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An Observational Study of Gestational Diabetes Mellitus in Women with Bad Obstetric History at A Tertiary Care Centre

[1]Dr Pooja Puri, Resident, Department of Obstetrics & Gynecology, Lokmanya Tilak Municipal Medical College & Hospital, Mumbai, Maharashtra, India

[2]Dr Meenal Sarmalkar, MD(OBGY), Associate Professor, Department of Obstetrics & Gynecology, Lokmanya Tilak Municipal Medical College & Hospital, Mumbai, Maharashtra, India

[3]Dr Mrinal Chatterjee, MS(OBGY) Resident, Department of Obstetrics & Gynecology, Lokmanya Tilak Municipal Medical College & Hospital, Mumbai, Maharashtra, India

[4]Dr Madhuri Mehendale, MS(OBGY), Assistant Professor, Department of Obstetrics & Gynecology, Lokmanya Tilak Municipal Medical College & Hospital, Mumbai, Maharashtra, India

Corresponding Author: Dr Meenal Sarmalkar, MD (OBGY), Associate Professor, Department of Obstetrics & Gynecology, Lokmanya Tilak Municipal Medical College & Hospital, Mumbai, Maharashtra, India

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Abstract

Background: Gestational Diabetes Mellitus (GDM) is a common pregnancy complication that poses significant risks to both maternal and fetal health. Women with a history of Bad Obstetric History (BOH), defined by recurrent pregnancy losses, preterm deliveries, stillbirths, or previous macrosomic babies, are at an elevated risk of GDM and its associated complications. The present study was undertaken to estimate the prevalence of Gestational Diabetes Mellitus (GDM) in women with Bad Obstetric History (BOH) and to study maternal and fetal outcome after controlling blood sugars to provide insights into better management strategies for these high-risk pregnancies.

Methods: In this prospective observational study, 52 pregnant women with BOH and GDM were studied in the Department of Obstetrics and Gynecology, at Lokmanya Tilak Municipal Medical College and Hospital, Mumbai during the period of 18 months from January 2020 to June 2021.

Result: The prevalence of Gestational diabetes mellitus (GDM) in women with Bad Obstetric History was 24.18%. The average maternal age at the time of diagnosis was 25.70 ± 06.57 years. The average duration of pregnancy at diagnosis of GDM was 29±4.33weeks. Mean Gestational Age at delivery with SD 37.39 ±1.64. The mean gravidity was 4±0.82. All were multigravidas in this study and had an average body mass index (BMI) of 25.22 ±2.33. The mean blood glucose values were mg/dl at diagnosis. Twenty-two (22) patients (42.30%) were treated with metformin and subcutaneous insulin. Twenty-one (21) patients (40.38%) were treated with

Metformin. Eighty women (58%) received subcutaneous insulin, and 9 patients (17.30%) were managed with dietary advice alone. Most common mode of delivery was LSCS- 23 cases (44.24%). Maternal complications observed were polyhydramnios in 17 cases, PROM in 10 cases, preterm delivery in 7 cases, and shoulder dystocia in 3 cases. There were 49 live births and 3 fetal deaths. Thus, maximum patients had good outcome.

Conclusion: Hence, treatment of gestational diabetes mellitus (GDM) can improve pregnancy outcome in cases of bad Obstetric history.

Keywords: Bad obstetric history; Gestational diabetes; Stillbirth

Introduction

Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance of varying degrees that is first detected during pregnancy[1]. GDM affects approximately 7–10% of pregnancies globally and is associated with both maternal and fetal complications. These complications include preeclampsia, macrosomia (infants large for gestational age), preterm birth, and an increased risk of type 2 diabetes postpartum [2]. Effective management typically involves lifestyle interventions, dietary modifications, and sometimes insulin therapy to maintain optimal glucose levels and reduce risks to both mother and baby.

Bad Obstetric History (BOH) refers to a series of unfavourable pregnancy outcomes, such as recurrent miscarriages, stillbirths, intrauterine fetal deaths, intrauterine growth retardation, or the delivery of neonates with congenital anomalies [3]. This term is used to identify women at high risk of complications in future pregnancies. BOH encompasses a range of pregnancy-related challenges, necessitating more intensive monitoring and care to improve maternal and neonatal outcomes.

