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Early versus 6–12 week Postpartum Glucose Tolerance Testingfor Women with Gestational Diabetes and Factors Associated- Observational Study

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Background-The World Health Organisation has recommended glucose testing at six weeks postpartum as the earliest point of detection for abnormal glucose tolerance in women diagnosed with gestational diabetes mellitus (GDM). Nonetheless, there exists a low prevalence of postpartum glucose testing in numerous regions across the globe, ranging from 30% to 60%. The objective of this study was to ascertain the percentage of women diagnosed with gestational diabetes mellitus (GDM) who underwent glucose testing at six weeks and 12 weeks postpartum, as well as to identify the factors that are linked to compliance with the test.

Material and Methods- the present study is Prospective observational cross sectional study done at antenatal outdoor from April 2016 to March 2018 and admitted for delivery at obstetrics and gynaecology, Department B.R.SINGH Hospital Kolkata. total 100 pregnant women had selected as study population on the basis of inclusion and exclusion criteria.

Results- Women with GDM ranged from the ages18.00-34.00 years with mean age (Mean ± S.D.) of patients being 25.4400±3.6991 years. Proportion of patients was significantly higher in age group 26-30 years. We found that 80 (80.0%) patients had FBS ≤95 mg/dl at 6 weeks and 90(90%) at 12 weeks follow up. 14 (14.0%) patients had FBS >95-125 mg/dl at 6 weeks and 9 (9.0%) patients at 12 weeks follow-up. 6 (6.0%) patient had FBS >125 mg/dl at 6 weeks follow-up and 1

(1.0%) at 12 weeks follow-up and statistically significant similarly 80 (80.0%) patients had PPBS<140 mg/dl at 6 weeks and 93 (93.0%) at 12weeks follow-up. 15 (15.0%) patients had PPBS 140-199 mg/dl at 6 weeks and 6 (6.0%) at 12 weeks follow-up. 5 (5.0%) patient had PPBS >200 mg/dl at 6 weeks and 1 (1.0%) at 12 weeks follow-up and it is also statistically significant while the association of age is not significant at any interval of time.

Conclusion- rates of type 2 diabetes continue to increase, women with GDM should be educated that glucose intolerance may not be temporary, that it can be modified by behaviour changes and that is why postpartum testing is important.

Key-Word- Follow-up; gestational diabetes mellitus, type 2 diabetes mellitus , postpartum glucose intolerance

Introduction- Gestational diabetes (GDM) is a prevalent complication that affects approximately 3-5% of pregnancies in the United States, and its incidence is on the rise. (1) Females diagnosed with gestational diabetes mellitus (GDM) are at a notable risk of developing type 2 diabetes, hypertension, and cardiovascular disease. The majority of women with gestational diabetes mellitus (GDM) experience a resolution of carbohydrate intolerance after childbirth. However, a significant proportion of up to 30% may still exhibit impaired glucose tolerance during postpartum screening. The American Congress of Obstetricians and Gynecologists, along with the American Diabetes Association and various professional organizations, suggest that women diagnosed with GDM undergo screening 6-12 weeks after delivery, which aligns with the timing of their initial postpartum visit. Regrettably, a minority of women diagnosed with gestational diabetes mellitus undergo glucose screening during the postpartum period, with less than 50% of them receiving this evaluation.(12) Despite presenting to the routine postpartum visit, women with gestational diabetes mellitus (GDM) may not always receive postpartum glucose testing from healthcare providers. Various approaches have been employed to counteract this phenomenon, including the implementation of reminder systems. However, such interventions have demonstrated restricted efficacy, with postpartum screening rates only increasing from around 14% to 28%.According to the findings, there is a positive correlation between completion of postpartum glucose screening and certain demographic and medical factors, such as advanced maternal age, nulliparity, higher socioeconomic status, receipt of prenatal care, insulin treatment during pregnancy, and attendance of a 6-week

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postpartum visit .However, it is noteworthy that none of these factors are readily modifiable to enhance screening rates.

The selection of a 6 to 12 week period for postpartum screening is a relatively subjective decision, and it is possible for insulin resistance to return to normal levels sooner after childbirth. The rapid decline of placental factors, namely human placental lactogen, progesterone, prolactin, cortisol, and tumor necrosis factor, following delivery is responsible for the reversal of insulin resistance during pregnancy.(16) Hence, a potential approach to enhance postpartum screening rates subsequent to gestational diabetes mellitus (GDM) would be to conduct assessments on women subsequent to childbirth and before their discharge from the hospital. The objective of this research was to examine the efficacy of an initial glucose tolerance test (GTT) conducted shortly after delivery and before hospital discharge in the identification of impaired glucose tolerance and diabetes, with the conventional 6-12 week postpartum GTT serving as the benchmark.

