



Vitamin D status and its determinants in Pre Diabetic pregnant mothers attending tertiary care centre in Tamilnadu, India

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ABSTRACT

Vitamin D is a vital nutrient factor in the healthiness of the mother and infant. Vitamin D is mainly amalgamated in the skin following exposure to ultraviolet B radiation. Insufficiency of vitamin D in Pregnancy had been related to various sicknesses, such as respiratory infection, type 1 diabetes mellitus, high risk of childhood wheezing. The aim of this study was to investigate the impact of Vitamin D supplementation on the incidence of pregestational diabetes in pregnant women referred to antenatal clinics in SRM Medical College hospital, Tamilnadu, India. 200 pregnant women were recruited, and orwomen referred to gynecological glucose challenge test (OGCT), serum calcium and 25(OH) D were determined. Participants were in the age group of 18 to 35 years, with a mean age of 26.29. Among the participants, 59% were multiparous. The present study showed that a high prevalence of vitamin D deficiency (61.5%) and insufficiency (34%) in pregnant women before supplementation with a mean of 16.84. Vitamin D supplementation during the early weeks of pregnancy might help in the improvement of maternal and child health.



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INTRODUCTION

Vitamin D is a vital nutrient factor in the healthiness of the mother and infant. Vitamin D is mainly amalgamated in the skin following exposure to ultraviolet B radiation (Benitez-Aguirre *et al.*, 2009). Besides,

vitamin D is determined by the dietary factor, which is rich food such as mushrooms, tuna, and other oily fishes, and cooked egg. The dietary sources of vitamin D are, however inadequate to meet body necessity. Hence it is suggested that individuals get maximum sunlight exposure. The largest origin of vitamin D in adults is synthesis from sun rays; half an hour of sunrays carriers 50, 000 IU of vitamin D with white-coloured skin (Yu *et al.*, 2009). Vitamin D deficiency causes osteomalacia in adults and rickets in children who are not exposed to sunlight or who do not receive adequate amounts of vitamin D in the diet. Excess intake of the vitamin leads to hypervitaminosis characterized by high blood calcium concentrations and calcification of soft tissues.

Insufficiency of vitamin D in Pregnancy had been related to various sicknesses, such as respiratory infection Camargo *et al.* (2011), type 1 diabetes

mellitus, high risk of childhood and gasp (Stelmach *et al.*, 2015). Many differences in maternal and vitamin D and calcium metabolism appear to carry the calcium that is essential for fetal bone accretion, at the time of pregnancy and lactation. During the first trimester in the skeleton of the fetus accumulates 2 -3 mg/dl; in spite of that, the rate of accumulation doubles in the last trimester (Abrams, 2007). Maternal hypovitaminosis D can vary as stated by ethnic, geographical area, and tradition about regional clothing (Willix *et al.*, 2015). Pregnancy-related conditions such as gestational diabetes, pre-eclampsia and bacterial vaginosis have also been associated with vitamin D concentration during pregnancy (Bodnar *et al.*, 2014; Achkar *et al.*, 2015).

Gestational diabetes mellitus (GDM) is a common carbohydrate metabolism disorder, and the prevalence of GDM ranges from 0.6 to 15 %. Generally, It is diagnosed after 20 weeks of gestation and vanishes either immediately or within 6 weeks afterwards delivery. Vitamin D deficiency can be correlated with GDM and insulin tolerance (Zhang *et al.*, 2008; Clifton-Bligh *et al.*, 2008; Maghbooli *et al.*, 2008; Azar *et al.*, 2011). Vitamin D deficiencies related to a high risk of GDM and concluded that vitamin D administration can raise glucose tolerance and insulin sensitivity. In Pregnant women of any age, Vitamin D has non-classical actions which an increasingly recognized repertoire, such as improving insulin action and secretion, immune regulation and pulmonary growth (RCOG, 2014).

