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Original Research Article

Correlation of HbA1c levels in third trimester with maternal and perinatal outcome in patients with gestational diabetes mellitus

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is one of the most common metabolic disorders complicating pregnancy. GDM occurs in 2-22% of pregnancies depending on the diagnostic criteria and the epidemiologic characteristics of the population. Elevation of HBA1c have strong correlation with risks of adverse maternal and neonatal outcomes. Aims and objective were to determine the HbA1c levels and to evaluate the maternal and neonatal outcomes in women with HbA1c <5.8% and >5.8%
Methods: A retrospective study at ESIC-PGIMSR from June 2021 to December 2021.All mothers diagnosed with GDM using IADPSG criteria were included. HbA1c measured during the 2nd or 3rd trimester. Cut offs of HbA1c in 3rd trimester was taken as 5.8 according to Versantvoort et al. Maternal and neonatal outcome were assessed among two groups i.e., HbA1c <5.8% the control group and HbA1c >5.8% the case group. Demographic, maternal, and infant data were entered and statistical analysis done using SPSS software.
Results: Total GDM mothers diagnosed were 152 out of 1454 pregnancies. Incidence is 10.4%. the 38.8% were of 25-30 years age group and 46% were multiparous.48.6% neonates were male and 50.6% were females. Among women with HbA1c >5.8%- Preeclampsia seen in 11 cases (21%), polyhydromnios in 5 cases (11.6%), hypothyroidism in 6 cases (12%) UTI in 1 case (2.3%) and candidiasis in 2 cases (4.6%) while among women with HBA1c <5.8% preeclampsia seen in 20 cases (18.3%), polyhydromnios in 2 cases (1.8%), hypothyroidism in 14 cases (13%) UTI in 2 cases (1.8%) and candidiasis in 4 cases (3.6%). Among women with HbA1c >5.8%-respiratory distress syndrome in 6 babies (13%), hyperbilirubinemia in 9 babies (18.6%), hypoglycemia 2 (4.6%) and hypocalemia in 2 babies (4.6%), 14 babies had normal course (32.5%) while among women with HbA1c 5.8% Among women with HbA1c >5.8%-respiratory distress syndrome in 13 babies (12%), hyperbilirubinemia in 20 babies (18.3%) and hypoglycemia 3 (2.7%).
Conclusions: Optimal control of HbA1c along with lifestyle modification and glycemic control helps to reduce maternal and neonatal complications

Keywords: GDM, Polyhydromnios, Preeclampsia, Hyperbilirubinemia, Hypoglycemia

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as any degree of carbohydrate intolerance detected first time in pregnancy during the 2nd and 3rd trimester which usually returns back to normal immediately after delivery. Prevalence of GDM is rising globally and there is wide variation in the prevalence due to ethnic heterogeneity among different population and also because of the different screening and diagnostic criteria being used.[1] As there is high prevalence of diabetes in Indian ethnicity, universal screening for diabetes in pregnancy is recommended.

Glycosylated haemoglobin refers to glucose derived products of normal adult haemoglobin. Most abundant form of glycated haemoglobins is HbA1c. HbA1c is produced by condensation of glucose with N-terminal of valine of each β chain of HbA. Initially an unstable form is formed which is followed by a stable form. This

conversion occurs slowly, continuously and almost irreversibly throughout the entire lifespan of erythrocytes. Lifespan of RBC's is shortened approximately to 90days during pregnancy. Rate of synthesis is directly related to exposure of RBC's to glucose. Thus the concentration of HbA1c serves as an indication of blood glucose concentration over approximately half of RBC i.e., 6-8weeks.Used as a guide in therapeutic decisions in all pregnancies complicated by diabetes mellitus including GDM.[1] During pregnancy fasting sugar decreases and hence HbA1c is decreased. According to DCCT (diabetes control and complication trial) HbA1c levels reflects the change in mean plasma glucose value. HbA1c >7% in first trimester is associated with increased risk of abortion, stillbirth, neonatal death or major congenital anomaly. In third trimester it is associated with increased risk of preeclampsia, macrosomia and still birth.

