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ORIGINAL ARTICLE

Role of Vitamins D Supplements in Preventing Development of Gestational Diabetes Mellitus

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ABSTRACT

Aim: To evaluate the role of vitamin D supplements in prevention of gestational diabetes mellitus.
Study Design: Cross sectional.
Place and duration: Study was carried out at obstetrics and gynecology department of Roshan Suleman Medical College, Tando Adam, from June 10, 2021 to November 09, 2021.
Methodology: Initially 125 pregnant women were enrolled in study and 15 women refused to give consent and study was conducted on 110 pregnant women. Main variables of study were age of women, parity, education status, occupation and previous mode of delivery. Outcome of study was gestational diabetes at 28 weeks of glucose tolerance test. SPSS version 23 was used for data analysis, mean and SD for numerical data and frequency percentages for categorical data were calculated. Test of significance was chi square test and p value ≤0.05 was significant.
Results: Of the total patients, 40.9% had ≤20 ng/ml and 59.1% had >20 ng/ml level of vitamin D. It was seen that 44.4% patients had ≤20 ng/ml as well as GDM. About 35.6% had normal OGTT with ≤20 vitamin D level. On the other hand, most of the patients 60.0% had normal OGTT as well as >20 ng/ml vitamin D level. The difference had statistically significant, (p=0.005).
Conclusion: use of vitamin D supplements in high risk pregnant women till 28 weeks of pregnancy has positive effect on prevention of gestational diabetes.
Keywords: Gestational diabetes, Vitamin D, 25-hydroxyvitamin D, gestational diabetes mellitus, GDM, pregnancy.

INTRODUCTION

Vitamin D a fat soluble vitamin has so many characteristics in human body along with bone health[1]. It has a vital role in prevention of cell proliferation in prostate, colorectal and breast cancer and also famous for control of autoimmune disease. In some stages of life increased ratio of vitamin D is required especially during pregnancy for the purpose of fetal growth, at embryonic growth[2]. Studies conducted on relationship between vitamin D and pregnancy concluded a strong association between pregnancy outcomes and vitamin D deficiency[3]. Its deficiency also associated with increased incidence of cesarean section, preeclampsia and gestational diabetes mellitus[4].

Reverse relationship between risk of diabetes type II and vitamin D concentration also proved[5]. Direct effects of vitamin D concentration on glucose metabolism and pancreatic beta cells were observed thus later on a reverse mechanism with HbA1c/glycosylated hemoglobin was found[6]. Deficiency of vitamin D is also related to insulin concentration changes and blood glucose level. Gestational diabetes mellitus is also known as glucose intolerance in gestation which has similarity of pathophysiology with type II diabetes[7].

Development of GDM have both maternal (infection, premature birth, hypertension and hydramnios) and fetal (altered fetal growth, death birth, respiratory distress syndrome, metabolic disorders, diabetes and obesity) complications[8]. During antenatal period vitamin D deficiency is a common phenomenon that causes increased insulin sensitivity glucose tolerance. Many studies have shown a strong association between vitamin D deficiency and GDM but only fewer studies evaluated that role of vitamin D supplementation in prevention of GDM[9].

Although number of observational studies proved the effect of vitamin D deficiency on gestational diabetes but role of vitamin D supplements and dose calculation in prevention of GDM is unknown yet[10,11]. It was observed in vivo studies that vitamin D supplements improved the insulin secretion and glucose tolerance and very small authors reported its role in control of glucose in gestational age[12]. Looking at vitamin D deficiency in Pakistani population, specifically in pregnant women and its adverse effects on pregnancy outcomes, this study was planned to investigate the role of vitamin D supplements during pregnancy on GDM in high risk women.

METHODOLOGY

Study was carried out at obstetrics and gynecology department of Roshan Suleman Medical College, Tando Adam from June 10, 2021 to November 09, 2021. Study was started after ethical approval from departmental ethical committee. Written informed consent was obtained from patients. Non probability consecutive sampling technique was used and sample size was calculated by using openepi.com online software with confidence interval 95% and margin of error 0.5%. Pregnant women presented at outpatients department having at least one risk factor like

previous history of gestational diabetes, increased body mass index (above 25 kg/m^2), family history of diabetes or gestational diabetes, glycosuria and history of macrosomic baby were included. Women with any chronic disease like rheumatic disease, renal disease, thyroid, hepatic, gestational diabetes at admission time, diabetic before pregnancy and women already using vitamin D supplements were excluded.

Glucose challenge test was performed on all women then blood sample was taken for measurement of vitamin D level. Women with vitamin D level ≤20ug/ml and >20ug/ml were recorded. All women were advised vitamin D supplements 5000 units per week till 28 weeks. All women were examined every month and oral glucose tolerance test at 26-28 weeks was done to determine the gestational diabetes. Oral glucose tolerance test was done with following approach: Baseline blood glucose was measured after that 75 g oral glucose was given and blood glucose level. Fasting blood sugar 100-120 mg/dl or 140 mg/dl after 1 hour of oral glucose was considered as normal, similarly blood glucose 140-200 mg/dl after 2 hours of oral glucose considered as impaired. Test was taken as positive when two continuous OGTT were impaired.

