Preliminary Study on the Relationship Between Serum 25-Hydroxyvitamin D Levels and FGR

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Abstract

This paper aims to investigate the correlation between 25 hydroxyvitamin D and fetal growth restriction (FGR). 400 pregnant women who underwent prenatal examination and delivered in our hospital in 2018 were selected and divided into normal control group (379 cases) and FGR group (21 cases). Serum was collected in both groups at 11~13 weeks of gestation and 24~28 weeks of gestation respectively. The content of serum 25 hydroxyvitamin D[25(OH)VitD] was detected and compared, with Logistic regression used to analyze the relationship between serum 25(OH)VitD levels and FGR. As a result, the serum 25(OH)VitD levels of normal control group and FGR group were (55.7±17.4)nmol/L and (44.3±15.8)nmol/L, respectively, with statistically significant difference (P<0.01). The serum 25(OH)VitD level at 24~28 weeks of gestation is correlated with the onset of FGR. The corrected OR value is 0.73 (P=0.0l), the regression coefficient is -0.3625, and the Wald value is 11.2385. In conclusion, the serum 25(OH)VitD content at 24~28 weeks of pregnancy is correlated with the onset of FGR.

Keywords 25 hydroxyvitamin D; Vitamin D; Fetal growth restriction

1. Introduction

Fetal growth restriction (FGR) refers to the failure of the intrauterine fetus to reach its potential growth state because of various adverse factors, and its clinical manifestations are the birth weight of full-term infants <2500g, or the fetal weight below two standard deviations or the 10th percentile of the average weight of the same gestational age. The etiology of FGR is numerous and complex, of which at least 40% of patients are still unclear. At present, some scholars have found that the vitamin D content of pregnant women not only affects their own health, but also has impact on the growth and development of intrauterine fetuses, and even the health expectation of the next generation, suggesting that the lack of vitamin D in pregnant women may be related to the pathogenesis of FGR [1]. The currently internationally recognized indicator for the assessment of serum vitamin D is 25(OH)VitD. Therefore, in this study, the relationship between 25(OH)VitD and FGR was preliminarily investigated by measuring serum 25(OH)VitD levels at 11 ~ 13 weeks and 24 ~ 28 weeks of gestation in 400 pregnant women who underwent antenatal examination and were delivered in our hospital in 2018.

2. Materials and Methods

2.1 General information

400 pregnant women who underwent prenatal examination and delivered in our hospital in 2018 were selected, among whom 21 were in the FGR group with an age of (24.7±5.2) years old, 379 with no complications or complications and aged (23.2±3.4) years old were selected as the normal control group. Age, gestational weeks and body mass index (BMI) between two groups were compared and there was no significant difference (P>0.05).

2.2Research methods

2mL of fasting venous blood was taken from pregnant women in the two groups having pregnancy check at 11~13 weeks of gestation and 24~28 weeks of gestation, respectively. The serum was separated by high-speed centrifugation at 3000 r/min for 10min, and the serum 25(OH)VitD levels were measured by enzyme-linked immunosorbent assay (Elisa). The kit was provided by Abbott. The detection range of serum 25(OH)D was 30 ~ 50 nmol/L.

2.3 Statistical method

All data were analyzed by SPSS 20.0 statistical analysis software. The t-test was used to compare the measurement data. Logistic regression was used to analyze the relationship among age, BMI and serum 25(OH)D content and FGR. P<0.01 was considered statistically significant.

3. Results

3.1 Comparison of serum 25(OH)VitD levels between the two groups

The results of serum 25(OH)VitD levels in two groups of pregnant women during pregnancy were shown in Table 1. Statistical analysis indicated that there was no significant difference in serum 25(OH)VitD levels between the normal control group and the FGR group at 11 to 13 weeks of gestation (P>0.01). However, there was statistically significant difference in the serum 25(OH)VitD levels between the two groups at the 24 to 28 week of gestation (P<0.01)

Table 1 Comparison of serum 25(OH)VitD levels between the two groups (nmol/L； x^±s)

Group	Cases	11 to 13 weeks of gestation （T1）	24-28 weeks of gestation(T2)	T_2-T_1
Control	379	53.2±14.7	55.7±17.4	1.2±14.2
FGR	21	50.8±12.1	44.3±15.8	-1.5±10.4
P Value		0.16	<0.01	0.47

3.2 Correlation analysis between serum 25(OH)VitD levels and FGR

It can be seen from Table 2 that statistical analysis indicates there is no significant correlation between serum 25(OH)VitD levels and the onset of FGR in pregnant women at 11~13 weeks of gestation, and the corrected OR is 0.84 (P=0.19); at 24~28 weeks of gestation, serum 25 (OH)VitD levels in pregnant women are associated with the onset of FGR, and the corrected OR is 0.73 (P=0.01). After Logistic regression analysis, the corrected OR value is 0.73 (P=0.0l), the regression coefficient is -0.3625, and the Wald value is 11.2385.

