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STUDY OF CORELATION OF HBA1C AND MACROSOMIA IN INFANT OF DIABETIC MOTHER IN TERTIARY MEDICAL CENTRE OF BIHAR

Pediatrics

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ABSTRACT

Introduction: Diabetes mellitus that develops in a woman prior to pregnancy (pregestational diabetes mellitus—PGDM) can have a number of negative consequences for the mother, foetus, child, and the pregnancy itself. Poorly regulated PGDM prior to conception and throughout the first trimester of pregnancy is linked to a higher risk of significant congenital deformities, spontaneous abortions, stillbirth, and perinatal mortality. PGDM has also been linked to a variety of pregnancy difficulties as well as neurological issues in the children. **Aim and objectives:** To study the corelation of HBA1c and macrosomia in infant of diabetic mother. **Material and methods:** This study is a descriptive observational type of study done at Narayan medical college and hospital Jamuhar, in the department of paediatrics in collaboration with Department of Obstetrics and gynecology during May 2020 to May 2021 on 200 newborn babies of mothers who were already diagnosed as diabetic. **Result :** On assessing the Correlation of HBA1C and Birth weight by applying regression analysis there was strong positive correlation with R square 0.70, which shows that there is positive correlation between HBA1C and birth weight of baby. **Conclusion:** glycosylated haemoglobin (HbA1c) statistically significantly related to the women giving birth to Macrosomic babies.

KEYWORDS

HBA1C, Macrosomia, Type 1 DM, gestational diabetes

Diabetes mellitus is a condition whose incidence has risen considerably in recent decades and is expected to rise even more in the near future, as obesity and sedentary lifestyles become more common. Its geographical distribution is diverse. According to the World Health Organization's 2016 worldwide report on diabetes, the number of diabetic adults has nearly quadrupled since 1980, with 422 million adults now living with diabetes. According to the International Diabetes Federation, the number of adults with diabetes will rise to 642 million by 2040. (1) Gestational diabetes mellitus (GDM) is one of the most frequent pregnancy problems, and it is linked to significant mother and newborn morbidity throughout generations. GDM is becoming more common as a result of increased maternal risk factors including as obesity and advanced maternal age, as well as the influence of the new International Association for Diabetes in Pregnancy Study Group recommendations for GDM diagnosis and categorization. (2) In women of reproductive age, the prevalence of type 1 or type 2 diabetes mellitus (T1DM or T2DM) has continuously increased, impacting around 1% of all pregnancies. Diabetes mellitus that develops in a woman prior to pregnancy (pregestational diabetes mellitus—PGDM) can have a number of negative consequences for the mother, foetus, child, and the pregnancy itself. Poorly regulated PGDM prior to conception and throughout the first trimester of pregnancy is linked to a higher risk of significant congenital deformities, spontaneous abortions, stillbirth, and perinatal mortality. PGDM has also been linked to a variety of pregnancy difficulties as well as neurological issues in the children. Furthermore, long-term consequences of insulin resistance in kids may raise the risk of cardiovascular disease, hypertension, and diabetes (metabolic syndrome). (3)

An oral glucose tolerance test (OGTT) has traditionally been used to diagnose GDM, and it is regarded the gold standard. The American Diabetes Association included HbA1c as a diagnostic test for type 2 diabetes in non-pregnant women in 2010, with a cut point of 6.5 percent (48 mmol/mol), which was later supported by the World Health Organization. HbA1c testing in the first trimester of pregnancy is recommended by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) to rule out overt diabetes. An OGTT necessitates pregnant women to come to the test fasted, which can be inconvenient and time consuming. HbA1c, on the other hand, has the advantage of being able to be measured at any time of day, regardless of meal timings. (4)

Fetal macrosomia is a significant pregnancy-related consequence of diabetes. Labor irregularities, severe perineal lacerations, and caesarean delivery are all more likely in the mother of a macrosomic foetus. Intracranial bleeding and shoulder dystocia, with Erb's palsy and hypoxia, are risks for the foetus. Hypoglycemia, hypocalcemia, hypomagnesemia, polycythemia, hyperbilirubinemia, neonatal cardiomyopathy, and obesity are all risks for the newborn.

Fetal macrosomia is caused by foetal hyperinsulinemia, which occurs as a physiological response to maternal hyperglycemia, according to Pedersen's widely recognised explanation. Several studies have found that diabetes moms who have poor glycemic control throughout pregnancy are more likely to produce macrosomic babies than diabetic mothers who have adequate glycemic control during pregnancy. C-peptide levels in cord blood and amniotic fluid are higher in macrosomic newborns of diabetes mothers, indicating the presence of foetal hyperinsulinemia. (5)

With the above background in mind, we undertook this study to see if there was a link between HBA1C in the mother and baby macrosomia.

AIM OF THE STUDY

To study the corelation of HBA1c and macrosomia in infant of diabetic mother.

