Article published online: 2022-04-18

Glycemic Status and Maternal Outcome among Women with Gestational Diabetes Mellitus

Reena Wilma Frank[1] Devina E. Rodrigues[2] Rajagopal Kaipangala[3] Kunnath Chacko Leena[4] Prema D. Cunha[3]

[1] Department of OBG Nursing, Yenepoya Deemed to be University, Mangaluru, Karnataka, India.
[2] Department of Community Health Nursing, Father Muller College of Nursing, Mangaluru, Karnataka, India
[3] Department of Obstetrics and Gynaecology, Srinivas Institute of Medical Science and Research Center, Mangaluru, Karnataka, India
[4] Yenepoya College of Nursing, Yenepoya Deemed to be University, Deralakatte, Mangaluru, Karnataka, India

Address for correspondence Reena Wilma Frank, PhD, Yenepoya Deemed to be University, Mangaluru, Karnataka, India 575018 (e-mail: rinwil21@yahoo.co.in).

J Health Allied Sci[NU] 2023;13:28–31.

Abstract

Introduction Maternal gestational diabetes mellitus (GDM) is one of the most common medical complications of pregnancy. GDM can adversely affect the short- and long-term health of mothers and their newborns.

Aim This study aims to determine the association between maternal glycemic parameters with adverse maternal outcomes and baseline characteristics among women with GDM.

Settings and Design Observational, prospective study.

Materials and Methods Sixty-six pregnant women visiting outpatient department of a parent hospital who were diagnosed with GDM by an obstetrician were included in the study. Glycemic parameters were documented at the time of diagnosis (at 24 weeks of pregnancy). The maternal outcomes were studied after 24 hours of delivery.

Results The mean age of the women was 29.05 ± 3.98 years and 36.4% of the women were primipara. Among 66 women, 47% had a family history of diabetes mellitus, and that 48.28% of them belonged to first-degree relatives. Body mass index indicated in prepregnancy status 39.4% of them were overweight. In glycemic parameters, 63.6 and 93.9% of the women had increased fasting blood sugar and postprandial blood sugar values, respectively. Hemoglobin A1c (HbA1c) was elevated in 45.5% of the women. The maternal outcome showed that 30.30% of the women underwent cesarean section, 18.18% had preeclampsia, and 15.16% of them had increased weight gain (>11kg). There was a significant association between HbA1c and preeclampsia, $p = 0.044$.

Conclusions The study reiterates that GDM has a poor maternal outcome, the mother is at risk to develop preeclampsia, increased maternal weight gain, and interference of cesarean section is more.

Clinical Significance During the antenatal period among GDM mothers' glycemic control is very essential. Any variation in the glycemic parameters of the mother will lead to poor maternal outcomes.

Keywords
- glycemia
- gestational diabetes mellitus
- maternal outcome
- pregnancy outcomes

article published online
April 18, 2022

DOI https://doi.org/10.1055/s-0042-1744358.
ISSN 2582-4287.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

Introduction

Gestational diabetes mellitus (GDM) refers to any degree of blood glucose intolerance that occurs or is discovered for the first time during pregnancy.[1] In recent years, the incidence of GDM has been increasing year by year. There are an estimated 223 million women (20–79 years) living with diabetes. This number is projected to increase to 343 million by 2045. Out of the above statistics, 20 million had some form of hyperglycemia in pregnancy.[2] GDM is a well-known risk factor for adverse maternal outcomes such as big baby, prolonged labor, macrosomia, and neonatal hypoglycemia.[3–5] It is a common high-risk[6] metabolic complication. A case–control study was conducted in a tertiary care maternity hospital in coastal South India. The study results depicted that women from rural areas and those with a monthly income ≤international normalized ratio 20,000, body mass index (BMI) >23 kg/m^2, polyhydramnios, pregnancy-induced hypertension, oligohydramnios, and a gap between pregnancies of <2 years had a higher risk to develop GDM.[7] Exploring the risk factors of GDM, analyzing the adverse effects on pregnancy outcomes, and proposing corresponding preventive measures are of great significance for reducing the presence and progression of GDM and ensuring the safety of mothers and infants. The study aims to determine the association between maternal glycemic parameters and adverse maternal outcomes of GDM among women.

Materials and Methods

This is a prospective observational study conducted among 66 pregnant women diagnosed with GDM. These women were recruited from the outpatient department of the selected tertiary care hospital. Data were collected from January to December 2020. Ethical clearance was obtained from the Institutional Ethics Committee and due permission was taken from concerned authorities in the hospital. Informed written consent was taken from the study participants. Subjects were recruited at 24 weeks of pregnancy. Baseline data were collected by interview method and the glycemic parameters were collected by sending the blood to the laboratory. These women continued to visit the antenatal clinic and received routine care. Maternal outcomes were obtained from the mother's case sheet at 24 hours of delivery.

