COMMON PREGNANCY COMPLICATIONS IN RELATION TO VITAMIN D DEFICIENCY

By

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ABSTRACT

Background: Maternal vitamin D deficiency is a widespread public health problem as the prevalence of inadequate and deficient vitamin D status in pregnant women ranges from 5 to 84% globally.

Objective: To assess risk factors for vitamin D deficiency and investigate the relation between maternal vitamin D level, and development of gestational diabetes mellitus, gestational hypertension, intrauterine growth retardation, and preterm labor.

Patients and methods: Our prospective observational study included 100 pregnant women divided into 2 equal groups: group A had insufficient vitamin D level and group B had sufficient vitamin D level in serum with no risk factors. Vitamin D levels were measured on the MiniVidas (Biomerieux, France).

Results: The incidence of preterm labor was 22%. There was a statistically significant association between hypovitaminosis D and preterm labor. There was no significant association between hypovitaminosis D and gestational diabetes mellitus, gestational hypertension and intrauterine growth retardation.

Conclusion: There was an association between hypovitaminosis D in pregnancy and preterm deliveries. No association between vitamin D deficiency and common pregnancy complications as gestational diabetes, gestational hypertension and intrauterine growth retardation.

Keywords: Hypovitaminosis D, preterm labor, gestational diabetes mellitus, gestational hypertension and intrauterine growth retardation.

INTRODUCTION

Vitamin D deficiency in pregnancy is prevalent (ACOG, 2019), especially in women with limited access to sunlight due to minimal outdoor activity or heavy use of sunscreen, cultural practices or traditional clothing, and among women with dark skin pigmentation.

Vitamin D receptor gene is one of the genes that have been extensively studied in relation to osteoporosis. It is responsible for a broad range of actions of 1, 25 (OH) 2 vitamin D3, including its effect on calcium transport, homeostasis and bone resorption. Vitamin D interacts with its receptor and affects calcium homeostasis by regulating bone cell growth and differentiation, calcium absorption and PTH secretion (McCarthy et al., 2011). Serum 25-hydroxyvitamin D [25(OH) D] of less than 30ng/ml is considered an insufficient level (ACOG, 2019).

Cord concentrations of 25(OH) D are lower than maternal concentrations. The fetus relies entirely on the vitamin D stores of the mother. Vitamin D may be an
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important factor in preeclampsia causation (Adams et al., 2014). Vitamin D deficiency may also elevate blood pressure. This effect may be related to the ability of 1,25 (OH) 2D to down regulate the renin–angiotensin–aldosterone system. Vitamin D may play a functional role in the preservation of glucose tolerance through its effects on insulin secretion and insulin sensitivity. There may be an autocrine/paracrine role of vitamin D in insulin target tissues (Adorini, 2015). As the osteoblasts have 1, 25-(OH) 2D receptors and several osteoblast specific genes that are also 1,25-(OH)2D responsive, low 25-(OH) D concentrations in mother and, therefore, low 25-(OH) D and/or 1, 25-(OH)2D in the fetus may lead to reduced osteoblastic activity, affecting long bone growth (Pereira et al., 2015).

The aim of this study was to investigate the relation between maternal vitamin D level and development of gestational DM, gestational hypertension, intrauterine growth retardation, and preterm labor.

**PATIENTS AND METHODS**

This observational prospective study was done in Gynecology and Obstetrics Department in Sayed Galal Hospital.

This study included 100 pregnant women who attended outpatient clinics in Sayed Galal Hospital with the following criteria: Age: 16-45 and gestational age 20–26 weeks with living fetus. We excluded cases who were pregnant less than 20 weeks of gestation, multiple gestation, uncertain gestational age, very obese patient (BMI > 40) for prevention of sonography false results, severe medical condition leading to termination of pregnancy, accidental hemorrhage associated with moderate or severe bleeding and cases suffering from polyhydramnios and oligohydramnios.

Patients were investigated by vitamin D level in blood and divided according to results (Table 3) into 2 equal groups: Group A have insufficient vitamin d level, and group B included 50 pregnant women have sufficient vitamin d level in serum.

Patients were followed up thorough pregnancy till delivery after taking their consent to participate in the study for development of gestational hypertension, gestational diabetes mellitus, intrauterine growth retardation and preterm delivery by gathering information on the mothers such as age, weight, height, parity, socio-economic status, occupation, daily sun exposure, daily usual duties, duration of daily exposure to the sun, sleep habits and time of sleep through day, Body mass index (BMI) was calculated by the formula [weight (kg)/height (m)²] then blood samples for vitamin D were examined on the same day, and the vitamin D levels was measured on the MiniVidas, in The Clinical Pathology Department, Sayed Galal Hospital.