The association between GDM and BOH has gained increasing attention in obstetric research due to the higher likelihood of recurrent pregnancy complications in women with both conditions. Women with a history of adverse obstetric events, such as delivering macrosomic infants, are at an increased risk of developing GDM in subsequent pregnancies, likely due to underlying insulin resistance or metabolic disturbances[4]. Additionally, women with BOH, particularly those with a history of preterm birth or stillbirth, face a higher recurrence of GDM, which exacerbates pregnancy challenges. The interplay between GDM and BOH is multifactorial, influenced by genetic predisposition, environmental factors, and underlying maternal health conditions. Factors such as a family history of diabetes, obesity, and poor glycemic control increase susceptibility to both GDM and adverse obstetric outcomes. Moreover, GDM may amplify complications like placental dysfunction, raising risks of preeclampsia, preterm labor, and fetal growth restriction [5]. The physiological changes in pregnancy, such as increased insulin resistance, heighten these risks when pre-existing obstetric issues are present. The aim of our study was to estimate the prevalence of GDM in the cases of Bad Obstetric History and to observe the maternal and fetal outcome in mother with GDM after giving the necessary advice and treatment to control their blood sugar.

Material and Methods

This was a prospective observational study conducted in the Department of Obstetrics & Gynaecology, at a Tertiary Care Hospital during a period of 18 months from January 2020 to June 2021. For the initiation of the study, Institutional Ethical Committee approval was obtained and written informed consent was taken from all the patients.

All the patients of Bad Obstetric History who fulfilled the inclusion criteria of two or more abortions, history of stillbirths, Intrauterine Fetal Deaths and neonatal deaths, presenting to the antenatal OPD and labor ward were included in the study and were screened for Gestational Diabetes Mellitus. Women with anatomical factors, microbiological factors, Hypertension, autoimmune factors, overt diabetes, and those who denied for participating in this study were excluded. A total of 52 cases with Gestational Diabetes Mellitus (GDM) were selected from 215 pregnant women with Bad Obstetric History (BOH) based on our inclusion and exclusion criteria.

GDM was diagnosed using International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria. If the fasting and post lunch sugars were not in overt diabetes group then OGTT was done. 75 grams glucose was given and fasting, one hour and 2 hour fasting blood sugars were monitored. The cut-offs for each glucose level were as follows: FBS (Fasting Blood Sugar)>92mg/dl, 1 Hour >180mg/dl and 2 Hour >153mg/dl. If any one or more values were abnormal the patient was diagnosed as GDM. GDM was considered to be optimally controlled if the fasting glucose (FBS) was <95 mg/dl and 2nd hr. Postprandial blood glucose (PPBS) was <120 mg/dl.

The outcomes of the pregnant women with GDM were studied after controlling blood sugar which was done by starting patient on diabetic diet alone, the use of oral hypoglycemic agents (Metformin) or Insulin depending upon the patient blood sugar level. The frequency of Gestational diabetes mellitus (GDM) was also be noted in the cases of Bad Obstetric History.

Maternal parameters assessed were age, height, weight (pre-pregnancy weight), Body Mass Index (BMI), Gravida status, Parity status, LMP (Last Menstrual Period) Gestational age, Obstetrics high risk factors, medical and surgical illness, modes of diabetic control, correlation of mode of delivery with modes of diabetic control, period of gestation at delivery and mode of delivery i.e. normal vaginal delivery, instrumental or Lower Segment Cesarean Section(LSCS). Mean blood sugar and mode of diabetic control was also studied. Maternal complications during pregnancy and during delivery were recorded. Fetal parameters like birth weight, Apgar score, IUGR (Intrauterine Growth Retardation) Neonatal intensive care unit (NICU) admission, still birth (fresh still birth and macerated still birth) and neonatal deaths were noted.

Collected data were entered in the MS excel sheet and analysed using SPSS Software 20 package. Numbers and percentages were used to represent the results. Descriptive variables were presented as frequencies and percentages. Significance for continuous variables was tested using student t-test and discrete variables using CHI-SQUARE test.

A p- value < 0.05 was considered to be statistically significant statistics.

Results

A prospective observational study was conducted at Tertiary Care Centre for 18 months from Jan 2020 to Jun 2021 in 52 cases of Gestational diabetes mellitus (GDM). with Bad Obstetric History.

