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Prediction of the Risk of Development of GDM with the Association of BMI in Early Pregnancy

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ABSTRACT

This study reflects on the BMI of the pregnant women in early pregnancy can be used as a predictive factor for the risk of developing GDM. This will help prevent the development of GDM by healthy diet, exercise and blood sugar monitoring which could modify the risk factor, lead to reduced BMI which eventually reduces the risk of development of GDM. This is a retrospective study. Eighty pregnant women with single pregnancy and primigravida who came for regular ANC visits to the obstetrics clinic were included in this study as per the inclusion criteria. BMI was measure of each woman who was included in the study in her early pregnancy and screening for GDM was done in early pregnancy and at 24 -28 weeks of GA and study the association of BMI in early pregnancy with development of GDM. We perform logistic regression to validate the influence of inter-gestational BMI on the risk of GDM. The findings indicated that age ≥30 and BMI recorded during 24th to 28th week of pregnancy confirms the influence on the risk of GDM (p value < 0.05).

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is more common complication in pregnancy. It affects atleast 4-5 women in 100 women during pregnancy[1].

Gestational Diabetes Mellitus is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.

GDM increases the risk of fetal Macrosomia, neonatal hypoglycemia, neonatal birth trauma, respiratory distress syndrome, hyperbilirubinemia, hypocalcemia, polycythemia and even mortality. Maternal risk caused by GDM are difficult labour, birth canal trauma, infections, preterm labour and mortality[2].

Hence screening and diagnosing GDM is important for treating it and preventing its complications. GDM risk assessment should be ascertained at the first prenatal or antenatal visit. Diagnosis of GDM is done by one step diagnostic process proposed by the International Association of Diabetes and Pregnancy Study Group (IADPSG). Criteria for the 75-g OGTT recommended is consumption of 75 grams of glucose followed by oral glucose tolerance test (OGTT) done after 2 hours and the value >8.5 mmol/L or >153 mg/dL is diagnosed as GDM. First OGTT screening done in early pregnancy, again repeat OGTT between 24-28 weeks of gestation age[3].

Some of the risk factors for development of GDM are higher BMI, older age, family history of DM, previous GDM. Abnormal Body Mass Index (BMI) is one of the major and modifiable risk factors in pregnancy. It has been correlated with maternal and neonatal complications. The risk of development of GDM in women with high BMI who are obese is high and it can be used as a predictive factor. Women with higher BMI tend to have higher fat mass which could cause maternal insulin resistance which indeed results in risk of development of GDM. In this study the association of BMI in early pregnancy with the risk of development of GDM is assessed under different categories of BMI (normal weight, overweight, obese I, obese II)[4].

This study reflects on the BMI of the pregnant women in early pregnancy can be used as a predictive factor for the risk of developing GDM. This will help prevent the development of GDM by healthy diet, exercise and blood sugar monitoring which could modify the risk factor, lead to reduced BMI which eventually reduces the risk of development of GDM. Hence a retrospective study of the association between BMI in early pregnancy with the risk of development of GDM is justified.

MATERIAL AND METHODS

Study Design: The study was a retrospective study with each participant being enrolled after fulfilling inclusion criteria.

Study Population: Study population includes pregnant women in the ANC clinic in the obstetrics and Gynaecology department.

Sample Size: Sample size of 80 pregnant women were taken who fulfilled all inclusion criteria.

Study Technique: This was a retrospective study done in a tertiary care hospital after ethical committee approval. 80 pregnant women with single pregnancy and primigravida who came for regular ANC visits to the obstetrics clinic were included in this study as per the inclusion criteria. BMI was measure of each woman who was included in the study in her early pregnancy and screening for GDM was done in early pregnancy and at 24-28 weeks of GA and study the association of BMI in early pregnancy with development of GDM.

Inclusion Criteria:

- Age between ≥20 - ≤34 years
- Primigravida
- Singleton pregnancy

Exclusion Criteria:

- Elderly gravida (Age >34 years)
- Multigravida
- Twin pregnancy
- Overt Diabetes Mellitus
- Previous miscarriages
- Family history of DM

RESULTS AND DISCUSSIONS

The present study identified four categories of pre- pregnancy BMIs namely healthy weight, overweight, and obesity I and obesity II women. Out of the total study population, 41(51.2%) women fall under healthy weight category followed by over weight (40%), obesity I (6.3%) and only 2.5% of women fall under obesity II.

As per ADA criteria of non-fasting, none of the women has developed GDM in first trimester. However, during 24th to 28th week of pregnancy, the cases of GDM rise significantly. In comparison with women without GDM, those with GDM were older and more likely to be overweight and obese. A non-significant p value (>0.05) concludes that there is no association between GDM and age category of women. A significant p value concludes that there is a significant association between BMI and GDM.

We perform logistic regression to validate the influence of inter-gestational BMI on the risk of GDM. The findings indicated that age ≥30 and BMI recorded during 24^{th} to 28^{th} week of pregnancy confirms the influence on the risk of GDM (p value < 0.05).

