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ASSOCIATION OF FIRST TRIMESTER HbA1c VALUES AND THE DEVELOPMENT OF GESTATIONAL DIABETES MELLITUS

Obstetrics & Gynaecology

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ABSTRACT

Gestational diabetes mellitus (GDM) is increasingly common worldwide, particularly in India. It is one of the most frequent medical complications in pregnancy and is linked to adverse maternal and perinatal outcomes. Early diagnosis and treatment are essential to prevent complications, most of which are avoidable with timely intervention. This study aimed to evaluate whether first-trimester HbA1c levels can predict the development of GDM in later trimesters. A cross-sectional study conducted among 232 antenatal patients. All underwent HbA1c testing in first-trimester and were later screened for GDM using the oral glucose tolerance test during the second and third trimester. The relationship between first-trimester HbA1c and later GDM development was analyzed. 59 out of 232 patients developed GDM. A significant association was found between first-trimester HbA1c and GDM. However, some patients with low HbA1c also developed GDM. First-trimester HbA1c alone cannot replace OGTT for diagnosing GDM

KEYWORDS

GDM, HbA1c, OGTT

INTRODUCTION

As the prevalence of diabetes mellitus continues to grow, impacting individuals across all age groups, including children and young adults, women of childbearing age are also more likely to develop diabetes during pregnancy. GDM is increasing enormously worldwide in the recent decades especially in developing countries. Gestational diabetes mellitus is defined as carbohydrate intolerance of varying severity with onset or first detection during pregnancy. Gestational diabetes is a frequent complication during pregnancy and is linked to negative outcomes for both the mother and the baby. Early diagnosis and treatment are crucial in preventing serious maternal and fetal complications. Timely identification and management of gestational diabetes can enhance immediate outcomes, reduce maternal and fetal morbidity, and help prevent long-term issues. This study aimed to investigate the extent to which GDM can be predicted in the first trimester by HbA1c.

MATERIALS AND METHOD

Study Design: Cross Sectional study
Sample Population: All antenatal patients delivering in the department of obstetrics and gynaecology, Dr Somervell Memorial CSI Medical College and Hospital.
Exclusion Criteria: All antenatal patients with pregestational diabetes mellitus.
Sample Size: A total of 232 patients were included in this study.
Study Period: A period of 3 months.

Our study was approved by the Institutional Ethics Committee in Karakonam.

Data Collection Method

All antenatal patients delivered in our hospital were included in our study.Blood samples were drawn from all antenatal patients who have attended our antenatal clinic in the first or second visit itself. HbA1c and random blood sugar were checked along with other parameters. Those patients with HbA1c values ≥6.5 will be categorized as Pregestational Diabetes Mellitus.

Those who diagnosed as Pregestational Diabetes Mellitus were excluded from the study.

Table No : 1 Criteria To Diagnose Pre-gestational Diabetes In Pregnancy (Any one criteria) (1)

HbA1c	≥6.5%
FBS	≥126 mg/dl
RBS	≥200 mg/dl

All other antenatal women were followed up till delivery. In the second and third trimester 75g oral glucose tolerance test (OGTT) is done to diagnose GDM.

Antenatal patients who become GDM in the second trimester were included in the GDM category and 75gm OGTT will be repeated for those patients who is not in GDM group.

Data collection was made at the time of delivery since few patients may lost follow up. We categorized patients according to the HbA1c values.

Table 2: Criteria to diagnose Gestational Diabetes in pregnancy include (any one criteria) (2)

Fasting plasma glucose	≥92 mg/dl
1-hour plasma glucose after a 75 g glucose load	≥180 mg/dl
2-hour plasma glucose after a 75 g glucose load	≥153 mg/dl

HbA1c is divided into 5 classes
Class 1 6- 6.4%
Class 2 5.6 - 5.9%
Class 3 5- 5.5%
Class 4 4.5- 4.9%
Class 5 <4.5%
Later we statistically analysed the association of HbA1c and GDM.

RESULT

Distribution Of Study Subjects Based On HbA1C

This indicates that the majority (66.8%) fall within the 5-5.5% range, suggesting a predominance of individuals with normal glycemic control. A smaller proportion (20.7%) have HbA1C levels between 4.5-4.9%, while 9.9% fall within the 5.6-5.9% range. Only a small percentage (1.3%) have HbA1C levels below 4.5% or within the 6-6.4% range.

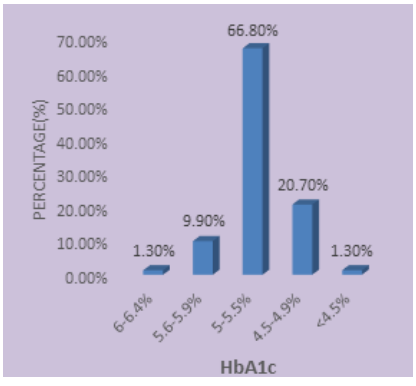

Fig 1: The distribution of study subjects based on HbA1C levels.