In the study period, out of 215 cases of Bad Obstetric History there were 52 cases of Gestational diabetes mellitus (GDM) so, the prevalence of Gestational diabetes mellitus (GDM) in Bad Obstetric History in our hospital setting was 24.18%.

Table 1: Clinical Characteristics of The Women With Gdm And Boh

	Characteristics	No. of patients	Percentage	
Age in years	≤ 20	0	0	(Mean Age ± SD= 25.70 ± 06.57 years)
	21-25	15	29	
	26-30	21	40	
	31-35	11	21	
	36-40	5	10	
Gestational Age(weeks)	<20	2	4	(Mean Age ± SD = 29±4.33)
	21-25	4	8	
	26-30	29	56	
	31-35	13	25	
	36-40	4	8	
BMI (kg/m2)	<20	0	0	Mean BMI±SD= 25.22 ±2.33
	20.01-25	23	44	
	25.01-30	28	54	
	30.01-35	1	2	
GRAVIDA	G3	16	30.77	Mean Gravida± SD=4±0.82
	G4	21	40.38	
	G5	14	26.92	
	G6	1	1.92	

As per Table 1, maximum number of women (21, 40.38%) were in age group of 26-30 years followed by 21-25 years (15, 28.84%) with mean age ±SD of 25.70 ± 06.57 years. Most cases were having gestational age of 26-30 weeks (29, 56%) at the time of diagnosis. Also, maximum number (28, 54%) had a BMI of 25.01 to 30 (kg/m2)

All cases in or study were multigravidas and maximum number of pregnant women were fourth gravida (21, 40.38%).

Table 2: Mean Gestational Age in weeks at delivery and modes of diabetic control

Variable	Diabetic diet	Insulin ± Metformin	Metformin	p-value
Mean Gestational Age at delivery with SD 37.39 ±1.64	37.35 ± 01.05	37.42 ± 01.64	37.30 ± 01.68	0.009

The mean Gestational Age at delivery was found to be 37 weeks in diabetic diet, Insulin ± Metformin & Metformin treatment group, the values being 37.35 ± 01.05, 37.42 ± 01.64 and 37.30 ± 01.68 respectively)(Table 2).

Table 3: Mean blood sugar before & after treatment and modes of diabetic control

Variable	Diabetic diet	Insulin ± Metformin	Metformin
Mean blood sugar before treatment ± SD	147.44± 5.47	201.72± 22.53	161.04± 13.11
Mean blood sugar after treatment ± SD	129.67 ± 18.02	155.55 ± 15.25	135.57 ± 18.60
p-value	0.01203 <0.05	<0.001	<0.001

Mean blood sugar with standard deviation before & after different modes treatment (Table 3) was found to be 147.44± 5.47 & 129.67 ± 18.02, 201.72± 22.53 & 155.55 ± 15.25 and 161.04± 13.11 & 135.57 ± 18.60 for diabetic diet, Insulin ± Metformin & Metformin the values were respectively. The p value was found to be significant.

On comparison of age (Mean ± SD) in years with different modes of treatment taken by patients it was reported that for diabetic diet, Insulin ± Metformin & Metformin the values were 28.41 ± 05.18, 25.62 ± 04.70 and 26.76 ± 05.10 respectively. Results were found statistically significant with p-value <0.05.

On comparison of BMI (Mean ± SD) with different modes of treatment taken by patients it was reported that for diabetic diet, Insulin ± Metformin & Metformin the values were 27.90 ± 03.92, 24.23 ± 03.86 and 23.10 ± 03.61 respectively. Results were found statistically significant with p-value <0.001. All the cases had a BMI >25 kg/m^2.

Table 4: Presence of maternal complications and modes of diabetic control

Variable	Present n/%	Modes of diabetic control		
		Diabetic diet (n/%)	Insulin ± Metformin (n/%)	Metformin (n/%)
Polyhydramnios	17(32.7)	03 (17.64)	10 (58.82)	04 (23.53)
Pre-term delivery	07(13.5)	00 (0.0)	03 (42.86)	04 (57.14)
PROM	10(19.2)	00 (0.0)	06 (60)	04 (40)
Shoulder dystocia	03(5.8)	00 (0.0)	03 (100)	00 (0.0)
Maternal death	00(0.0)	00 (0.0)	00 (0.0)	00 (0.0)
chi-square 2.368		The p-value= 0.047 significant		

As per Table 4, out of 52 cases of GDM, 17(32.7%) cases had polyhydramnios ,7(13.5%) cases had preterm delivery, 10 (19.2%) cases had Premature Rupture of Membranes (PROM) and 3(5.8%) had shoulder dystocia as a complication during their antenatal and intranatal period. There were no maternal deaths in our study.