METHODS

Retrospective observational study type was used. Study carried out at ESIC-PGIMSR, Rajajinagar, Bangalore.

Study period

Study conducted from June 2021 to December 2021. For a duration of 6 months.

Inclusion criteria

All mothers diagnosed with GDM using IADPSG criteria in the third trimester were included in the study.

Exclusion criteria

Patients with pre-existing diabetes mellitus and chronic hypertension and multiple pregnancy were excluded from the study.

Procedure

A total of 152 GDM mothers in the third trimester were taken. HbA1c levels measured during the 3rd trimester. Cut offs of HbA1c in 3rd trimester was taken as 5.8 according to Versantvoort et al.[2] GDM mothers with HBA1c levels >5.8 was considered as target values. Maternal and neonatal outcome were assessed among two groups i.e., HbA1c <5.8% the control group and HbA1c >5.8% the case group. Demographic details like age, parity was taken. Details of glycemic control were noted. Maternal outcomes were assessed in terms of preeclampsia, hypothyroidism, polyhydromnios, preterm birth, UTI, vulvovaginal infections, mode of deliveries. Neonatal outcomes will be assessed like birth weights per plotted as per their gestational age using Fenton's chart and classified into AGA, SGA and LGA. And NICU admission were entered. In the present study considering power of 80% and α error of 5%, minimum sample size was estimated to 152. Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions.

RESULTS

Total number of GDM mothers included were 152. Out of 1454 deliveries 152 were diagnosed with GDM. Incidence is 10.4%

Majority were in the age group of 26-30years accounting to 38%, 29.6% between 30-35years, 22.3% between 20-25 years,7.2% between 35-40 years and 1.9% less than 20 years.

Table 1: Age wise distribution of the study subjects.

Age (Years)	Number	Percentage (%)
<20	3	1.9
21-25	34	22.3
26-30	59	38
31-35	45	29.6
36-40	11	7.2

Among them 70 (46%) were primigravida and 82 (53.93%) were multigravida.

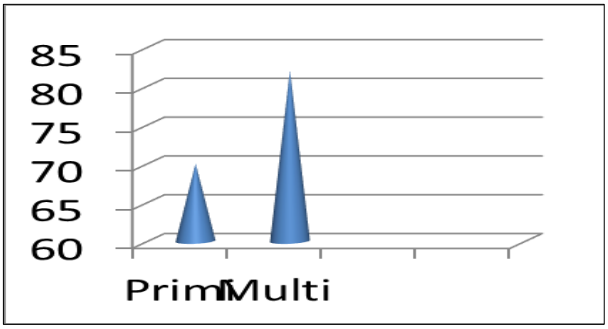

Figure 1: Classification of study subjects based on parity.

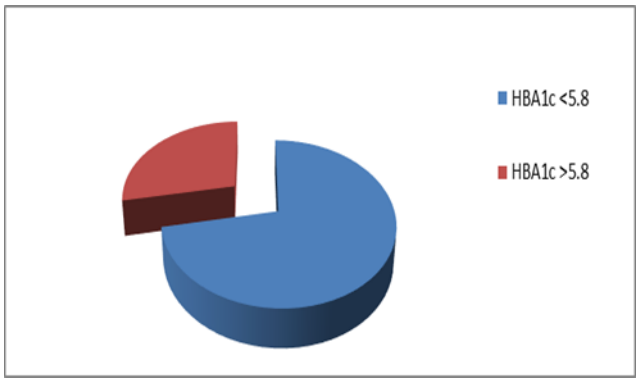

Figure 2: Classification of GDM mothers into cases and controls.

Among 152 GDM mothers, 109 had HbA1c <5.8% (control group) and 43 had HbA1c >5.8% (case group).

Out of 43 GDM mothers. The 15 members (35%) were on medical nutritional therapy, 19 members were on insulin (44.1%) and 9 members on metformin (20.9%).