Statistical analysis: Quantitative data were presented as mean ± standard deviation, and categorical data were presented as percentages. The test of significance used was the analysis of variance test. A p-value < 0.05 was considered statistically significant.

Table 1 Distribution of baseline characteristics among GDM mothers, $n = 66$

Sl no	Variables	f	%
1.	Age in years	29.05 ± 3.98	
	a. 20–25	10	15.2
	b. 26–30	36	54.5
	c. 31–35	14	19.7
	d. 36–40	6	10.6
2	Gravida		
	a. Primigravida	20	30.3
	b. Multigravida	39	59.1
	c. Grand multigravida	7	10.6
3	Education level		
	a. No formal education	1	1.5
	b. Primary education	27	40.9
	c. High school	27	40.9
	d. Higher secondary/diploma	10	15.2
	e. Degree and above	1	1.5
4	Occupation		
	a. Homemaker	55	83.3
	b. Employed	11	16.7
5	History of macrosomia (≥4 kg)		
	a. Yes	3	4.54
	b. No	43	65.16
	c. Not applicable	20	30.30
6	Family history of diabetic mellitus		
	a. Yes	31	47.0
	b. No	35	53.0
7	Family history of hypertension		
	a. Yes	19	28.8
	b. No	47	71.2
8	History of PCOS		
	a. Yes	8	12.1
	b. No	58	87.9
9	BMI (Prepregnancy)		
	a. Normal	40	60.6
	b. Overweight	26	39.4

Abbreviations: BMI, body mass index; GDM, gestational diabetes mellitus; PCOS, polycystic ovarian syndrome.

Results

Baseline characteristics of the women were discussed in ►**Table 1** in which 54.5% of the women belonged to 26 to 30 years of age. Among the subjects, 59.1% of them were multigravida. A family history of DM was presented by 47% of the women and 28.8% of them had a family history of hypertension. In the prepregnancy period, BMI indicated 39.4% of them as overweight.

The distribution of the glycemic parameters was depicted in ►**Table 2**. The mean fasting blood sugar (FBS) was 108.61 ± 31.41, postprandial blood sugar (PPBS) was 163.94 ± 39.98, and mean hemoglobin A1c (HbA1c) was 6.52 ± 1.35.

Table 2 Distribution of FBS, PPBS, and HbA1c values, $n = 66$

Variables	Values	Mean ± SD	*f*-Value	%
FBS (mg/dL)	≤94	108.61 ± 31.41	24	36.4
	≥95		42	63.6
HbA1c (%)	≤6.5	6.52 ± 1.35	36	54.5
	≥6.6		30	45.5
PPBS (mg/dL)	≤120	163.94 ± 39.98	4	6.1
	≥121		62	93.9

Abbreviations: FBS, fasting blood sugar; HbA1c, hemoglobin A1c; PPBS, postprandial blood sugar; SD, standard deviation.

Maternal outcomes of the women were discussed in ►**Table 3**, in which 30.30% underwent lower segment cesarean section (LSCS), 18.18% had preeclampsia, and weight gain found to be more than 11 kg during pregnancy among 15.16% of the subjects.

►**Fig. 1** depicted the association between glycemic parameters with the maternal outcome, which showed that there was a significant association between glycemic scores and maternal outcome of preeclampsia, $p = 0.044$.

Association of glycemic parameters with selected baseline variables was analyzed and it showed a significant association between FBS scores and family history of hypertension, $p = 0.010$ and family history of DM, $p = 0.002$.

Table 3 Association between glycemic parameters with maternal outcome, $n = 66$

Variables	Maternal outcome	*f*-Value	*p*-Value
FBS	Preeclampsia	0.861	0.357
	Polyhydramnios	0.007	0.936
	Prolonged labor	2.542	0.116
	Perineal injury	1.348	0.250
	LSCS	0.769	0.384
	Preterm	0.760	0.387
	Weight gain	0.183	0.670
PPBS	Preeclampsia	0.826	0.367
	Polyhydramnios	0.004	0.950
	Prolonged labor	1.966	0.166
	Perineal injury	1.095	0.300
	LSCS	1.776	0.188
	Preterm	0.036	0.851
	Weight gain	1.779	0.188
HbA1c	Preeclampsia	4.235	0.044*
	Polyhydramnios	0.009	0.926
	Prolonged labor	0.408	0.526
	Perineal injury	0.036	0.851
	LSCS	3.778	0.057*
	Preterm	0.267	0.607
	Weight gain	0.006	0.878

Abbreviations: FBS, fasting blood sugar; HbA1c, hemoglobin A1c; LSCS, lower segment cesarean section; PPBS, postprandial blood sugar; SD, standard deviation.
$p < 0.05$, *significant.