Collected data was entered in SPSS version 23 and analyze for mean and SD of continuous variables e.g age, Frequency and percentages were calculated for categorical variables like education status, occupation, parity, previous mode of delivery. Test of significance were applied and p value ≤0.05 was taken as significant.

RESULTS

One hundred and ten patients were included in this study. The mean age of the patients was 28.87±6.32 years. Majority of the patients (62.7%) between age group 18-30 years.

Table 1: Demographic characteristics of the patients

Characteristic	N (%)
Age distribution (years)	
18-30	69 (62.7)
31-35	20 (18.2)
36-45	21 (19.1)
Education status	
Uneducated	45 (40.9)
Primary	26 (23.6)
Secondary	16 (14.5)
Higher	23 (20.9)
Occupation	
House wife	69 (62.7)
Working lady	41 (37.3)
Parity	
Primi para	53 (48.2)
Multi para	57 (51.8)
Previous mode of delivery	
Normal vaginal delivery	73 (66.4)
Caesarean section	37 (33.6)
Gestational age (weeks)	
4-13	43 (39.1)
14-26	40 (36.4)
27-35	11 (10.0)
36 and above	16 (14.5)

Most of the patients (62.7%) were house wives and uneducated (40.9%). Primi para had (48.2%) patients and multipara had (51.8%) patients. Majority of the patients were delivered by normal vagina (66.4%). The mean gestational age of the patients was 24.41±6.31 weeks. Most of the patients between 4-13 weeks of gestational age. (Table. I).

Of the total patients, (40.9%) had ≤20 ng/ml and (59.1%) had >20 ng/ml level of vitamin D. It was seen that (44.4%) patients had ≤20 ng/ml as well as GDM. Out of total (35.6%) had normal OGTT with ≤20 vitamin D level. On the other hand, most of the patients (60.0%) had normal OGTT as well as >20 ng/ml vitamin D level. The difference had statistically significant, (p=0.005). (Table. II).

Table 2: Association of Vitamin D level with oral glucose tolerance test

Oral glucose tolerance test	Vitamin D level		P-value
	≤20 mg N (%)	>20 mg N (%)	
Normal	16 (35.6)	39 (60.0)	0.005
Paired	9 (20.0)	15 (23.1)	
Gestational diabetes millets	20 (44.4)	11 (16.9)	
Total	45	65	

DISCUSSION

In our study we observed higher proportion of gestational diabetes in women with low level of vitamin D (≤ 20 mg) as compare to those women with higher level of vitamin D. Similar results were reported by Lacroix et al[13] that low level of vitamin D in 1st trimester of pregnancy is responsible for GDM. Women with low level of vitamin D concentration are 1.4 time more prone to GDM.

In our study we investigated final glucose tolerance test at 26-28 weeks. In a study conducted by Farrant et al[14] and final tolerance test was done at 30th week of pregnancy. Results showed significant reduction in plasma glucose level and reduced rate of GDM at the end of pregnancy. Asemi et al[15] conducted a study on effect of vitamin D supplements on reduction of gestational diabetes. Two groups' vitamin D supplements and placebo were compared and observed significant reduction in plasma glucose level after administration of supplements as compared to placebo group.

A study was conducted by Pittas[16] and concluded that there is an association between vitamin D deficiency and gestational diabetes mellitus. Further studies on prescription of vitamin D supplementation during antenatal period are recommended to evaluate the incidence of GDM and effect of vitamin D deficiency. Hossein et al[17] also conducted a study on 741 pregnant women and concluded strong association between vitamin D concentration and insulin sensitivity index.

Zhou et al[18] carried out a study on pregnant women who were presented with low serum vitamin D level and at the end of pregnancy they were observed with adverse pregnancy outcomes like macrosomic baby, congenital anomalies, birth weight and gestational diabetes. In our study we didn't included various pregnancy outcomes except gestational diabetes. Rudnicki and Pedersen[19] found a significant decrease in GDM when glucose tolerance test was performed at 28 weeks of pregnancy.

Zhang et al[20] completed a case control study on US population and reported that in women with 20% lower 25(OH) D level at 16 weeks of pregnancy were developed GDM in later pregnancy days. In contrast to our conclusion some studies reported no significant association between vitamin D and gestational diabetes. Makgoba and colleagues[21] observed a study on 90 GDM and 158 controls in UK population and concluded that there is no association between development of subsequent GDM and blood samples taken for serum vitamin D level.

Limitations: Patient's poor compliance to study drugs and advise of non gynecological medical specialists, Hakeem's and lay man to stop any medication during pregnancy are main limitations of our study.

Recommendations: Proper counseling and education about importance of supplementation of vitamin D is necessary. Further studies with larger sample size are recommended.

CONCLUSION

Our findings reveal that use of vitamin D supplements in high risk pregnant women till 28 weeks of pregnancy has positive effect on prevention of gestational diabetes.

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