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Research Article

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Vitamin D Deficiency among Pregnant Women Attending Tertiary Care Centre in Tamilnadu

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ABSTRACT

The present study was undertaken to the prevalence of Vitamin D deficiency and dietary calcium and sun exposure among pregnant women in a tertiary care hospital. This is a cross-sectional analysis of the serum 25(OH) D levels in pregnant women at SRM Hospital, a tertiary level hospital at booking-in appointment in the antenatal clinic. The total number of pregnant women recruited during this period was 200.

Keywords: Vitamin D; Calcium; Antenatal clinic

INTRODUCTION

India is the country of contrast and being a tropical country where vitamin D deficiency is unexpected. Urbanization resulted in less outdoor activity and excessive pollution, coupled with skin pigment, may further complex this problem [1].

Vitamin D deficiency among pregnant women is an important issue because of the fact that prevalence of vitamin D deficiency among pregnant women might lead to serious consequences not only to the mother but also to the new born.

Generally the foetus is a parasite that takes nutrition from the mother and worsening the mother's condition further more. The calcium iron is needed for the bone growth and also for the insulin receptor activation giving way for Gestational diabetic mellitus in the mother, when the mothers are not diagnosed in time while carrying the foetus, the foetus will be exposed to maternal hyperglycemias causing anomaly in the early days. In later time it enhancing the insulin in the pancreatic reservoir by secreting insulin. When there was exhaust of insulin, mother and baby may prone to have GDM. GDM has complications in obstetrics and foetal outcome like polyhydraminas, premature labour, operative and instrumental delivery

Vitamin D deficiency in the prenatal period has poor maternal and fetal outcomes. Many studies have reported a strong association of vitamin D deficiency with increased risk to develop pre-eclampsia [2-4]. The prevalence of vitamin D deficiency is inclined by ethnicity, food habits, clothing, climate and exposure to sun. The largest source of vitamin D in adults is synthesis from sun light; half an hour of sunlight delivers 50000 IU of vitamin D with white-complexioned skin [5].

Vitamin D deficiency is a global burden and it is common in Northern Europe, especially in women with pigmented skin. Vitamin D deficiency is three times more common in the winter and spring compared to the summer and autumn in the UK [6]. In a London antenatal population, vitamin D deficiency was found in 47% of Indian Asian women, 64% of Middle Eastern women, 58% of black women and 13% of Caucasian women [5].

A study from Mysore reported that the prevalence of vitamin D deficiency at 30-week gestation to be 66% [7]. A recent study from Mumbai reported that the prevalence of vitamin D deficiency at 32–36 weeks of gestation to be 94% [8].

Even though there were many studies conducted on serum vitamin D deficiency among pregnant women in India, There are few data on serum 25(OH)D concentration and the prevalence of osteomalacia among pregnant women from India [9,10]. Very few studies were reported from tertiary care setting in Tamilnadu. The aim of the study was to determine the prevalence of Vitamin D deficiency and dietary calcium and sun exposure among pregnant women in a tertiary care hospital.

SUBJECTS AND METHODS

This is a cross-sectional analysis of the serum 25(OH) D levels in pregnant women at SRM Hospital, a tertiary level hospital in Chennai, Tamilnadu, India. Women were enrolled between June and August 2016, at booking in appointment in the antenatal clinic. The total number of pregnant women recruited during this period was 200.

The measurement of 25(OH) D was added to the routine antenatal screening. The level of 25(OH) D in serum was tested in our bio-chemistry laboratory using a chemiluminescence analyser. Vitamin D levels were categorised as, severe deficiency (<20nmol/L), moderate deficiency (20-30 nmol/L) and sufficient (> 30 nmol/L). The data was analysed using SPSS 20. Two tailed Test (Chi-Square) with a significance level of 5% was used throughout. Ethical approval for this study was granted by the SRM Human Research Ethics Committee. The subjects were included based on criteria such as from first registration, singleton pregnancy, live foetus and up to gravida five. Women with pre-existing DM, Oral Glucose Challenge Test (OGCT, Diabetes In Pregnancy Study group India Oral Glucose Challenge Test) values of fasting blood glucose > 126 mg/dl or 2 h post glucose> 200 mg/dl or those taking metformin for polycystic ovary syndrome (PCOS) were excluded from the study and Women with bad obstetric history (>3 spontaneous abortions), hypertension, renal, or hepatic dysfunction were also excluded.