Discussion

The maternal outcome is comparatively poor among GDM women. Present study showed that mean FBS, PPBS and HbA1c values as 108.61 ± 31.41, 163.94 ± 39.98, and 6.52 ± 1.35 respectively. As a results of increased glycmic values 30.30% of the women underwent LSCS and 18.18% had preedampcia. Ma and Zhang noted that during pregnancy, 28.0% patients were with pregnancy-induced hypertension, 24.0% with polyhydramnios, and 26.0% with preeclampsia.[8] Study conducted by Muche et al depicted that GDM mothers had a higher risk for a poor maternal outcome like cesarean section, pregnancy-induced hypertension, premature rupture of membranes, antepartum hemorrhage, and postpartum hemorrhage.[9] Other studies reported that 40.1% of GDM mothers were delivered by cesarean section.[10] A prospective study on the maternal and perinatal outcome of GDM showed a higher incidence of pregnancy-induced hypertension (11.9%), induction of labor (37.2%), cesarean section (58.96%) preterm delivery (2.99%), and macrosomia (2.9%).[11] Zheng et al's multivariable-adjusted model showed only fasting glucose was significantly associated with total and individual adverse pregnancy outcomes.[12] In the current study, there was a significant association between HbA1c scores and maternal outcome of preeclampsia, $p = 0.044$. The study conducted by Buhary et al reported that patients with higher HbA1c were older ($p = 0.0077$), had significantly higher blood pressure, proteinuria ($p < 0.0001$), and were multiparous ($p = 0.0269$).[13]

This study found a significant association between FBS scores and family history of hypertension, $p = .010$, and family history of DM, $p = .002$. The study done by Nicolosi et al found that family history of DM (169, 1.16–2.16) and hypertension (2.00, 1.36–2.98) were independent risk factors for cesarean section.[14]

Limitations of the Study

The sample size of the study was comparatively small, so generalization was found to be difficult. Further studies can be done to assess the risk factors of GDM and relative risk can be measured.

Conclusions

GDM has many adverse outcomes in maternal and fetal life. Early screening and timely intervention will help us to reduce future complications and maternal and neonatal mortality and morbidity. The present study highlights that there is an influence of glycemic status on maternal outcomes.