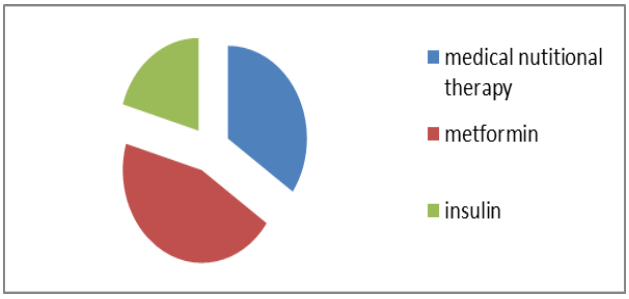

Figure 3: Classification of GDM mothers based on treatment modalities.

Maternal outcomes

Among women with HbA1c >5.8%-preeclampsia seen in 11 cases (21%), polyhydromnios in 5 cases (11.6%), hypothyroidism in 6 cases (12%) UTI in 1 case (2.3%) and candidiasis in 2 cases (4.6%)

Among women with HbA1c <5.8%-preeclampsia seen in 20 cases (18.3%), polyhydromnios in 2 cases (1.8%), hypothyroidism in 14 cases (13%) UTI in 2 cases (1.8%) and candidiasis in 4 cases (3.6%)

Table 2: Comparison of maternal outcomes between cases and controls.

Outcomes	HbA1c <5.8		HbA1c <5.8	
	N	%	N	%
Preeclampsia	20	18.3	11	21
Polyhydromnios	2	1.8	5	11.6
UTI	2	1.8	1	2.3
Candidiasis	4	3.6	2	4.6
Hypothyroidism	14	13	6	12

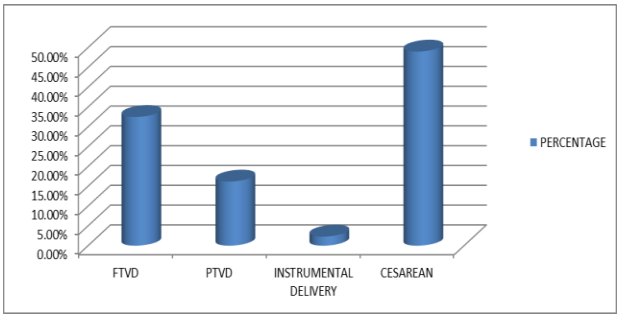

Figure 4: Distribution on mode of deliveries among cases.

Mode of delivery

Among women with HbA1c >5.8%, 14 (32.5%) delivered by full term vaginal delivery, 7 (16.2%) delivered by preterm vaginal delivery, 1 (2.3%) instrumental delivery and caesarean was performed in 21 (49%).

Among women with HbA1c <5.8%, 54(49.5%) delivered by full term vaginal delivery, 10 (9.1%) delivered by preterm vaginal delivery, caesarean was performed in 45 (41.2%)

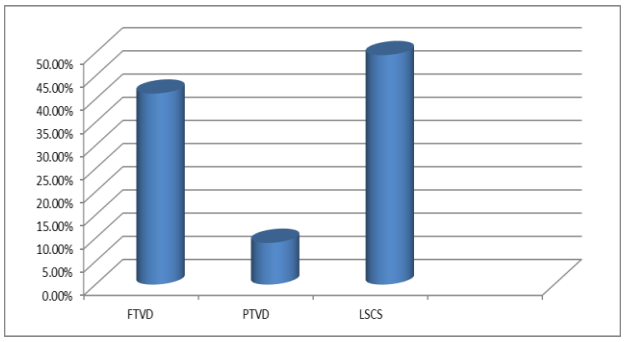

Figure 5: Distribution on mode of deliveries among controls.

Indication for caesarean section

Among women with HbA1c >5.8%-fetal distress was seen in 7 cases (33%), failed induction 3 (14%), non-progression of labour 1 case (4.7%), cephalopelvic disproportion was seen in 9 cases (43%) and breech in 1 case (4.7%).

Among with HbA1c <5.8%-fetal distress seen in 15 cases (33.33%), failed induction 5 (11.1%), non-women progression of labour 2 case (4.4%), cephalopelvic disproportion seen in 20 cases (44.4%) and breech in 3 case (6.66%).

