



Association of Vitamin D Deficiency with Gestational Diabetes Mellitus: A Prospective Observational Study.

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Abstract

Background:

Vitamin D deficiency is increasingly recognized as a potential risk factor for metabolic disorders such as gestational diabetes mellitus (GDM). It plays a role in glucose metabolism through its effects on insulin secretion and sensitivity.

Objective:

To evaluate the association between maternal vitamin D deficiency and gestational diabetes mellitus.

Methods:

This prospective observational study was conducted over four months among 100 pregnant women attending antenatal clinics at a tertiary care hospital. Women aged 18–40 years between 24–28 weeks of gestation were included. Serum 25-hydroxyvitamin D levels were measured, and GDM was diagnosed using the oral glucose tolerance test. Statistical analysis was performed using the chi-square test.

Results:

The mean age of participants was approximately 26.4 ± 4.2 years. Vitamin D deficiency was observed in 60% of participants, while 30% were diagnosed with GDM. Among vitamin D-deficient women, 40% had GDM compared to 15% in those with sufficient levels. A statistically significant association was found ($p = 0.014$).

Conclusion:

Vitamin D deficiency is significantly associated with increased risk of GDM.

Recommendation:

Routine screening and early supplementation of vitamin D during pregnancy may help reduce the risk of GDM.

Keywords: Vitamin D deficiency, gestational diabetes mellitus, pregnancy, insulin resistance, maternal health.

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Introduction

Glucose intolerance initially identified during pregnancy is known as gestational diabetes mellitus (GDM). One of the most prevalent metabolic issues during pregnancy, it is

linked to preeclampsia, macrosomia, and an increased risk of type 2 diabetes in the future for both the mother and the fetus. (1). Through its impact on insulin sensitivity and pancreatic β -cell activity, vitamin D plays a significant role



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in glucose metabolism. Skeletal muscle and pancreatic tissue both have vitamin D receptors, which may be involved in peripheral glucose uptake and insulin secretion.(2).

Pregnant women all throughout the world, especially in developing nations, suffer from vitamin D inadequacy. Low maternal vitamin D levels may raise the risk of insulin resistance and gestational diabetes mellitus, according to a number of studies.

Nevertheless, there is still conflicting data about the link between GDM and vitamin D deficiency. (3). In order to assess the relationship between maternal vitamin D deficiency and gestational diabetes mellitus in pregnant women who attend prenatal clinics, this study was carried out.

Materials and Methods

Study Design

This was a prospective observational study conducted to evaluate the association between maternal vitamin D deficiency and gestational diabetes mellitus.

Study Setting

The study was carried out in the Department of Obstetrics and Gynaecology at DRIEMS Institute of Health Sciences and Hospital, Odisha, India, a tertiary care center providing comprehensive maternal and neonatal healthcare services.

Study Duration

The study was conducted over a period of four months.

Study Population

The study population consisted of pregnant women attending antenatal outpatient clinics at the study center.

Sample Size

A total of 100 pregnant women were included in the study. The sample size was determined based on feasibility and the availability of eligible participants during the study period.

Sampling Method

Participants were selected using convenience sampling from those attending the antenatal clinics during the study period.

Inclusion Criteria

Pregnant women aged 18–40 years with a singleton pregnancy between 24 and 28 weeks of gestation were included in the study.

Exclusion Criteria

Women with pre-existing diabetes mellitus, chronic kidney disease, thyroid disorders, or those already receiving vitamin D supplementation were excluded from the study.

Data Collection Procedure

After obtaining informed consent, eligible participants underwent clinical evaluation and laboratory investigations. Serum 25-hydroxyvitamin D levels were measured during the second trimester using standard laboratory methods. Screening for gestational diabetes mellitus was performed using the oral glucose tolerance test (OGTT) as per standard guidelines. Vitamin D deficiency was defined as serum levels less than 20 ng/mL.

Bias Control

Efforts were made to minimize potential sources of bias by applying uniform inclusion and exclusion criteria and using standardized procedures for biochemical assessment and diagnosis. All participants were assessed using the same diagnostic criteria throughout the study.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of DRIEMS Institute of Health Sciences and Hospital. Written informed consent was obtained from all participants prior to inclusion, and confidentiality of patient information was strictly maintained.

Statistical Analysis

Data were entered into a database and analyzed using appropriate statistical software. Categorical variables were expressed as frequencies and percentages. The association between vitamin D status and gestational diabetes mellitus was evaluated using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 120 pregnant women were assessed for eligibility, of which 100 met the inclusion criteria and were enrolled in the study. Twenty participants were excluded due to not



meeting the inclusion criteria or declining participation. All enrolled participants were included in the final analysis.

Table 1: Distribution of Participants by Vitamin D Status

Vitamin D Status	Number (n)	Percentage (%)
Deficient	60	60
Sufficient	40	40
Total	100	100

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Table 2: Incidence of Gestational Diabetes

GDM Status	Number	Percentage
GDM	30	30
No GDM	70	70
Total	100	100

Table 3: Association Between Vitamin D Status and GDM

Vitamin D Status	GDM	No GDM	Total	Chi-square	p-value
Deficient	24	36	60	6.02	0.014
Sufficient	6	34	40		
Total	30	70	100		

The chi-square value was 6.02, indicating a statistically significant association between vitamin D deficiency and GDM ($p = 0.014$).

