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Fetal and Maternal Outcome in Patients with Diabetes, Type 1, Type 2 and Gestational Diabetes and Normal Pregnancy

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Abstract

Background: *Pregnant women with DM type 1 (T1DM), DM type 2 (T2DM), and GDM had varied age distributions. Generally speaking, women with T2DM and GDM are older than those with T1DM.*

Objectives: *To examine the differences in pregnancy complications, delivery characteristics, and neonatal outcomes between women with type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), and gestational diabetes mellitus (GDM).*

Methods: *It was a Retrospective cohort study done for duration of 1 year in a tertiary care hospital in India. Pregnant women ≥20 years who were attending the Department of Obstetrics and Gynaecology during the study period were included in the study. Women with multiple pregnancies were excluded from study. The study included all pregnant women with diabetes in pregnancy with normal pregnancy as control. Total 50 diabetics and 75 control participants are included in the study. SPSS (22.0) was used for analysis.*

Results: *Women with T1DM, T2DM, and GDM differed significantly in the average age in the frequency of vaginal delivery; gestational hypertension; chronic hypertension; status of an Apgar score under 8; frequency of SGA, AGA, and LGA. Women with T1DM had a decreased risk of vaginal birth and gestational hypertension as well as a higher likelihood of having a baby vaginally. Compared to women with GDM, there is a higher chance of chronic hypertension and gestational age at birth before 37 weeks. Women with T2DM had a decreased chance of gestational hypertension compared to women with GDM, according to multivariate logistic regression analyses using the type of diabetes as an end variable.*

Conclusion- *Our findings show that GDM accounts for the majority of pregnancy-related diabetes, and that there are variations in pregnancy problems, delivery traits, and neonatal outcomes, primarily between women with GDM and women without T1DM.*

Keywords- *Gestational Diabetes, Type 1 DM, Type 2 DM, Hypertension, Low birth weight*

Introduction

Globally, diabetes mellitus (DM) is a major public health issue. The International Diabetes Federation (IDF) estimates that by 2045, the number of individuals with diabetes will have increased from the current 10% global average will increase to 700 million with diabetes.[1] Age-adjusted prevalence of DM in adults is predicted to be 9.2% globally and 7.3% in Europe by 2030, compared to 8.3% and 6.3%, respectively, in 2019. Also, DM raises a number of issues with global health care disparity.[2] Along with an increase in the incidence of diabetes in the general population; there is a significant rise in the prevalence of diabetes during pregnancy.[3] Pregnancy-related hyperglycemia affects almost 1 in 6 live births, and over 85% of these patients are women. Pre-gestational diabetes makes up the remaining percentage of women who have gestational diabetes mellitus (GDM). "Glucose intolerance with onset or first detection during pregnancy" is the definition of GDM.[4]

Pregnant women with DM type 1 (T1DM), DM type 2 (T2DM), and GDM had varied age distributions. Generally speaking, women with T2DM and GDM are older than those with T1DM.[5] The pathophysiology of illness development can explain this for each kind of DM. Beta cell hypertrophy results from pregnancy-induced insulin resistance, but gestational diabetes develops when insulin output cannot keep up with the elevated insulin needs. After that, the glucose is passed through the placenta and causes concurrent fetal hyperglycemia, which is followed by fetal pancreatic beta-cell hyperplasia and fetal hyperinsulinemia. Fetal hyperinsulinemia causes high weight increase (4000 g) in the fetus, which is typically referred to as large-for-gestational-age (LGA) newborns or fetal macrosomia. [6,7]

Together with macrosomia, IUGR, and HDP, diabetes during pregnancy is linked to spontaneous abortions, a greater chance of cesarean delivery, operative vaginal delivery, as well as a higher overall perinatal mortality rate, which includes perinatal mortality. Congenital abnormalities, particularly those involving the heart, polycythemia, organomegaly, neonatal hypoglycemia, alterations in electrolytes, and neonatal hyperbilirubinemia, as well as asphyxia.[8]

There aren't enough studies on the variations in co-morbidities and the variations in maternal and fetal pregnancy outcomes among pregnant women with various forms of diabetes. This study's objective was to investigate the women with T1DM, T2DM, and GDM had different pregnancy difficulties, labour features, and neonatal outcomes.