Recently, various meta-analyses have investigated the existing data on the relation of serum levels of vitamin D with the risk of Gestational diabetes mellitus (Scragg *et al.*, 2004; Chiu *et al.*, 2004; Baynes *et al.*, 1997; Forouhi *et al.*, 1990). Studies recommended that vitamin D may be required up to 6000 IU/day. The ideal vitamin D regimen is to prevent and treat insufficiency of vitamin D, in utero is unknown (Hollis, 2007). Deficiency of Vitamin D is common in non-rural Indians, although living in the tropical region and its public health outcomes are enormous (Sahu *et al.*, 2009). The aim of this study was to investigate the effect of Vitamin D supplementation on the incidence of pregestational diabetes in pregnant women referred to antenatal clinics in SRM Medical college hospital, Tamilnadu, India.

MATERIALS AND METHODS

This is a pretest and post-test analysis of the serum 25 (OH) D levels in pregnant women at SRM Medical College Hospital, a tertiary level hospital in Kancheepuram District, Tamilnadu, India. This

study was approved by the Institutional human ethical committee, SRM Medical college hospital, SRM Institute of Science and Technology, India (351/IEC/2012). Women who were registered between June and August 2016, at the booking-in appointment in the antenatal clinic were included in the study, and during this period, totally 200 pregnant women were enrolled.

Oral glucose challenge test (OGCT) was estimated by the glucose Oxidase- Peroxidase method using full automated analyser and the measurement of 25(OH) D was added to the routine antenatal screening. The serum 25 (OH) D levels were tested by using a chemiluminescence analyser. Vitamin D levels were categorised as, deficiency (<20 nmol/L/<20 ng/ml), insufficiency (20-30 nmol/L /20 -30ng/ml) and sufficient (> 30 nmol/L/30 -100 ng/ml). Calcium was estimated by O- Cresolphthalein complex one method. The data analysis was done using SPSS 20, and a significance level of 5% was used throughout.

RESULTS AND DISCUSSION

Table 1 illustrate that participants were in the age group of 18 to 35 years, with a mean age of 26.29. Out of 200 maternal women surveyed, 93 were in the age group of 18-25 years contributed 46.5% of participants. Majority of the participants were from middle and upper-middle socio-economic groups and from both urban and rural areas. When analyzing the religious affiliation, 68.5% are Hindu, 21% and 10.5% were Christian and Muslim, respectively. History and examination were performed with regard to current and past pregnancies.

The percentage of multiparous among the participants in the study was 59%, 34% of them were primi, and only 7 % were grand multiparous. The age of the first conception of women was found to be mostly between 26-30 years of age. 127 of them conceived for the first time between 26 and 30 years; 17 participants between the age of 21 and 25 years while 56 of them conceived for the first time above 30 years of age as shown in Table 2.

Table 3 shows that among the pregnant women, 129 were having normal BMI, 67 were overweight and obese, and 4 were underweight. Moderate level of anemia was found with 114 cases studied. Among the participants, 96% of women were found to be having inadequate Vitamin D intake in their diet. Nearly 94.5% of maternal women are pre-diabetic, which may due to impaired insulin secretion.

The pre and post-test comparison of OGCT showed that statistically significant between pre and

Table 1: Socio-demographic profile of participants

Variables	Group	Frequency	Percentage
Age	18-25	93	46.5
	26-30	59	29.5
	31-35	48	24.0
Socio-economic status	Upper	11	5.5
	Upper Middle	100	50
	Middle	60	30
	Upper Lower	16	8.0
	Lower	13	6.5
Religion	Hindu	137	68.5
	Christian	42	21.0
	Muslim	21	10.5

Table 2: Clinical characteristics of subjects

Variables	Group	Frequency	Percentage
Parity	Primi	68	34
	Multi	118	59
	Grand multi	14	7
Age at first conception	21-25	17	8.5
	26-30	127	63.5
	>30	56	28.0
Family History of Diabetes	No	190	95
	Yes	10	5
History of still abortion	No	161	80.5
	Yes	39	19.5
History of stillbirth	No	194	97
	Yes	6	3
History of Caesarean section	No	177	88.5
	Yes	23	11.5

posttest levels $p < 0.001$. Similarly, the level of Vitamin D and Calcium between pre and post-test showed a significant difference $p < 0.001$ as shown in Table 4.