Table 2 Correlation analysis between serum 25(OH)VitD levels and FGR

Time	11 to 13 weeks of gestation			24-28 weeks of gestation		
	OR value	P value	P value	OR value	95%CI	P value
Before correction	0.81	0.45-0.97	0.20	0.75	0.43-1.08	0.04
After correction	0.84	0.44-1.02	0.19	0.73	0.41-0.93	0.01

4. Discussion

FGR is a serious complication during pregnancy with complex etiology not fully clarified so far. The main reasons are the genetic defects of the fetus itself, or the influence on normal operation of placental function or the direct effect on the embryo by various unfavorable factors inside and outside the uterus, such as malnutrition caused by various factors, hypertension, diabetes mellitus, intrauterine and extrauterine infection, exposure to some drugs, etc. [2]. The etiology of at least 40% of the patients is unclear. FGR caused by any reason will affect the development of the intrauterine fetus, and even lead to fetal death, or cause the function or health decline of newborn and its adult organs. The fetus will survive to alter the blood distribution and nutrition supply in the body, so as to ensure the growth and development of important organs, such as brain, resulting in a series of permanent changes in the structure, physiological function and metabolism of its organs and tissues, and then leading to the long-term diseases of the newborn in adulthood, which is called the programmed phenomenon of the fetal period of adult diseases [3]. Therefore, in recent years, the research on FGR has been emphasized and strengthened at home and abroad.

Vitamin D is an important basic substance to support human life activities, and its general lack has become a public health problem. As a special group, pregnant women are also a high-risk group of vitamin D deficiency. Serum

25(OH)VitD is the main active product of vitamin D in vivo, which is a reliable and sensitive index to evaluate the nutritional level of vitamin D in individuals and to diagnose rickets [4].

Recent studies showed that vitamin D deficiency was also closely related to many diseases, such as cardiovascular diseases, immune diseases, diabetes mellitus, neuromuscular diseases, kidney diseases, skin diseases, tumors and so on, that is, the non-osseous complications of vitamin D deficiency [5-6].

Vitamin D and its metabolite 25(OH)VitD can passively or actively enter the fetal body through the placenta. When abnormal bone mineral metabolism occurs in the mother, fetal bone development is affected as the fetus is living in the uterine environment. Previous studies showed that when the bone development of the fetal fetus was stimulated by adverse factors, the whole process of the growth and development of the fetal bone would be affected differently [7]. Therefore, vitamin D deficiency during pregnancy could not only lead to the above diseases, but also affected the growth and development of fetuses, and could even lead to rickets in infancy and childhood, resulting in growth retardation, bone deformity, muscle weakness and tetany [8].

The results in this study showed that there was a statistically significant difference in serum 25(OH)VitD levels between the normal control group and the FGR group at G24 ~ G28 ($P<0.01$). The serum 25(OH)VitD levels in the normal control group at G11 ~ G13 was slightly higher than that in the FGR group, but the difference was not statistically significant ($P>0.05$). At the same time, Logistic regression analysis for all test data showed that the 25(OH)VitD levels at G24 ~ G28 was correlated with the onset of FGR, indicating that the increase of serum 25(OH) VitD levels in vivo could prevent the onset of FGR, but there was no correlation between the 25(OH)VitD level and the onset of FGR at G11 ~ G34.

At the same time, this study also found that there was statistically significant difference between the serum 25(OH) VitD levels in the normal control group at G11 ~ G13 and G24 ~ G28, indicating that the serum 25(OH)VitD levels of pregnant women at G24 ~ G28 was higher than that at G11 ~ G13, and the nutritional status of serum 25(OH) VitD of the women in the normal control group at G24 ~ G28 was better than that at G11 ~ G13, which might be related to calcium supplementation or consumption of some maternal health milk powder by some pregnant women during the second trimester of pregnancy, further indicating that the demand of pregnant women for vitamin D in second-late trimester of pregnancy was higher than that in the first-second trimester of pregnancy.

To sum up, timely supplementation of vitamin D and calcium in pregnant women should be guided in clinical, which can effectively reduce the occurrence of perioperative complications and reduce the adverse outcome of newborns.

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Competing Financial Interests

The authors declare no competing financial interests.

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