It was found that maximum number of patients in the Polyhydramnios group (17) i.e. 10 (58.82%) were on Insulin ± Metformin treatment. In the pre-term delivery group (7cases), four (57.14%) were on Metformin followed by 3 (42.86%) on Insulin ± Metformin. There were no patients on Diabetic diet in this group.

In the PROM group (10), six 60 %) were on Insulin ± Metformin and remaining 4 (40%) were on Metformin. 3 patients with Shoulder dystocia (03) were on Insulin ± Metformin treatment.

Table 5: Correlation of Mode of Delivery with Modes of Diabetic Control

Mode of Delivery	Diabetic control measures			Total
	Diabetic diet	Insulin ± Metformin	Metformin	N (%)
LSCS	03	14	06	23(44.24)
Instrumental	01	03	04	08(15.38)
Vaginal Delivery	05	05	11	21(40.38)
Total	09 (17.30)	22 (42.30)	21 (40.38)	52(100)
chi-square test is 6.5724 The p-value is 0.160287. The result is not significant at $p < 0.05$.				

As per Table 5, the most common mode of delivery of GDM cases with BOH was LSCS i.e., 23 (44.24%) followed by normal delivery in 21 (40.38%) cases respectively. Maximum number of pregnant women who underwent LSCS, instrumental and normal delivery were on Insulin ± Metformin (22, 42.30%) and Metformin group (21, 40.38%).

Table 6: Pregnancy Outcome with Respect To Modes of Diabetic Control

		Modes of diabetic control		
Variable	n (%)	Diabetic diet	Insulin ± Metformin	Metformin
Live births	49(94.23)	9(100)	19(86.36)	21(100)
Intra-uterine fetal deaths	1(1.92)	0	1(4.5)	0
Neonatal deaths	2(3.85)	0	2(9.09)	0
Total	52	9(17.31)	22(42.31)	21(40.38)
The chi-square statistic is 5.2945 The p-value is 0.021392. The result is significant at $p < 0.05$.				

As per Table 6, Majority were live births (49, 94.23%). There were 2 (3.85%) neonatal deaths and one (1.92%) Intra-uterine fetal death (IUFD) all three were on Insulin ± Metformin treatment group.

Table 7: Fetal Outcome and Modes of Diabetic Control

Variable		Diabetic diet	Insulin ± Metformin	Metformin
Birth weight (Mean ± SD)	3.09±0.39	03.07 ± 00.46	03.69 ± 00.39	03.03 ± 00.37
Apgar score (Mean ± SD)	7.87±1.56	08.56 ± 00.53	7.27 ± 02.10	08.19 ± 08.70
NICU admissions	18	00	14	04

As per table 7, the mean birth weight in our study was 3.09±0.39. The mean birth weight was found to be 03.69 ± 00.39 in Insulin ± Metformin and 03.07 ± 00.46 and 03.03 ± 00.37 in diabetic diet and Metformin treatment group.

The mean Apgar score at delivery with standard deviation was found to be 7.87±1.56 with 08.56 ± 00.53 in diabetic diet group and 8.19 ± 08.70 in Metformin group. It was found to be 7.27 ± 02.10 in Insulin ± Metformin treatment group.

Most number of NICU admission were found in patients on Insulin ± Metformin i.e. 14 out of 18 cases and rest 4 cases in patients on Metformin.

There were 18 (34.61%) NICU admissions, out of which there were 9 polyhydramnios cases, 5 Preterm deliveries, 5 PROM and 1 shoulder dystocia.

Discussion

Prevalence

The prevalence of GDM varies across different states in India, reflecting the country's diversity, which is influenced by the gestational age at screening and the type of screening test used[6].

The prevalence of GDM was 2-25 % depending on the population studied. In present study, out of 215 BOH cases, 52 were diagnosed as GDM giving a prevalence of 24.18%.This was similar to study done by Todi S et al [7], Puducherry where prevalence was 25.1%. In the study by Bhargavi et al study[8] and Rajasekar G et al [9] Vellore (Southern India), the prevalence was 14.6 % (6/41) and 14% whereas study by Gowthami B et al [10], and Singh G et al[11] showed a prevalence of 4.9 %(5/102) and 02.53%(2/79) respectively. The numbers of cases were larger in our study due to it being a referral centre.