The prime focus of this study was to determine whether 25 (OH) D concentrations differ between the pre and post-test of OGCT and calcium levels in 200 pregnant women after the supplementation of Vitamin D. The present study showed that a high prevalence of vitamin D deficiency (61.5%) and insufficiency (34%) in pregnant women before supplementation with a mean of 16.84. Many studies reported that Hypovitaminosis D in pregnant women worldwide to be 1–96% (Xiao et al., 2015; Zhou et al., 2014)

A study from Vietnam reported that, the premature stages of pregnancy who had a 25(OH)D level of < 50 nmol/L. The prevalence of deficiency of vitamin D

was 19% with a (95% CI) geometric mean of 75 (68–83) nmol/L (Hien et al., 2012). Another study from Mysore showed that the prevalence of vitamin D deficiency to be 66% at 30-week gestation with a median (IQR) maternal serum level concentration of 25(OH)D of 37.8 (24.0–58.5) nmol/L (Farrant et al., 2009). A study from Mumbai showed that the prevalence of vitamin D deficiency was 94% with a geometric mean (95% CI) of 26.5 (25.0–28.3) nmol/L at 32–36 weeks of gestation (Jani et al., 2014).

The pre and post-test comparison of OGCT showed that statistically significant between pre and post-test levels $p < 0.001$. Gestational diabetes mellitus is a state of high blood glucose levels that occurred during pregnancy. It is associated with both resistance to outermost action of insulin and weakens of beta-cell function. During pregnancy, its transitory presence alerts to a high risk of diabetes in the future. About 10–50% develops diabetes mellitus of

Table 3: Anthropometry and Biochemical indexes

Variables	Groups	Frequency	Percentage
BMI	Underweight	4	2.0
	Normal	129	64.5
	Over weight	54	27
	Obese	13	6.5
Haemoglobin	Normal	61	30.5
	Mild	20	10
	Moderate	114	57
	Severe	5	2.5
Vitamin D intake	Inadequate	192	96
	Adequate	8	4
Sun exposure	Inadequate	142	71.0
	Adequate	58	29.0
OGCT	Normal	11	5.5
	Pre Diabetes	189	94.5
Vitamin D	<20	123	61.5
	20-30	68	34.0
	>30	9	4.5
Calcium	In sufficient	73	36.5
	Sufficient	127	63.5

Table 4: Pre and post-test comparison of parameters studied

Parameter		N	Mean	SD	Paired t	P value
OGCT	Pre test	200	125.58	5.73	12.15	0.000**
	Post test	200	118.59	9.27		
Vitamin D	Pre test	200	16.84	7.14	12.99	0.000**
	Post test	200	20.26	5.16		
Calcium	Pre test	200	8.47	0.85	16.67	0.000**
	Post test	200	9.18	0.52		

women with GDM later on in life.

The foremost reason for prevention of GDM in uneducated pregnant women's was due to vitamin D direct effect on the performance of pancreas β cells and on intracellular calcium regulation, which plays a vital role in insulin-receptor tissue, insulin-mediated intracellular processes. The current finding shows that 25(OH) D low levels perhaps considered a risk factor during gestation. This study reveals that Vitamin D supplementation reduces the risk of gestational diabetes mellitus and increasing calcium levels. More clinical trials and studies are required to find the effects of supplements of vitamin D in the prevention of GDM. Based on these findings, healthcare providers should encourage to follows the daily intake of vitamin D guidelines for pregnant women.

CONCLUSIONS

Because of the high percentage of the incidence of deficiency of vitamin D among pregnant women in our study, we turned to recommend that early screening of vitamin D with supplementation wherever required particularly those with deficiency. Vitamin D Supplementation during the early weeks of pregnancy might help in the improvement of maternal and child health.

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