**Statistical Methods:**

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 22.0, IBM Corp., Chicago, USA, 2013.

Inferential analyses were done for quantitative variables using Shapiro-Wilk test for normality testing, independent t-test in cases of two independent groups with normally distributed data. In qualitative data, inferential analyses for
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independent variables was done using Chi square test for differences between proportions and Fisher’s Exact test for variables with small expected numbers with Post Hoc Bonferroni test. The level of significance was taken at P value < 0.050 is significant.

RESULTS

There were no significant differences in demographic and clinical characteristics between the 2 groups although sun exposure was lower among the deficiency group and development of gestational DM and gestational hypertension were higher in deficiency group but the difference was not significant (Table 1).

Table (1): Comparison between the studied groups regarding demographic and clinical characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>Deficiency (N=50)</th>
<th>Normal (N=50)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean±SD</td>
<td>30.6±3.6</td>
<td>30.4±4.7</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>24.0–38.0</td>
<td>21.0–40.0</td>
<td></td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>Mean±SD</td>
<td>31.6±2.2</td>
<td>31.3±2.3</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>24.2–34.9</td>
<td>24.7–36.6</td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td>Mean±SD</td>
<td>3.2±0.9</td>
<td>3.1±1.1</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>1.0–5.0</td>
<td>1.0–5.0</td>
<td></td>
</tr>
<tr>
<td>GA (weeks)</td>
<td>Mean±SD</td>
<td>22.9±1.4</td>
<td>22.7±1.8</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>20.0–25.0</td>
<td>20.0–26.0</td>
<td></td>
</tr>
<tr>
<td>Sun exposure (hours)</td>
<td>Mean±SD</td>
<td>2.3±1.1</td>
<td>2.7±0.9</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>0.0–4.5</td>
<td>0.9–4.9</td>
<td></td>
</tr>
<tr>
<td>Vitamin 25(OH)D level</td>
<td>Mean±SD</td>
<td>19.2±6.6</td>
<td>40.5±5.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>5.2–29.2</td>
<td>30.8–54.1</td>
<td></td>
</tr>
<tr>
<td>Gestational DM</td>
<td>Present</td>
<td>9 (18.0%)</td>
<td>5 (10.0%)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>41 (82.0%)</td>
<td>45 (90.0%)</td>
<td></td>
</tr>
<tr>
<td>Gestational HTN</td>
<td>Present</td>
<td>4 (8.0%)</td>
<td>3 (6.0%)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>46 (92.0%)</td>
<td>47 (94.0%)</td>
<td></td>
</tr>
</tbody>
</table>

The development of intrauterine growth retardation and development of low birth weight were higher among the deficiency group as shown in table 2 but the difference was not significant between the 2 groups .There were significant differences in developing preterm deliveries among the 2 groups as among the deficiency group 11 cases developed preterm delivery in comparison to the normal group only 3 cases developed preterm delivery (Table 2).
Table (2): Intrauterine growth retardation, low birth weight and preterm deliveries among the studied groups

<table>
<thead>
<tr>
<th>Groups Variables</th>
<th>Findings</th>
<th>Deficiency (N=50)</th>
<th>Normal (N=50)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrauterine growth retardation</td>
<td>Present</td>
<td>3 (6.0%)</td>
<td>0 (0.0%)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>47 (94.0%)</td>
<td>50 (100.0%)</td>
<td></td>
</tr>
<tr>
<td>Low birth weight</td>
<td>Present</td>
<td>6 (12.0%)</td>
<td>0 (0.0%)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>44 (88.0%)</td>
<td>50 (100.0%)</td>
<td></td>
</tr>
<tr>
<td>Preterm delivery</td>
<td>Present</td>
<td>11 (22.0%)</td>
<td>3 (6.0%)</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>39 (78.0%)</td>
<td>47 (94.0%)</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

Vitamin D deficiency in pregnant women and their children is a major health problem, with potential adverse consequences for overall health. Vitamin D deficiency has been associated with several adverse pregnancy outcomes, including pre-eclampsia, gestational diabetes mellitus, intrauterine growth restriction and preterm birth. The studies on this subject showed conflicting results on the association between vitamin D levels in pregnancy and adverse effects on maternal and fetal health, both skeletal and non-skeletal like autoimmune diseases, cardiovascular diseases and diabetes (Makrides et al., 2016).