The tool was developed after extensive review of literature, internet search and experts 'advice. The tool for the data collection consists of two sections. Part I with General Information for mother age, height, weight, and health status, Part II with Obstetrical Information including gestational age, parity and Phase III with routine blood investigation with OGCT (DIPSI-75gms-2hrs) and serum vitamin D estimation.

STATISTICAL ANALYSIS

Data are presented as frequency and percentages. Statistical analysis was conducted using SPSS 20. The proportions were compared using the chi-square test. Significant was observed a $p<0.05$ with two sided tests.

Participants were in the age group of 18 to 35 years with a mean age of 25.77 years. Out of 200 maternal subjects 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 analysing the religious affiliation, 68.5% are Hindu, 21% and 10.5% were Christian and Muslim respectively. History and examination were performed with special regard to current and past pregnancies. Daily intake of Vitamin D was calculated and any supplementary maternal calcium intake in the current pregnancy was also noted followed by daily sun exposure.

RESULTS

Table 1 shows socio- demographic profile of the study participants. Of the total 200 participants 93 were in the age group of 18-25 years, 59 were in the age group of 26-30 years and48 were in the age group of 31-35 years. As regards to their socio- economic status majority of them (50%) belong to upper middle class; 30% belonged to middle class; 8% belonged to upper lower class; 6.5% belonged to lower class and only 5% belonged to upper class. Hindus were 137, 42 Christians and 21 Muslims participated in the study.

Table 1: Socio-demographic profile of participants

Variables	Groups	Frequency	Percentage
Age	18-25	93	46.5
	26-30	59	29.5
	31-35	48	24
Socio-economic status	Upper	11	5.5
	Upper Middle	100	50
	Middle	60	30
	Upper Lower	16	8
	Lower	13	6.5
Religion	Hindu	137	68.5
	Christian	42	21
	Muslim	21	10.5

Table 2: Clinical characteristics of subjects

Variables		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 still birth	No	194	97
	Yes	6	3
History of caesarean section	No	177	88.5
	Yes	23	11.5

The percentage of multiparous among the participants in the study was 59%, 34% of them were primi and only 7 % were grand multiparous. Their age of first conception 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 21and25 years while 56 of them conceived for the first time above 30 years of age.

Table 3: Anthropometry and Biochemical indexes

Variables	Cut off value (WHO)	Groups	Frequency	Percentage
BMI	<18	Underweight	4	2.0
	18-24.9	Normal	129	64.5
	25-29.9	Over weight	54	27
	≥30	Obese	13	6.5
Haemoglobin	>11mg/dl	Normal	61	30.5
	10-10.9mg/dl	Mild	20	10
	7-9.9mg/dl	Moderate	114	57
	<7mg/dl	Severe	5	2.5

Vitamin D intake in the diet		Inadequate	192	96
		Adequate	8	4
Sun exposure		Inadequate	142	71.0
		Adequate	58	29.0
OGCT	120-130mg/dl	Normal	11	5.5
	130-140mg/dl	Pre Diabetes	189	94.5
Vitamin D (CLIA)	<20ng/ml	Deficiency	123	61.5
	20-30ng/ml	Insufficient	68	34.0
	30-100ng/ml	Sufficient	9	4.5
Calcium	<8.5mg/dl	In sufficient	73	36.5
	8.5-10.1mg/dl	Sufficient	127	63.5

Among the pregnant women, 129 were having normal BMI, 67 were over weight 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 Vitamine D intake in their diet. Nearly 94.5% of maternal women are pre-diabetic which may due to impaired insulin secretion.