Neonatal birth weights

Among women with HbA1c>5.8%-Appropriate for gestation age seen in 36 babies (83.7%), small for gestation seen in 2 babies (4.6%), large for gestation in 4 babies (9.3%).

Among women with HbA1c <5.8%-appropriate for gestation age seen in 99 babies (90.8%) and small for gestation seen in 10 babies (9.8%).

Table 3: Comparison of neonatal birth weights among the case and control group.

Birth weights	HbA1c <5.8%		HbA1c >5.8%	
	N	%	N	%
Appropriate for gestation	99	90.8	36	83.7
Small for gestation	10	9.8	2	4.6
Large for gestation	-	-	4	9.3

NICU admission

NICU admission was required in 10 babies (23.2%) for HbA1c >5.8% and for 17 babies (15.5).

Neonatal complication

Among women with HbA1c>5.8%-respiratory distress syndrome in 6 babies (13%), hyperbilirubinemia in 9 babies (18.6%), hypoglycemia 2 (4.6%) and hypocalemia in 2 babies (4.6%), 14 babies had normal course (32.5%).

Table 4: Comparison of neonatal outcomes between the cases and controls.

Outcomes	HbA1c <5.8		HbA1c > 5.8	
	N	%	N	%
Respiratory distress syndrome	13	12	6	13
Hyperbilirubinemia	20	18.3	9	18
Hypoglycemia	3	2.7	2	4.6
Hypocalemia	-	-	2	4.6

Among women with HbA1c >5.8%-respiratory distress syndrome in 13 babies (12%), hyperbilirubinemia in 20 babies (18.3%) and hypoglycemia 3 (2.7%).

DISCUSSION

Incidence of GDM in the present study is 10.4%. Prevalence of GDM according to Suryanarayan et al is 17.8%.[3] There are no exact cut off values of HbA1c during pregnancy. Different studies mention different cut offs in second and third trimester to predict the pregnancy outcomes. Versantvoort et al studied HbA1c levels in healthy pregnant women and concluded that the cut off levels of HbA1c in first, second and third trimester were 5.4%, 5.5% and 5.8% respectively.[2] In the present study the cut off taken is 5.8% which corellates with Gupta et al which is 6.0% and 5.9% by Rador et al study.[4,5]

In the present study preeclampsia was seen in 11 cases (21%) in the case group and among the controls 18.3% which corelates with study done by Bhat et al reported 29% and Ho et al in Taiwanese women.[6,7] Exact etiology of preeclampsia is not known. But whenever there is involvement in the microvascular system it leads to pre-eclampsia. In the present caesarean section was seen in 49% among the cases and 41.2% among the controls which correlates with Bhat et al and Sreelakshmi et al 40% and 33% respectively.[6,8] Present study incidence of LGA newborns among the cases was 9.3%, according to Liliana Fonseca et al (4.5%).[9] There wasn't any LGA babies among the controls. Priming of beta cell mass in early gestation causes persistent foetal hyperinsulinaemia throughout the pregnancy which increases the risk of accelerated foetal growth. There is an inverse relationship between first trimester glycemic controls and standardized weight gain. Respiratory distress syndrome among the cases is seen in 13% and among controls it was seen in 12% which correlates with Prakash et al which is 11% and Sreelakshmi et al.[8,10] The reasons is due to decreased surfactant production which leads to delayed lung maturity neonatal hypoglycemia was seen in 4.6% among cases and 2.7% among controls which correlates with Navjout et al is 4%.[11]

NICU admission among cases was seen in 23.2% which correlates with Navjout et al is 20%.[11]

Limitation

The above study is conducted for a short duration with small sample size and at a single centre and hence lacks population diversity. Confounding factors like pre pregnancy weight and BMI can be avoided by performing additional propensity-based subgroup studies

CONCLUSION

Gestational diabetes is commonly associated with maternal complication like gestational hypertension, preeclampsia, hypothyroidism. Optimal control of HbA1c along with lifestyle modification and glycemic control helps to reduce maternal and neonatal complications.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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