Maternal vitamin D deficiency is common during pregnancy and a widespread public health problem. A high prevalence of vitamin D deficiency has been observed among pregnant women, with prevalence rates varying by ethnicity and sunlight exposure. According to (ACOG, 2019) there is currently a lack of information and data to draw any definitive conclusions regarding vitamin D role in adverse pregnancy outcomes. Intake of vitamin D supplements during pregnancy has also been reported to decrease a subsequent risk for adverse pregnancy outcomes (Masvidal et al., 2013).

The current study found that cases developed preterm labor in hypovitaminosis D group were 22% while in normal group were 3% that declared Preterm delivery was significantly more frequent among deficiency group than among normal group. Two studies confirmed current findings. Leticia et al. (2014) declared increasing incidence of adverse neonatal outcomes and recommended a daily intake dose of vitamin D, taking into account the needs of the fetus and maternal milk output. Faustino et al. (2015) showed that Vitamin D supplementation during pregnancy was associated with increased circulating vitamin D levels, birth weight, and birth length, and was not associated with other maternal outcomes. Study).

The current study found that cases developed gestational diabetes mellitus in hypovitaminosis D group were 18% while in normal group were 10% that declare gestational diabetes mellitus was non-significantly more frequent among deficiency group than among normal group.
The current study found that cases developed gestational hypertension in hypovitaminosis D group were 8% while in normal group were 6% that declared gestational hypertension was non-significantly more frequent among deficiency group than among normal group. And the cases developed intra uterine growth retardation in hypovitaminosis D group were 6% while in normal group were 0% that declared intra uterine growth retardation was non-significantly more frequent among deficiency group than among normal group. While, in contrary with current findings, there were a nested case-control study at United States to assess relationship between midgestation vitamin D deficiency and severe preeclampsia between 43 cases and 198 controls and found that maternal midgestation vitamin D deficiency was associated with increased risk of severe preeclampsia (Baker et al., 2010). Xu et al. (2014) found that the mean concentration of vitamin D was lower in preeclamptic women, so it was hypothesized that the plasma concentrations of maternal vitamin D measured at an average of 35 week gestational age were statistically significantly lower in women with adverse pregnancy outcomes compared to non-complicated controls.

CONCLUSION

There was an association between hypovitaminosis D in pregnancy and preterm deliveries. No association between vitamin D deficiency and common pregnancy complications as gestational diabetes, gestational hypertension, and intra uterine growth retardation.

Conflicts of interest: No conflicts of interest were encountered.

REFERENCES


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نقص فيتامين D في الحمل وعلاقته بحودث مضاعفات أثناء الحمل

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خلفية البحث: يعد نقص فيتامين D مشكلة صحية واسعة الانتشار حيث إن معدل نقص فيتامين D في السيدات الحوامل يتراوح من 5 إلى 84% عالمياً. يُؤدي نقص فيتامين D عند المرأة إلى ضعف الحمل وتكسر عمليات الإجهاض، أو التعريض للولادة مبكرة. كما يمكن أن يساهم فيتامين D في الحالة فين أن يكون على نمط الطفل ووزنه، بسبب نقص في إمداد النمذ للمشيمة من خلال إصابة الأم الحامل بتنقُّس

الهدف من البحث: تحديد العوامل التي قد تؤدي إلى نقص فيتامين D في الحمل وبحث وثبات وجود علاقة بين نقص فيتامين D عند الأم والعديد من المشاكل التي قد تصاحب المرأة الحامل مثل سكر الحمل وضغط الحمل ونقص النمو الجنيني والولادة المبكرة.

المريضات وطريق البحث: تم اختيار مائة سيدة من السيدات الحوامل في 20-26 أسبوع من الحمل من اللاتي يتواجدن في قسم النساء والتوليد مستشفى سيد جلال وتم تقسيمهم إلى مجموعتين رئيسيتين.

المجموعة الأولى: تتضمن الحالات التي تعاني من نقص حاد في مستوي فيتامين D في الدم.

المجموعة الثانية: تتضمن الحالات التي تحافظ على مستوي طبيعي من نسبة فيتامين D في الدم.

وتم أخذ موافقه على الالحترام في البحث من كل المشاركات في الدراسة ومعرفة تاريخهم الطبي كاملاً ثم تم عمل تحليل نسبة فيتامين D بالدم لكل...
المشاركين في الدراسة ب العسكرية篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮篮basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketball basketba