Materials and Methods

It was a Retrospective cohort study done for duration of 1 year in a tertiary care hospital in India. Pregnant women ≥20 years who were attending the Department of Obstetrics and Gynaecology during the study period were included in the study. Women with multiple pregnancies were excluded from study. The study included all pregnant women with diabetes in pregnancy with normal pregnancy as control. Total 50 diabetics and 75 control participants are included in the study.

Maternal age in years, socio-demographic data, clinical information on pregnancy characteristics (such as preeclampsia, gestational hypertension, chronic hypertension, and HEELP syndrome), and delivery information are all provided by the database characteristics (such as the kind of delivery used, the gestational age of delivery in weeks, and the traits of the babies) (birth weight in grams, birth height in centimeters, Apgar score). Based on the type of diabetes, women were classified into four groups: women with T1DM-(05), women with T2DM (21), and women with GDM (24), normal pregnant females (75).

Statistical Analysis

The statistical analysis was performed using SPSS for windows version 22.0 software (Mac, and Linux). The findings were present in number and percentage analyzed by frequency, percent, and Chi-squared test. Chi-squared test was used to find the association among variables. The critical value of P indicating the probability of significant difference was taken as <0.05 for comparison.

Results

Table 1- Demographic details of Study participants

Variables	T1DM	T2DM	GDM	Normal	p-value
	N	N	N	N	
Age					
<34 years	2	16	17	50 25	
>34 years	3	5	7		0.060
Birth Weight					
SGA	1	11	14	05	
AGA	3	9	8	70	
LGA	1	1	2		<0.001
Delivery					
Vaginal	2	9	8	15 60	
Cesarean delivery	3	12	16		<0.001
Chronic Hypertension					
No	3	20	14	73	
Yes	2	1	8 2		<0.001
Preeclampsia					
No	3	20	14	74	
Yes	2	1	8	2	0.154
HELLP					
No	5	21	22	75	
Yes	0	0	0	0	0.759
Gestational Hypertension					
No	5	20	14	75	
Yes	0	1	8	0	<0.001
Ponderal index (X ± SD)	2.55 ± 0.26	2.55 ± 0.27	2.50 ± 0.24		<0.001
Apgar Score					
<8	1	3	4	6	
>8	4	18	22	68	<0.001
Birth Length (in cms)	50.84 ± 3.56	51.11 ± 2.95	51.65 ± 3.00		<0.001

As per table 1 women with T1DM, T2DM, and GDM differed significantly in the average age in the frequency of vaginal delivery; gestational hypertension; chronic hypertension; status of an Apgar score under 8; frequency of SGA, AGA, and LGA; and frequency of gestational age before 37 weeks at delivery they all are significant as compared to 3 groups with Non-diabetic pregnant females.

Table 2- Multivariate logistic regression analysis with the type of diabetes as an outcome variable and GDM as a reference category.

Variables	T1DM	T2DM
	OR (95% CI)	**OR (95% CI)**
Weight		
SGA	1.29 (0.96–1.73)	1.38 (0.54–3.49)
AGA	0.94 (0.81–1.10)	1.20 (0.78–1.83)
LGA	1.0 reference category	1.0 reference category
Delivery		
Vaginal	**0.73 (0.64–0.83)**	1.00 (0.71–1.43)
Cesarean delivery	1.0 reference category	1.0 reference category
Chronic Hypertension		
No	1.0 reference category	1.0 reference category
Yes	**1.88 (1.55–2.29)**	1.48 (0.84–2.60)
Gestational Hypertension		
No	1.0 reference category	1.0 reference category
Yes	**0.47 (0.36–0.62)**	**0.37 (0.15–0.92)**
Apgar Score		
<8	1.13 (0.96–1.33)	1.20 (0.76–1.89)
>8	1.0 reference category	1.0 reference category
Gestational Age at Birth		
<37 weeks	**1.38 (1.18–1.63)**	0.70 (0.41–1.20)
>37 weeks	1.0 reference category	1.0 reference category

As per table 2 women with T1DM had a decreased risk of vaginal birth and gestational hypertension as well as a higher likelihood of having a baby vaginally. Compared to women with GDM, there is a higher chance of chronic hypertension and gestational age at birth before 37 weeks. Women with

T2DM had a decreased chance of gestational hypertension compared to women with GDM, according to multivariate logistic regression analyses using the type of diabetes as an end variable.

