Comparison of vitamin D level in pregnant women with and without gestational diabetes

Comparación del nivel de vitamina D en mujeres embarazadas con y sin diabetes gestacional

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Abstract

Introduction: Recent findings indicate the correlation of vitamin D metabolism with diabetes. Since, no comprehensive study has performed on pregnant women in this regard yet, this study aimed to evaluate the correlation of vitamin D deficiency and gestational diabetes occurrence.

Materials and Methods: In this descriptive cross-sectional study, to evaluate the vitamin D levels, 40 diabetic and 40 non-diabetic pregnant women referred to endocrinology clinics of Bushehr University of Medical Sciences, Bushehr, Iran were enrolled.

Results: In this study, 35 (87.5%) and 30 (75%) of diabetic and non-diabetic pregnant women had vitamin D levels < 20 ng/ml, respectively, which was not statistically significant (p=0.26).

Conclusion: Our data showed a high prevalence of vitamin D deficiency in pregnant women, so that, 90% of the individuals showed vitamin D levels < 30ng/ml. However, this deficiency was not associated with increased risk of GDM.

Keywords: Vitamin D, Pregnancy, Gestational Diabetes Mellitus.

Resumen

Introducción: hallazgos recientes indican la correlación del metabolismo de la vitamina D con la diabetes. Dado que todavía no se ha realizado un estudio exhaustivo en mujeres embarazadas a este respecto, este estudio tuvo como objetivo evaluar la correlación de la deficiencia de vitamina D y la aparición de diabetes gestacional.

Materiales y métodos: en este estudio descriptivo de corte transversal, para evaluar los niveles de vitamina D, se inscribieron 40 mujeres embarazadas diabéticas y 40 no diabéticas remitidas a clínicas de endocrinología de la Universidad de Ciencias Médicas de Bushehr, Bushehr, Irán.

Resultados: en este estudio, 35 (87.5%) y 30 (75%) de mujeres embarazadas diabéticas y no diabéticas tenían niveles de vitamina D <20 ng/ml, respectivamente, lo que no fue estadísticamente significativo (p = 0.26).

Conclusión: Nuestros datos mostraron una alta prevalencia de deficiencia de vitamina D en mujeres embarazadas, por lo que el 90% de los individuos mostraron niveles de vitamina D <30ng / ml. Sin embargo, esta deficiencia no se asoció con un mayor riesgo de DMG.

Palabras clave: vitamina D, embarazo, diabetes mellitus gestacional.

Introduction: Gestational diabetes mellitus (GDM) is characterized as glucose intolerance during pregnancy and includes about 7% (1-14%) of pregnancies[1]. Vitamin D deficiency has been considered as a risk factor for glucose intolerance for a long time[2]. In some studies, a correlation has been observed between low vitamin D levels and maternal glycemia, insulin resistance and risk of diabetes[3]. However, the exact association of vitamin D levels and diabetes risk still remains unclear. Different studies have also indicated that maternal low serum vitamin D levels may intensify the medical complications for both mother and fetus during pregnancy[4]. Moreover, low serum vitamin D levels has been reported in pregnant women with GDM which is usually associated with preeclampsia, GDM, infertility and increased probability of cesarean delivery[5]. Vitamin D also modulates the immune system, cytokines and anti-bacterial peptides and the use of this vitamin is considered as an important medical care during pregnancy[6]. For instance, increased risk of maternal human immune deficiency virus (HIV) transmission and fetal mortality have been observed in pregnant women with HIV[7]. Low vitamin D levels have also been associated with bacterial vaginoses during the first trimester[8]. Epidemiological studies have also reported low levels of this vitamin during pregnancy in different populations.

Several mechanisms have been proposed for low vitamin D levels and increased risk of GDM: i) the active form of vitamin D (1,25 (OH) vitamin D) by interaction with its receptor on pancreases β-cell can regulate the secretion pattern of these cells via intra or extracellular calcium balancing. ii) Vitamin D can increase the insulin sensitivity by insulin receptor overexpression and glucose transfer. iii) Vitamin D by regulating the extracellular calcium levels and transmembrane calcium transfer facilitation into intracellular matrix, provides a sufficient intracellular source for the insulin-dependent processes in insulin-responding tissues[9-11].

Regarding the above information, this study aimed to compare the vitamin D serum levels in pregnant women with or without GDM.

