24 - 40 weeks were included in the study. Women with preexisting Diabetes mellitus were excluded from the study. Informed consent was taken from all eligible women for the study. All the patients included were subjected to detailed history taking with special focus on maternal age, parity, gestational age at diagnosis of gestational diabetes, previous history or family history of diabetes, history of gestational diabetes in previous pregnancies. GDM was diagnosed by means of Oral Glucose Tolerance test. Diagnosed women for GDM with OGTT were offered for vitamin D levels using radio immunoassay. Vitamin D deficiency was defined conservatively as <25 nmol/L, insufficiency as 25–50 nmol/L and

sufficiency as >50 nmol/L. Results were documented on proforma. After collection of data, the analysis was conducted by using Statistical Package for Social Sciences (SPSS) software version 17. Mean and standard deviation was calculated for quantitative variable like age, parity, gravida, gestational age was controlled by stratification. Chi square test was applied.

RESULTS:

In our results mean age of patient was 26.46 ±2.91 years. Mean gestational age of the patients was 33.03 ±6.14 weeks. Majority of the patients 76 (55.90%) presented at >30 weeks of gestational weeks. There were 57 (41.90%) primiparous and 79 (58.1%) multiparous patients. We found 84(61.80%) patients of GDM suffering from Vitamin D₃ deficiency (Figure 1). Stratification was done to see the effect of age, gestational age, parity and gravida on the outcome. Chi-square test was applied. No significant association was detected between women's age, parity and gestational age and vitamin D deficiency (Table 1).

Figure: 1
Percentage of women with GDM and Vitamin D₃ deficiency

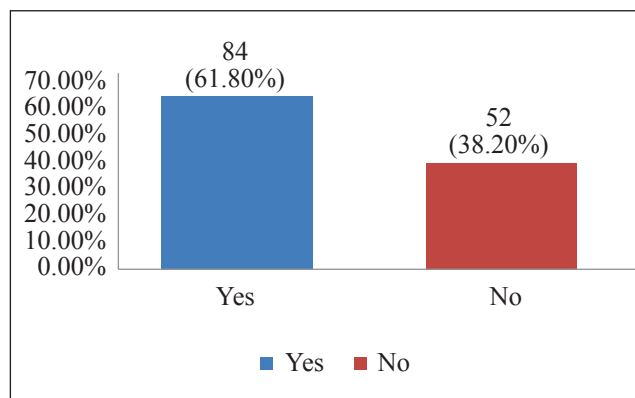


Table: 1
Comparison of vitamin D deficiency with respect to age, gestational age, parity and gravida

Variables		Vitamin D Deficiency		Total	P-value
		Yes	No		
Age	≤25	38 (61.3)	24 (38.7)	62 (100)	0.917
	>25	46 (62.2)	28 (37.8)	74 (100)	
	Total	84 (61.8)	52 (38.2)	136 (100)	
Gestational Age	≤30	38 (63.3)	22 (36.7)	60 (100)	0.738
	>30	46 (60.5)	30 (39.5)	76 (100)	
	Total	84 (61.8)	52 (38.2)	136 (100)	
Parity	Primiparous	35 (61.4)	22 (38.6)	57 (100)	0.941
	Multiparous	49 (62)	30 (38)	79 (100)	
	Total	84 (61.8)	52 (38.2)	136 (100)	
Gravida	Primigravida	39 (63.9)	22 (36.1)	61 (100)	0.639
	Multigravida	45 (60)	30 (40)	75 (100)	
	Total	84 (61.8)	52 (38.2)	136 (100)	

DISCUSSION:

Vitamin D deficiency is associated with a number of adverse pregnancy outcomes. One of the effects of vitamin D₃ deficiency is its association with gestational diabetes mellitus. The probable reason of this relationship could be that vitamin D plays a role in glucose homeostasis and it also improves insulin sensitivity of the target cells (liver, skeletal muscle, and adipos-etissue).¹⁶ However the prevalence of vitamin D₃ deficiency and GDM is different in different parts of the world. The prevalence of GDM in UK, USA and European countries was estimated to be 5%, 3-7% and 6% respectively. Higher prevalence of GDM was noted in African, Asian, Indian and Hispanic women.^{17, 18} In London antenatal population, vitamin D level of less than 25 nmol/l was found in 47% of Indian Asian women, 64% of Middle Eastern women, 58% of black women and 13% of Caucasian women.¹⁹ In our study, frequency of vitamin D deficiency among women with GDM was found to be 84(61.80%) patients, which is high. International studies results with regard to the relationship between vitamin D deficiency and GDM risk appears mixed and is not very clear with some of them in favor^{12, 13} and others not in favor of relationship between vitamin D deficiency and GDM.^{14, 15}

A meta-analysis by Poel¹³ has found a significant association between vitamin D₃ deficiency and gestational diabetes mellitus with odds ratio of 1.61 (95% CI 1.19-2.17; p=0.002). Similarly another meta-analysis of 20 independent observational studies done by Zhang provided strong evidence that vitamin D deficiency was associated with an increased risk of gestational diabetes.²⁰ The levels of serum 25(OH) D have been observed to be inversely associated with levels of HbA1c among women with GDM and this relationship seemed not to be affected by other known risk factors in a study done by Lau.²¹ in a tertiary referral Centre. Another recent large study published has found no association between circulating vitamin D₃ levels and GDM. They also looked for other complications such as preterm birth, small for gestational age and fetal growth retardation and found no association with circulating vitamin D₃ levels.²² Anna has documented in pregnant women with vitamin D₃ deficiency that most of their subjects had no significant association with GDM.²³ A case controlled study on 952 subjects however have found significant association with vitamin D₃ deficiency and GDM after adjusting for risk factors for GDM.²⁴ A recent meta-analysis on association of vitamin D₃ and GDM showed increased risk of gestational diabetes, pre-eclampsia, and small for gestational age infants but no association with increased risk of caesarean section.²⁵ Besides finding high levels of vitamin D₃ deficiency in women with gestational Diabetes Mellitus we could not find any association with women's age, parity and gestational age.

CONCLUSION:

The frequency of vitamin D deficiency was found to be higher among women with GDM visiting tertiary care

hospital, however we are not sure whether it is a casual or true relationship because of the observational nature of the study. A larger randomized controlled trial is needed to prove this relationship

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