Discussion

Using information from the registry for all patients, we examined the variations in pregnancy problems, delivery features, and neonatal outcomes among women with T1DM, women with T2DM, and women with GDM. The data used in this study however the bulk of research looking at diabetes during pregnancy is conducted in clinical settings, which may have an impact on the prevalence and demographics of the subjects. According to findings from other nations and significant centers, where GDM accounted for between 80% and 90% of all occurrences of diabetes in pregnancy, the majority of the women with diabetes in our study around four-fifths of the women—had GDM.**[**9**]**

The data from the USA revealed a comparable frequency of GDM among pregnant women with diabetes, but also a significant prevalence of T2DM of more than 16%, with less than 2% of pregnant women with diabetes having T1DM. T2DM was present in just 2% of the research participants.**[**10**]**

Nonetheless, there is a legitimate fear that the incidence of T2DM in pregnancy may rise in the coming decades due to a worrying trend of an increase in maternal age and prevalence of maternal obesity on a global scale.**[**11**]** The decreased prevalence of T2DM among diabetic women in our sample may be attributable to the lower fertility rates of pre-gestational T2DM patients and its link to obesity and polycystic ovarian syndrome, both of which are associated with a decline in fertility.**[**12**]** However, because many patients were examined for glucose intolerance for the first time during pregnancy, a certain proportion of patients with pre-gestational T2DM might have been mistakenly labeled as GDM. The data are sent to the registry immediately following delivery, and the six-week post-partum OGTT data are not available to help with the final diagnosis.**[**13**]**

The findings of our study highlight the disparities among pregnant women with various forms of diabetes and recommend modifying treatment strategies for these patients. In our study, women with T1DM were more likely to have persistent hypertension compared to women with GDM and a greater risk of giving birth prematurely, which is consistent with earlier studies showing a link between chronic hypertension and giving birth prematurely.**[**7,14**]** While oxidative stressors are linked to both diabetes and hypertension, those who have had diabetes for a longer period of time are more likely to develop hypertension. Contrarily, compared to women with GDM, women with T1DM had a more than two-times decreased risk of developing gestational hypertension.

In a similar vein, women with T2DM had approximately a three-fold lower chance of gestational hypertension than women with GDM, which may also explain why chronic hypertension is more common rather than the lower risk of cardiovascular problems being linked to pregnancy. Nonetheless, there may possibly be a link between late GDM diagnosis and gestational hypertension. According to the most recent recommendations [13,15], the GDM screening is done between weeks 24 and 28 of gestation. According to a recent study in the Slavic population, insulin resistance in the first trimester of pregnancy in pregnant women is on par with or even higher than that in non-pregnant women with polycystic ovarian syndrome.

According to earlier studies looking at the differences in pregnancy outcomes between women with T1DM and women with T2DM [15,16], women with T1DM had a 38% higher likelihood of preterm birth compared to women with GDM, and the frequency of preterm birth was higher among women in this group compared to both T2DM and GDM. There were no variations in the probability of various categories of weight at birth of neonates. Nevertheless, given that women with T1DM had a higher likelihood of preterm birth and a more than 25% lower likelihood of vaginal delivery, this could be due to obstetric intervention and elective cesarean delivery rather than a lower risk for macrosomia.

Conclusion

Our findings show that GDM accounts for the majority of pregnancy-related diabetes, and that there are variations in pregnancy problems, delivery traits, and neonatal outcomes, primarily between women with GDM and women without T1DM. Women with T1DM demonstrated a higher chance of chronic hypertension and preterm labour compared to those with GDM, as well as a lower likelihood of vaginal delivery. Women with pre-gestational diabetes were less likely to develop gestational hypertension than those with gestational diabetes mellitus (GDM). Given the rising prevalence of diabetes in pregnancy, it is important to carefully evaluate the consequences of prenatal hypertension, chronic hypertension, and diabetes in pregnancy-on-pregnancy outcomes.

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