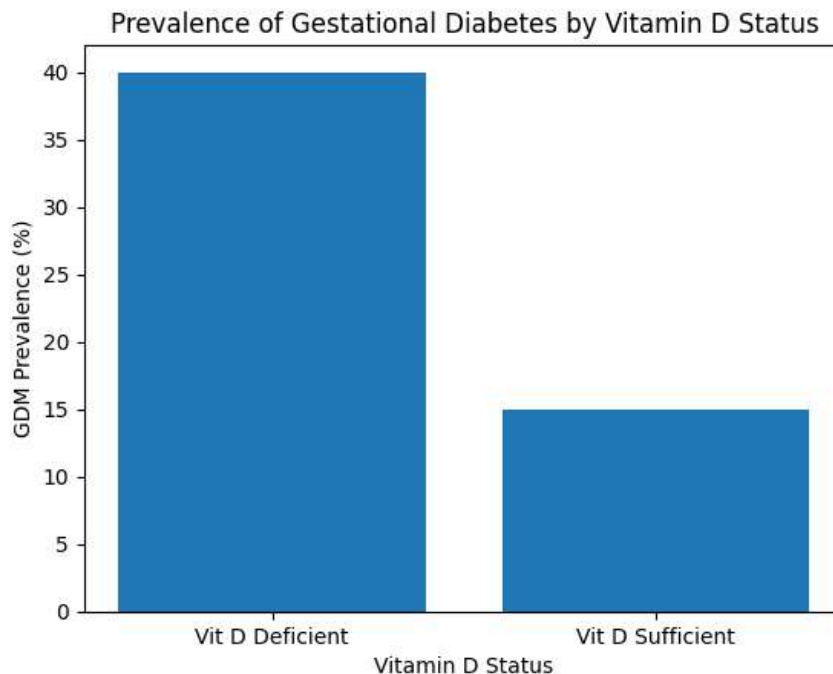


Figure 1: Prevalence of GDM by Vitamin D Status

Discussion

The current study evaluated the association between the incidence of gestational diabetes mellitus (GDM) in 100 pregnant women and maternal vitamin D insufficiency. The results showed that 60% of participants had low levels of vitamin D, indicating a high prevalence of the condition. This suggests that pregnant women frequently worry about vitamin D insufficiency. Similar results have been found in a number of studies carried out in underdeveloped nations, where low vitamin D levels during pregnancy are largely caused by a combination of variables such as inadequate nutritional consumption, limited sunshine exposure, and specific lifestyle choices.(4), (5).

The current study indicated that 30% of women had gestational diabetes mellitus. Notably, women with inadequate levels of vitamin D had a significantly greater incidence of GDM (40%) than those with adequate levels (15%). This raises the possibility of a connection between low vitamin D levels and a higher chance of GDM during pregnancy. According to statistical analysis, there was a

significant correlation ($p = 0.014$) between vitamin D insufficiency and GDM. This finding lends credence to the theory that poor glucose metabolism during pregnancy could be caused by low vitamin D levels. It is well established that vitamin D affects glucose homeostasis via a number of biological pathways. (6). It lowers systemic inflammation, improves peripheral tissue insulin sensitivity, and controls pancreatic β -cell insulin secretion—all of which are critical for preserving healthy glucose metabolism. (7).

These results are in line with earlier research showing a link between vitamin D deficiency and elevated insulin resistance and a higher risk of gestational diabetes. Nonetheless, other research has shown contradictory findings, indicating that GDM development is complex. The risk of gestational diabetes may also be influenced by other variables, including the mother's body mass index (BMI), genetic predisposition, dietary practices, and lifestyle choices. Therefore, more extensive research is needed to



fully comprehend the function of vitamin D in the therapy and prevention of GDM. (8), (9).

The findings of this study may be generalized to similar populations in tertiary care settings, particularly in developing countries where vitamin D deficiency is prevalent among pregnant women.

Conclusion

Among pregnant women, vitamin D deficiency is very common and strongly linked to an increased risk of gestational diabetes mellitus. Pregnancy outcomes for both mother and fetus may be improved, and the risk of GDM may be decreased with early detection of vitamin D insufficiency and proper treatment.

Limitations

This study has certain limitations, including a small sample size, short duration, and single-center design. Additionally, confounding factors such as BMI, diet, and sunlight exposure were not assessed.

Recommendation

Routine screening for vitamin D levels during pregnancy and appropriate supplementation should be considered as part of antenatal care to reduce the risk of gestational diabetes mellitus.

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List of Abbreviations

GDM – Gestational Diabetes Mellitus
OGTT – Oral Glucose Tolerance Test

Funding

No funding was received for this study.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

BBM: Concept and design
MM: Data collection and analysis
AP: Manuscript drafting and revision

Data Availability

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Biography

Dr. Binod Bihari Mishra is an Associate Professor in Obstetrics and Gynaecology with research interests in maternal health and metabolic disorders.

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