Distribution Of Study Subjects Based On Ga Of Diagnosis Of GDM

Figure 2 shows that the majority (50.8%) were diagnosed between 12-28 weeks of pregnancy. A smaller proportion (30.6%) were diagnosed after 28 weeks, indicating late detection. Meanwhile, 18.6% were diagnosed before 12 weeks in the first trimester itself.

Development Of GDM In Each Group In Each Trimesters

The development of gestational diabetes mellitus (GDM) across different HbA1C groups and gestational ages (GA) at diagnosis indicates variations in occurrence across trimesters

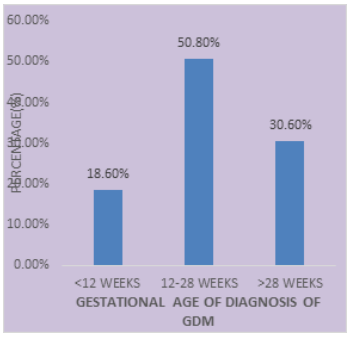

Fig 2 : The distribution of study subjects based on the gestational age (GA) at the diagnosis of gestational diabetes mellitus (GDM).

Distribution Of Study Subjects Based On The Development Of GDM

As the HbA1c values decreasing the incidence of developing GDM also decreasing.66.70% developed in the class 1 category (6-6.4%),52.10% developed in class 2(5.6-5.9) and 24.50% and 14.60% in class 3(5-5.5%) and class 4(4.5-4.9) categories respectively with a p value of 0.002.

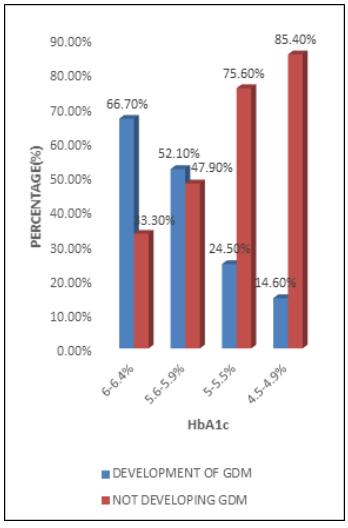

Fig 3: Distribution of study subjects based on development of GDM.

DISCUSSION

The current study estimated HbA1c levels in the first trimester based on the hypothesis that women with higher HbA1c levels in the first trimester are more likely to acquire gestational diabetes mellitus later in pregnancy and experience unfavorable consequences for both the mother and the fetus. Several studies showed that HbA_{1c} can be used for gestational diabetes screening in early pregnancy. Also reported that women with elevated HbA1c during early pregnancy have a higher risk of developing GDM.

In the present study we found out that there is significant relation between first trimester HbA1c value and the development of GDM in the later months with p value of 0.002. A total of 3 patients were included in the class 1 category, of which 2 (66.7%) developed GDM and almost half of the patients developed GDM in the class 2 category (12patients (52.1%)). The largest patient group was class 3 which included 155 patients and 38 (24.5%) developed GDM.14.6% patients developed GDM in the class 4 category.

Kaveriappan et al conducted a similar study showed the HbA1c value estimated during early pregnancy (<14 weeks) was useful in the prediction of GDM and it correlated well with adverse pregnancy outcomes (3). Amylidi-mohr et al conducted a study with similar objectives showed that HbA1c and random plasma glucose values combined with age, body mass index, and personal and family history, allow the identification of women in the first trimester who are at increased risk of developing GDM (4). Cetin et al states that first trimester HbA1c level is a promising biomarker for GDM screening (5).

In our study, Women with HbA1c values more than 6 were at a higher risk for GDM and those with HbA1c less than 4.5 were not complicated with GDM.As the HbA1c value increased from 4.5% to 6.4%, the chances of getting GDM also increases. Some patients with normal HbA1c value also developed GDM. Despite initial interest in using first trimester HbA1c as an early predictor of GDM current evidences suggests that it lacks sufficient predictive accuracy. Several large scale studies have shown that women with normal or even low HbA1c values in early pregnancy have later gone on to develop GDM. A Spanish prospective study (6) of over 1100 women found that an HbA1c cut off of 4.8% had a sensitivity of 96.7% but an extremely poor specificity of only 10.1%, meaning many women with low HbA1c still developed GDM. Similarly a Chinese cohort study conducted by Wang et al in 2021 reported the same. These findings suggest that while high HbA1c may indicate increased risk, a low HbA1c value does not exclude the risk of development of GDM. Therefore relying on the first trimester HbA1c alone for prediction or screening can result in underdiagnosis and missed opportunities for early intervention.

CONCLUSION

HbA1c estimation alone in the first trimester could not be used as a predictive tool for the development of GDM in later trimesters.

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