MATERIAL AND METHODS

This study is a descriptive observational type of study done at Narayan medical college and hospital Jamuhar, in the department of paediatrics in collaboration with Department of Obstetrics and gynecology during May 2020 to May 2021 on 200 newborn babies of mothers who were already diagnosed as diabetic.

INCLUSION CRITERIA

1. Babies born to mothers who are diagnosed as pre gestational diabetes mellitus and gestational diabetes mellitus.
2. Singleton pregnancy.

EXCLUSION CRITERIA

1) Newborns born with congenital anamolies.
2) Infants of mothers having any other co-morbid conditions apart from diabetes mellitus.

METHODOLOGY :

The study enlisted the participation of pregnant women who had been diagnosed with either overt diabetes or gestational diabetes. This research, which was conducted on their newborn babies, was thoroughly explained to them. Pregnant ladies who met the requirements for inclusion were listed. Blood samples were acquired from these mothers to determine their HbA1c levels. The women were divided into two groups: those with pre-gestational diabetes and those with gestational diabetes. Their BMI, weight growth during pregnancy, diabetes mellitus duration, and type of diabetes therapy were all reported. The birth order, mode of delivery, gestational age,

and birth weight of the newborn were all documented. After that, the data was analysed.

RESULTS

Table 1: Basic profile of study subjects.

	AGE	BMI	WEIGHT GAIN IN PREGNANCY
Mean	25.50	21.81	11.88
N	200	200	200
SD	3.046	3.031	1.343
Minimum	19	14	8
Maximum	36	28	15

Table 1 shows Basic demographic characteristics of study subjects. The mean age was 25.5±3.046, mean BMI was 21.81±3.031 and weight gain during pregnancy was 11.88±1.343 kg

Table 2: Type of Diabetes in study population

		Frequency	Percent
Valid	GDM	88	44
	PGDM	112	56
	Total	200	100.0

Table 2 shows type of Diabetes in study population. 56 % study subjects had pregestational diabetes whereas only 44% study subjects had gestational diabetes.

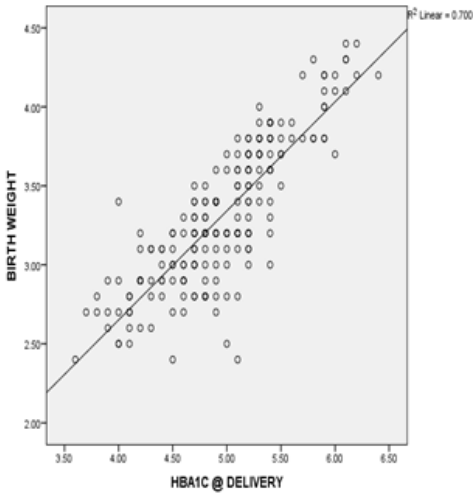

Fig 1: Correlation of HBA1C and Birth weight

Fig 1 shows Correlation of HBA1C and Birth weight. When we assess the correlation by applying regression analysis there was strong positive correlation with R square 0.70

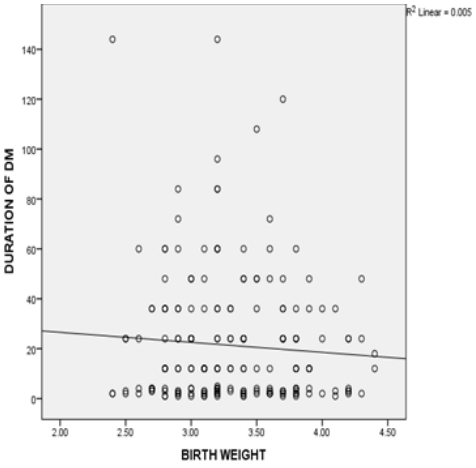

Fig 2: Correlation of Duration of diabetes in mother and Birth weight

Fig 2 shows Correlation of Duration of diabetes in mother and Birth weight. When we apply Regression analysis for calculating correlation we have findings that almost no correlation was found with R square 0.005.

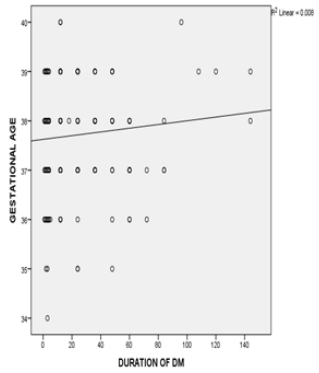

Fig 3: Correlation of gestational age with duration of DM

Fig 3 shows Correlation of gestational age with duration of DM. On applying regression analysis we found there is almost no correlation between duration of DM in mother with gestational age of baby with R square 0.008.

Table 4: Association of mode of treatment of DM with mode of delivery in mothers.