Age distribution

In present study, the mean age ± SD was found to be 25.70 ± 06.57 years which was similar to the study by Gopalakrishnan V et al. [12] i.e. 25.1 ± 3.9 years. The mean age was found to be 26.02 years, 26.5 ± 4.2 years, 27.4 ± 3.9 years and 28 years in a study by Todi S et al[7], Bhavdharini et al [13], Agarwal M et al [14] and Prakash et al [15] respectively.

Parity

In present study, GDM was seen in multigravidas only as these were cases of Bad Obstetric History. The mean gravidity was four in our study whereas the mean gravidity was 2 in Prakash et al study[15]. In a study by Ayaz A et al[16] there were 56.2 % multigravidas and 43.8 % primigravidas. In Jain study[17], while 72% patients were multigravida and 28% patients were primigravidas. The study by Rajput et al [18], showed that higher parity would have a higher rate of GDM.

BMI

All cases in our study had a BMI >25 kg/m^2.On comparison of BMI (Mean ± SD) with different modes of treatment taken by patients it was reported that BMI was higher for patients with diabetic diet. Results were found statistically significant with p-value <0.001. Obesity has become a most important public health crisis in recent times in India, which is still battling malnutrition, due to changing lifestyles, physical inactivity and westernized diets and culture especially in the urban areas of India. Increased prevalence of GDM in women with higher BMI was found to be a significant finding in studies like and Prakash et al [15], Shridevi AS et al[19] study, Naik RR et al[20] study.

Mean Gestational age at diagnosis and delivery

The mean gestational age at diagnosis in our study was 29±4.33 weeks whereas as compared to 30 weeks in study by Prakash et al study[15]. Mean Gestational Age at delivery with different modes of treatment was >37 weeks and pre-term delivery was reported in 7 cases (13.46%) which were in Insulin± Metformin and Metformin treatment patients which was similar to the study by Prakash et al [15] (37 weeks). Similarly, Jain S et al[17] study observed pre-term delivery in 27.50% cases.

Maternal complications

Polyhydramnios (17, 32.7%) was found in maximum Insulin ± Metformin10 (10, 58.82%) followed by Metformin group (4, 23.53%). diabetic diet 03 (17.64%). Pre-term delivery (7, 13.5%) was found in Metformin (4, 57.14%) followed by Insulin ± Metformin (3, 42.86 %).PROM (10, 19.2%) was found maximum in

Insulin ± Metformin (6, 60 %) followed by Metformin (4, 40%).There were no cases in Diabetic diet group. Shoulder dystocia (3, 5.8%) at delivery was found only in Insulin ± Metformin 03 (100.00%).

In a study conducted by Muche AA et al[21], out of the total 694 women, 233 (33.6%) had at least one type of adverse maternal outcome. The proportion of adverse maternal outcome among mothers with and without GDM was 52.9% and 29.5%, respectively. The overall incidence of Cesarean delivery was 18% , PIH was 5.3% , induction of labor was 13.5% , PROM was 9.9% , APH was 7.5% and PPH was 4.9% .The incidence of cesarean delivery, PIH, induction of labor, PROM, APH, and PPH was higher among women with GDM compared to those with non- GDM .

Additionally, Channu MM et al[22] study, observed increasing frequency of preterm labour and polyhydramnios in GDM patients. Bhattacharya Set al[23] studied that the incidence of pre-eclampsia in GDM was 30 % and preterm labor and PROM was 9 % and 8 % respectively. In addition, Majella MG et al[24] showing preterm labour was encountered in 8.8 % of the population and PROM in 6.8%.

Mode of Delivery

In present study, most common mode of delivery of GDM cases with BOH was LSCS i.e., 23 (44.24%) followed by vaginal deliveries i.e., 21 (40.38%) and instrumental deliveries i.e. 08(15.38). This was similar to the study by Jain et al [17] and Syeda Birjees[25]. Study by Syeda Birjees [25] reported a caesarean section rate of 50%, instrumental deliveries (10%) and vaginal delivery rate of 33.3%. Jain et al [18] also reported a Cesaraean section rate of 77.5% .In contrast to this in Prakash GT et al [26] study ,74 (56%) mothers delivered vaginally (7 required forceps assistance) and 58 (44%) required cesarean section.