DISCUSSION

Vitamin D's role in pregnancy outcomes has yet to be fully defined, making it a stirring field to explore. Research into vitamin D and its effects on pregnancy is still in its infancy, but many intriguing associations have been noted. For example, lower levels of vitamin D have been associated with increased rates of cesarean delivery [11], bacterial vaginosis, [12] and preeclampsia [13], as well as less efficient glucose metabolism [14]. The deficiency could lead to high bone turnover, bone loss, osteomalacia, and hypovitaminosis D myopathy in the mother [15]. Children of vitamin D deficient mothers are at risk for rickets, oteomalacia, hypocalcaemic seizures, dilated cardiomyopathy, marrow fibrosis, disregulation of immune function and cellular differentiation and proliferation and type I diabetes [16]. Also prevalence of vitamin D deficiency is predisposed by ethnicity, food habits, clothing, climate and exposure to sun.

Vitamin D plays an important role in bone metabolism and mineral homeostasis. Vitamin D insufficiency has identified effect on bone density, neonatal vitamin D and calcium status, and childhood rickets [17]. In several studies, the relation between low vitamin D levels, insulin resistance and impaired insulin secretion was clearly demonstrated [18]. Moreover, specific receptors for 1.25 (OH)2D3 were detected in pancreatic ß cells, denoting a probable effect of vitamin D on the insulin secretion process [11]. Our present study shows that 94.5% of maternal women are pre-diabetic which may due to impaired insulin secretion.

Obesity is another significant risk factor for 25OHD deficiency [19,20]. Vitamin D deficiency is common in obese patients, and it is possibly a result of decreased vitamin D bioavailability due to sequestration in fat tissue [21]. An analysis of the National Health and Nutrition Examination Survey (NHANES) for the years 2003/2004 data also demonstrated that 25 (OH) D deficiencies were highly prevalent in overweight and obese American subjects [22]. In our study also, the overweight and obese pregnant women were affected by 27% and 6.5% respectively due to sequestration in fat tissue.

Vitamin D acting on its own receptors can produce a number of desired biological effects via different mechanisms and, hence, contributes to the improvement of human health [16]. The levels of serum active vitamin D; 1.25 dihydroxy-cholecalciferol (1,25(OH)2 2D) increase during pregnancy as depicted by several studies, the general conclusion linked this serum rise to increased renal hydroxylation of 25-hydroxy-cholecalciferol (25(OH) D) to 1,25(OH)2 2D under stimulation of pregnancy [23]. Our study delineates that out of 200 women, 123 were found to be vitamin D deficient i.e 61.5% wheras 34% were possess normal level of vitamin D.

Calcium is an essential nutrient [23] and improves metabolic function, bone health, and neuromuscular function [21]. The total concentration of calcium reduces during pregnancy, because of increases in plasma volume, increased glomerular filtration, and maternal-fetal calcium transport. Calcium and vitamin D deficiency is very common in pregnant women and infants [12,13] and is an epidemic phenomenon globally [14] Relevant data

identify roles for the active form of vitamin D (1, 25(OH) 2D3) in many biological processes including regulation of cellular growth, differentiation and metabolic modulations [25]. The prevalence of vitamin D deficiency has been reported as 50-71% during pregnancy and 15-65% in infants. [25]. In our study 36.5% women were insufficient in calcium levels due to poor absorption of calcium.

CONCLUSION

This study has had a significant clinical impact on our practise at tertiary care Hospital. It has identified our at risk population, and highlighted the severity of vitamin D deficiency. In view of the emerging evidence of the resurgence of rickets in our community, and the high prevalence of vitamin D deficiency (46.3%) amongst our antenatal women, we have drafted our first protocol for screening and management of vitamin D deficiency. This protocol entails, identifying at risk women, also screening all pregnant women and treating those found to be vitamin D deficient. We recommend other hospitals do similar studies to look at the incidence in their own district population and therefore consider screening and treating for this major health problem.

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