		MODE OF DELIVERY		Total
		LSCS	NVD	
MODE OF TREATMENT	insulin	94	33	127
	meal plan	55	18	73
Total		149	51	200
Pearson chisquare value- 0.043, P value- 0.83				

Table 4 shows association of mode of treatment of DM with mode of delivery in mothers. Out of 127 study subjects who were on Insulin , 94 subjects had LSCS, whereas 33 study subjects had normal vaginal delivery. Out of 73 study subjects who were on meal plan 55 subjects had LSCS and 18 subjects had normal vaginal delivery. On applying Chi-square test to assess the statistical significance, we found that there is no statistical significance with Pearson chisquare value- 0.043, P value- 0.83

DISCUSSION

In the present study minimum age was 19 years and maximum of 36 years. The mean age was 25.5±3.046. Mean age of the women was 26.1 ± 3.9 years in a study by **Balaji Bhavadharini** et al (2017)(4). In a study by **Lakshmi M** et al (2020)(6) mean age of the mother (27.65 with SD 2.55 years) and (64%) mothers were conceived at the age of 26-30 years. In a study by **Ma. Martha Vela-Huerta** et al (2012)(7)mean age of women was 31.3(5.6) years. Mean age was 28 years in a study by **Navjot Kaur** et al (2019) (8). The findings of all different studies are almost in accordance of our study.

In the present study 56 % study subjects had pregestational diabetes whereas only 44% study subjects had gestational diabetes. Study by Balaji et al (9) shows GDM was identified in 195 women (n = 33 in the first trimester and n = 162 in the 2nd/3rd trimester) out of 1459 subjects.. Women with GDM were significantly older and had higher BMI at booking, higher HbA1c at booking, greater history of previous GDM, and greater family history of type 2 diabetes than women without GDM. The variation of the incidence of gestational diabetes in different study was due to difference in study design and study settings. In the present study Correlation of HBA1C and Birth weight. When we assess the correlation by applying regression analysis there was strong positive correlation with R square 0.70. In other similar studies such as In a study by Katarzania et al(10) shows The most important difference between the macrosomia and non-macrosomia groups was observed for HbA1c, especially in the 2nd and 3rd trimesters: 6.0 % (42 mmol/mol) vs. 5.6 % (38 mmol/mol), $p < 0.001$ and 6.0 % (42 mmol/mol) vs. 5.5 % (37 mmol/mol), $p < 0.001$, respectively. Lakshmi M et al (2020)(6) in DM cases birth weight was recorded and it was found to be >4Kg (3.6%) ($p < 0.05$). In a study by **Mehany M. Abdelsttara et al (2017)(11)** mean birth weight was reported to be 3525±130.14 grams. Birth weights ranged from 2296 to 5410 g (mean 3330 ± 568) in a study by **Sarah Chong Xin et al (2018)**(12)

Correlation of Duration of diabetes in mother and Birth weight. When we apply Regression analysis for calculating correlation we have findings that almost no correlation was found with R square 0.005.

Association of mode of treatment of DM with mode of delivery in mothers. Out of 127 study subjects who were on Insulin , 94 subjects had LSCS, whereas 33 study subjects had normal vaginal delivery. Out of 73 study subjects who were on meal plan 55 subjects had LSCS and 18 subjects had normal vaginal delivery. On applying Chi-square test to assess the statistical significance, we found that there is no statistical significance with Pearson chisquare value- 0.043, P value- 0.83. Study by Buhary MB et al(13) found there is significant difference between two group, with larger the value of HBA1C there is more chances of LSCS. Study by patients with HbA1c >6.5% had significantly shorter gestational period with higher CS rates and significantly more miscarriages. Their neonates had significantly more macrosomia and hypoglycemia. In a study by Dr. Anwika Kirti Kujur et al(2018)(1) all macrosomic babies were delivered by Caesarean Section. In a study by Esraa H AL-Maini et al (2017)(14) 71% women had caesarean section and 29% had vaginal delivery. In a study by Lakshmi M et al (2020) (6)an approximately (61%) neonates were delivered by caesarean section $p < 0.05$.

There is growing data to suggest that HbA1c can be used for predicting adverse pregnancy outcomes in women with GDM. Lowe et al.(15) and Capula et al.(16) have shown that higher HbA1c levels are significantly associated with primary and secondary outcomes studied under HAPO study. We found that pregnant women with HbA1c of ≥5.0% (≥31 mmol/mol) were significantly older and had higher BMI and higher previous history of GDM. These characteristics have been related to adverse pregnancy outcomes for both mother and baby. This is confirmed in our study as women with HbA1c ≥5.0% (≥31 mmol/mol) were at a higher risk of delivering macrosomic babies. However, other pregnancy outcomes did not statistically differ in women who had HbA1c cut points below this level.

CONCLUSIONS

Overall, this study suggests that glycosylated haemoglobin (HbA1c) statistically significantly related to the women giving birth to Macrosomic babies. Diabetic pregnant women who have a higher value of HbA1 care definitely more likely to have a macrosomic baby.

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Conflict of Interest: NA

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