WHO has prioritized attaining an optimal BMI before conception to promote the health of mothers

Table 1: Frequency and Percentage of Women Under BMI category

BMI (kg/m2)		Frequency	Percent	Cumulative Percent
≥18.5 and ≤24.9	Healthy Weight			
	Over weight			
	Obesity I Obesity II	41	51.2	51.2
≥25 and ≤29.9		32	40.0	91.3
≥30 and ≤34.9		5	6.3	97.5
≥35 and ≤34.9		2	2.5	100.0
Total		80	100.0	

Table 2: Characteristic of the study population

	Healthy	Overweight	Obesity I	Obesity II	P-value
18-24	9	5	1	0	0.672
25-29	22	15	3	1	
30-35	10	12	1	1	

Table 3: Distinctive features of the study population with respect to gestational diabetes mellitus

Variables	GDM	Non- GDM	Total	P-value
Age				
20-24	2	13	15	0.285
25-29	9	32	41	
≥30	6	18	24	
BMI				
Healthy weight	4	37	41	
Overweight	8	24	32	<0.05
Obese I	3	2	5	
Obese II	2	0	2	

Table 4: Logistic regression analysis of GDM by the effect of BMI and age group

Variable	OR Exp (B)	S.E.	P-value	95% C.I. EXP (B) Lower	For Upper
Age 20-24	1.041	0.117	0.735	0.827	1.309
25-29	1.27	0.128	0.286	1.05	1.46
≥30 BMI	2.15	0.183	< 0.05	1.82	2.61
Healthy weight	1.637	0.140	< 0.05	1.244	2.153
Overweight	1.72	0.120	< 0.05	1.262	2.138
Obese I	1.342	0.190	< 0.05	0.85	2.270
Obese II	1.857	0.191	< 0.05	1.359	2.532

and their progeny. There is currently new evidence regarding the management of pre-gestational obesity, especially the use of an adequate gestational weight gain during pregnancy. The implementation of effective interventions and the impact on outcomes of such interventions are currently in need of further research. Even in high-risk populations, previous systematic evaluations failed to show that adopting a healthier way of life and GWG increased rates of GDM. It necessitates us to reconsider the effects of lowering GWG for preventing GDM[5].

A significant community-based cohort was used in the current study to examine the relationship between maternal BMI and GDM. Under the investigation, none of the cases confirms the risk of GDM during first trimester of the pregnancy. However, the number of cases of GDM steadily rises during 24th to 28th week of the pregnancy. The study shows a significant association between higher BMI and the development of GDM. Additionally, a single-variable logistic regression analysis verified that BMI in early pregnancy was a significant risk factor for the development of GDM[6].

Our findings also confirm the prior hypothesis that being overweight and obese greatly increases the chance of developing GDM. Compared to women without GDM, those who acquire GDM frequently have a preclinical metabolic abnormality prior to pregnancy. The predisposed initial insulin resistance is aggravated further and, in conjunction with -cell dysfunction, leads to the progression of GDM because of the considerable decrease in insulin sensitivity that occurs in a typical pregnancy. Even with reference to recent signs, there are currently numerous disagreements[7].

One of the prominent results of the study reveals that age can be considered as a risk factor that can influence the impact of pre-pregnancy obesity on the initial development of GDM and the impact is substantial especially in the 30-34 age group. The findings indicate that the underlying processes producing GDM may vary depending on the maternal age and that weight loss may be more helpful in reducing the chance of developing GDM in pregnant women between the ages of 30 and 34. A more complicated challenge is the difference in the associations between overweight and GDM according to age. Researchers demonstrated that inflammation was associated with advanced maternal age, a significant risk factor for development of GDM, and that inflammation during pregnancy could exacerbate inflammatory state[8].

This study found that BMI gain in the first trimester of pregnancy before GDM screening was not associated with GDM risk. The changes in the composition of the female anatomy throughout the first trimester of pregnancy indicate how the maternal body is getting ready for the growth of the fetus. Particularly, the maternal uterus and breast tissue swell, and the blood volume increases. However, the primary contributor that could cause a change in glucose tolerance is the accumulation of fat. This may help to explain why high GWG during the first and second trimesters does not cause GDM through the accumulation of fat mass. As a result, the risk of GDM was not increased during the first half of BMI and weight rise. However, the increase in BMI from first trimester to 24th to 28th week of pregnancy has shown a significant association with GDM risk. The result of the study is consistent with studies like[9].

In research conducted on 1000 pregnant women in 2010, the mean maternal weight and, consequently, the mean BMI remained stable during the first trimester. A bioelectrical impedance investigation also revealed that the maternal body composition means had not changed. Particularly, the mean of the body fat measurements remained constant. These results show that accurate measurements of weight or body composition taken at any point during the first trimester may be used as a baseline for subsequent comparisons because changes in maternal weight or body composition during pregnancy often occur after

the first trimester. However, the study contradicts with some previous studies[10].

We next segregated pregnant women into several BMI categories and discovered that, in the normal weight, overweight, and obese groups, respectively, the early pregnancy BMI of women with GDM was remained considerably higher than the women without GDM. Although conditions such as vomiting and nausea in the first trimester of pregnancy can affect maternal weight, it does not appear to affect maternal weight substantially unless in situations of severe hyperemesis. This results in a 5% fall in body weight and affects 0.3%-2% of pregnancies, with several factors contributing to its incidence.

Insulin resistance is an additional factor in the pathogenesis of GDM, and in a typical pregnancy, the alterations cause a decrease in glucose absorption and an increase in insulin secretion, resulting in insulin resistance. Improper diet, overweight, obesity, and GDM all have a detrimental effect on embryo development and its long-term health.

CONCLUSION

The results of the present study show that higher BMI has been associated with adverse maternal and neonatal outcomes throughout pregnancy and thus can be used as a predictive factor for GDM. Modifications to the diet and exercise regimen are necessary for the effective management of the conditions.

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