Satyavathi et al [27] reported that out of 26 cases of GDM. 57.7% of cases underwent normal vaginal delivery, 38.4% of cases are delivered by caesarean section and 3.84% had instrumental delivery. 11.5% of cases underwent spontaneous preterm labour.

Fetal outcome

In the present study most cases with BOH and GDM (94.23%) had live births. There were 3.84% neonatal deaths and 1.92% Intrauterine fetal deaths. In a study by Prakash GT et al[26] study Twenty-nine neonates (22%) were admitted to the Neonatal Intensive Care Unit (NICU) BOH did not seem to affect outcome. There were no neonatal deaths in this subgroup.

Birth weight and Apgar

In present study, mean birth weights and Apgar values were 3.69 ± 00.39 kg & 10.10 ± 01.11 for Insulin ± Metformin, 3.07 ± 00.46 & 8.06 ± 00.47 for diabetic diet group & 3.03 ± 00.37 & 9.87 ± 01.78 for Metformin treated group. Thus, higher birth weight and Apgar were found in Insulin ± Metformin.

The mean birth weight in our study was 3.09±0.39 kg. Similar study conducted by Kumari, et al [28], in which the mean birth weight was significantly higher in (2848.8 ± 539.4 g) in the GDM group. In Prakash GT et al[26] the mean weight of the new-borns was 2.85 kg±0.48 .There was no significant difference in Apgar score at 1 and 5 min in two groups.

NICU Admissions

There were 18 (34.61%) NICU admissions in the present study , out of which there were 9 polyhydramnios cases ,5 Preterm deliveries ,5 PROM and 1 shoulder dystocia.

In a study by Satyavathi et al [27], there were 26.28% NICU admissions in which there were 4(15.3%) cases of hyperbilirubinemia, and 3(11.5%) cases in of RDS.

Modes of diabetic control in studied cases

In our study most common mode of treatment was Insulin ± Metformin i.e., 22 (42.30%) followed by Metformin only 21 (40.38%) respectively. Similar findings were noted in a study by Jain S et al [18] where 42.5 %(17 cases out of 40) of GDM were managed by diabetic diet whereas 72.50% required either Insulin or Metformin or both.

Similarly, Prakash GT et al[26] study, also reported that 58% were treated with only Insulin, 18% with Metformin and 7% were treated with Metformin and Insulin whereas 17% were managed with dietary advice alone. However, contrast to present study, in Kumari R et al[28] study, a total of 79.41% were controlled on diet, whereas 12.35% required insulin and 8.23% were treated with oral hypoglycemic agent (Metformin). Additionally, Deryabina EG et al[29] study where all women with GDM were managed by dietary regulation.

Conclusion

Over the span of 18 months BOH cases coming to ANC OPD, labour room were screened for GDM and those who were confirmed to have GDM were started on diabetic diet/ insulin/metformin or both according to their blood sugar level. In view of fetal outcome with modes of diabetic control on GDM patients with BOH, there were three fetal deaths and 49 live births. Thus, maximum patients had good outcome Hence, treatment of gestational diabetes mellitus (GDM) can improve pregnancy outcome. Above 3 foetal loses could have been avoided with more strict monitoring of sugar levels and frequent ANC visits. Therefore, these pregnancies should be managed well with pre-pregnancy counselling and preconception glycaemic control so as to reduce the risk of stillbirths and neonatal deaths. Comprehensive antenatal care should involve monitoring the mother for diabetic complications to minimize the risk of additional complications for both mother and baby.

Given the compounded risks, early and regular screening for glucose intolerance in women with BOH is vital. Timely intervention and rigorous monitoring can mitigate adverse outcomes and improve maternal and neonatal health.

Abbreviations

BMI- Body Mass Index

BOH - Bad Obstetric History

FBS-Fasting Blood Sugar

GDM -Gestational Diabetes Mellitus

IADPSG -International Association of Diabetes and Pregnancy Study Groups

IUGR-Intrauterine Growth Retardation

LMP- Last Menstrual Period

LSCS- Lower Segment Cesarean Section

NICU -Neonatal intensive care unit

PPBS- Post Prandial Blood Sugar

PROM -Premature Rupture of Membranes

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