Materials and methods

Patients

Eighty pregnant women (40 with GDM and 40 healthy controls) were enrolled in this descriptive cross-sectional study. Glucose tolerance test (GTT) was performed after 8 hours fasting using 75 gram glucose within 24-28 pregnancy weeks. The criteria for GDM diagnosis were fasting blood glucose (FBG) ≥92 mg/dl or 1 hour postprandial (1hpp) ≥180 mg/dl or 2hpp ≥153 mg/dl. The serum levels of 25(OH) vitamin D, calcium, phosphorous. Additionally, the serum levels of vitamin D was categorized in three groups as sufficient (30-100 ng/ml), insufficient (20-30 ng/ml) and deficiency (≤20 ng/dl). This study was approved by the local ethics committee of Bushehr University of Medical Sciences, Bushehr, Iran. Written informed consent was obtained from all participants prior the sampling.

Statistical analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) 23. Kolmogorov-Smirnov (K-S) test was used to assess the normality of the quantitative parameters. Independent T-test was also used for the comparison of the quantitative parameters mean between groups. Logistic regression test was used to adjust the age effect. P<0.05 was considered as statistically significant.

Results

General characteristics of the patients and biochemical parameters are presented in Table 1. Statistical significant differences were observed in age (p=0.017) and FBG (p=0.001) between studied groups. No significant statistical differences were observed in the remaining parameters between groups.

According to table 2, 35 (87.5%) and 30 (75%) of the diabetic and non-diabetic pregnant women had 25 (OH) vitamin D levels <20 ng/dl which showed no significant statistical differences (p=0.025). In individuals with 25 (OH) vitamin D ≥20 ng/dl no significant statistical differences were also observed between studied groups (p=0.31).

Table 3 also represents the diabetes odds ratio (OR) regarding the 25 (OH) vitamin D levels. As it is shown, the risk of diabetes was 2.44 fold higher in patients with 25 (OH) vitamin D levels <20 ng/ml. However this difference was not statistically significant (p=0.15).

Discussion

In the present study, 35 (87.5%) and 30 (75%) of the pregnant women were diabetic and non-diabetic, respectively which had 25 (OH) vitamin D levels less than 20 ng/ml. However, no significant statistical differences were observed between groups. In a study conducted by Farrant H.J et al on 599 pregnant women with GDM in India, similar results were observed and no correlations were found between low vitamin D levels and GDM[12]. In another study by Rodriguez A. et al. on 2382 Spanish pregnant women, no associations were also found between 25 (OH) vitamin D levels and

the risk of GDM[13]. Rodriguez A. et al study on 524 pregnant women also revealed similar results[14]. Clifton et al., in a cohort study in England and Australia also reported a reverse correlation between maternal vitamin D levels and FBS and insulin levels. However, the risk of GDM was not significantly increased in response to the low levels of vitamin D. The main limitation of the Clifton et al. study was targeting the pregnant women referring to the pregnancy clinics for any reason for performing blood tests specially GTT. Therefore, this study has mainly targeted the women at the risk of GDM and the other women at the risk were not evaluated. Additionally, this study was not applicable for the women with low glucose intolerance risk[15].

In another study by Makgoba et al. on 248 pregnant women (90 with GDM and 158 healthy controls), no correlations were observed between 25 (OH) vitamin D levels and the risk of GDM in the first trimester[16].

In contrast, Zhang et al in a study on 953 pregnant women showed a significant decreased 25 (OH) vitamin D levels in women with GDM compared to healthy controls. This study also has indicated the higher risk of GDM in pregnant women with vitamin D deficiency in the first pregnancy[17]. Moreover, Parlea et al. in a study on 335 patients reported an increased risk of GDM in vitamin D deficient individuals[18].

Ghiu et al. also reported a significant correlation between vitamin D deficiency and the increased risk of GDM. In this study, 20 GDM patients and 40 healthy pregnant women were enrolled. Data revealed vitamin D deficiency in 27% and 85% of healthy controls and GDM patients, respectively. Additionally, the vitamin D levels were significantly lower in GDM patients compared to the healthy controls. However, small sample size and cross-sectional data can make the results interpretation difficult[19].

Regarding the controversial results of our study with the other studies and the small sample size, further prospective studies with larger sample size is recommended.

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Conflict of interest: All authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Ethical approval

The study protocol was approved by the Ethics Committee of Bushehr University of Medical Sciences, Bushehr, Iran. The current study was performed according to the Institutional Committee for the Protection of Human Subjects, which was adopted by the 18th World Medical Assembly, Helsinki, Finland and its later amendments.

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