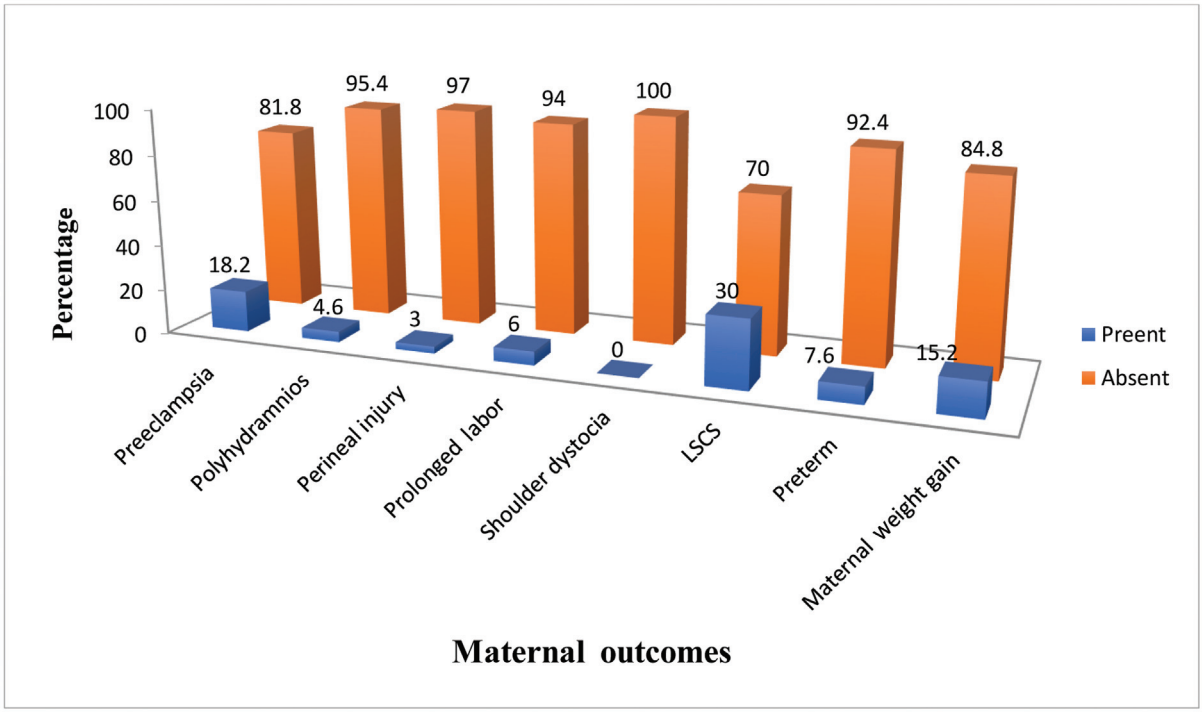

Fig. 1 Percentage distribution of mothers with gestational diabetes as per their maternal outcomes. LSCS, lower segment cesarean section.

Clinical Significance

GDM is increasing worldwide. During the antenatal period among GDM mothers, glycemic control is very essential. Any variation in the glycemic parameters of the mother will lead to poor maternal outcomes. Therefore, it is vital to prevent complications by achieving good control of glycemic parameters.

Source(s) of Support
Nil.

Conflict of Interest
None declared.

References

1 American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2009;32(Suppl 1):S62–S67-PubMed/NCBI View Article: Google Scholar.
2 International Diabetes Federation. IDF Diabetes Atlas. 9th edition. Brussels, Belgium: International Diabetes Federation; 2019
3 Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JSAustralian Carbohydrate Intolerance Study in Pregnant Women (ACHOIS) Trial Group. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. N Engl J Med 2005;352(24): 2477–2486PubMed/NCBI View Article: Google Scholar
4 Zhuang W, Lv J, Liang Q, Chen W, Zhang S, Sun X. Adverse effects of gestational diabetes-related risk factors on pregnancy outcomes and intervention measures. Exp Ther Med 2020;20(04):3361–3367
5 Farrar D, Simmonds M, Bryant M, et al. Hyperglycaemia and risk of adverse perinatal outcomes: systematic review and meta-analysis. BMJ 2016;354:i4694. Doi: 10.1136/bmj.i4694
6 Wei Y, Xu Q, Yang H, et al. Preconception diabetes mellitus and adverse pregnancy outcomes in over 6.4 million women: a population-based cohort study in China. PLoS Med 2019;16 (10):e1002926
7 Unnikrishnan B, Singh A, Rathi P, Bhat SK, Ravishankar N, Nayak PH, Praveen O. Risk factors of gestational diabetes mellitus: a hospital-based pair-matched case-control study in coastal South India. South Afr J Obstet Gynaecol 2020;26 (01):13–17
8 Ma X, Zhang T. The effect of blood glucose control on pregnancy outcomes in pregnant women with gestational diabetes mellitus. Int J Clin Exp Med 2017;10:15510–5
9 Muche AA, Olayemi OO, Gete YK. Effects of gestational diabetes mellitus on risk of adverse maternal outcomes: a prospective cohort study in Northwest Ethiopia. BMC Pregnancy Childbirth 2020;20(01):73
10 Bhat M, Ramesha KN, Sarma SP, Menon S, Ganesh Kumar S. Outcome of gestational diabetes mellitus from a tertiary referral center in South India: a case-control study. J Obstet Gynaecol India 2012;62(06):644–649
11 Sathiamma PK, Karunakaran L. A prospective study on maternal and perinatal outcome of gestational diabetes mellitus. Int J Reprod Contracept Obstet Gynecol 2017;6(07): 2933–39
12 Zheng Y, Shen Y, Jiang S, et al. Maternal glycemic parameters and adverse pregnancy outcomes among high-risk pregnant women. BMJ Open Diabetes Res Care 2019;7(01):e000774
13 Buhary BM, Almohareb O, Aljohani N, et al. Glycemic control and pregnancy outcomes in patients with diabetes in pregnancy: a retrospective study. Indian J Endocrinol Metab 2016;20(04): 481–490
14 Nicolosi BF, Vernini JM, Costa RA, et al. Maternal factors associated with hyperglycemia in pregnancy and perinatal outcomes: a Brazilian reference center cohort study. Diabetol Metab Syndr 2020;12:49. Doi: 10.1186/s13098-020-00556