Material and Method- The current investigation is a prospective observational cross-sectional study conducted at the antenatal outdoor facility between April 2016 and March 2018. The study participants were subsequently admitted for delivery at the obstetrics and gynaecology department of B.R.SINGH Hospital in Kolkata. A sample of 100 pregnant women was selected for the study based on predetermined inclusion and exclusion criteria. Prior to their voluntary participation, every patient provided informed consent. The proforma included essential data such as basic information, chief complaint, obstetric history, menstrual history, past medical and surgical history, dietary habits, family history, gestational age at which gestational diabetes mellitus (GDM) was detected, and treatment received during the antenatal period for GDM. Anthropometric measurements were conducted as part of the general physical examination for the enrolled subjects.

Results- Table 1 depicts demographic characteristics of studied subjects. The mean age (Mean± S.D.) of patients was 25.4400±3.6991years with range 18.00-34.00 years and the median age was 26.00 years. The mean BMI (mean± S.D.) of patients was 25.8080±3.7954kg/m^2 with range 18.00-33.10 kg/m^2 and the median BMI was 26.10 kg/m^2. The mean Gestational age at which GDM detected (Mean± S.D.) of patients was 26.4200±3.4994 weeks with range 20.00-34.00 weeks and the median Gestational age at which GDM detected was 26.00 weeks. The Mean delivery period of gestation age (Mean± S.D.) of patients was 37.6120±1.5270weeks with range 34.20-42.10 weeks and the median delivery period of gestation age was 37.40 weeks.

Table -1 Characteristics of studied subjects(n=100)

	Mean	SD	Minimum	Maximum	Median
Age (Years)	25.4400	3.6991	18.0000	34.0000	26.0000
BMI (kg/m^2)	25.8080	3.7954	18.0000	33.1000	26.1000
Mean Gestational age at which GDM detected (Weeks)	26.4200	3.4994	20.0000	34.0000	26.0000
Mean gestation age of delivery (Weeks)	37.6120	1.5270	34.2000	42.1000	37.4000

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Table 2: Distribution of FBS at 6 weeks and at 12 weeks after delivery

Blood sugar level	FBS at 6 weeks	FBS at 12 weeks
≤95 mg/dl	80(80%)	90(90%)
>95-125 mg/dl	14(14%)	9(9%)
>125mg/dl	6(6%)	1(1%)
P value	<0.0001	<0.0001
Z score	9.3507	11.4557

We found that 80 (80.0%) patients had FBS ≤95 mg/dl at 6 weeks and 90(90%) at 12 weeks follow up. 14 (14.0%) patients had FBS >95-125 mg/dl at 6 weeks and 9 (9.0%) patients at
12 weeks follow-up. 6 (6.0%) patient had FBS >125 mg/dl at 6 weeks follow-up and 1
(1.0%) at 12 weeks follow-up.

FBS at 6 weeks, the Z-Score is 9.3507. The p-value is <0.0001. The result is significant. FBS at 12 weeks, the Z-Score is 11.4557. The p-value is <0.0001. The result is significant.

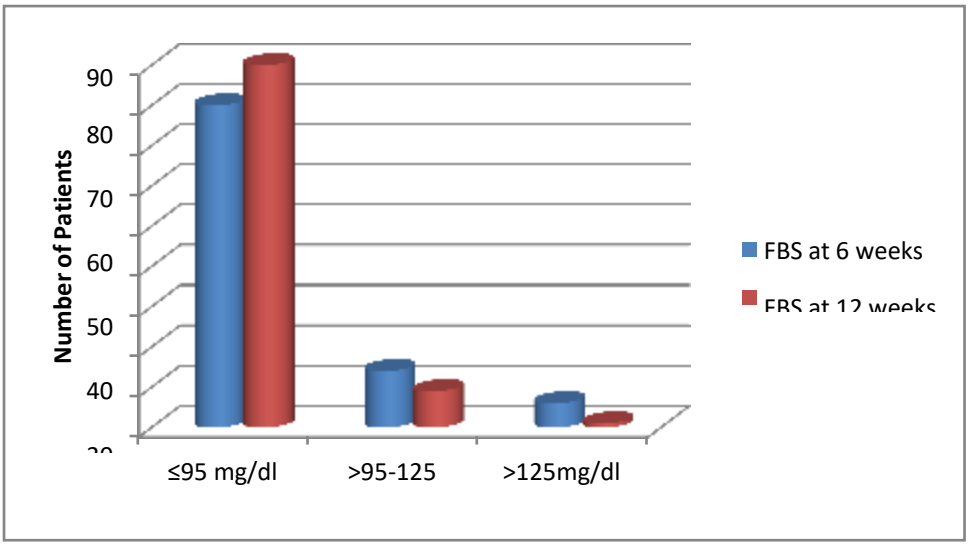

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Table 3: Distribution of PPBS at 6 weeks and at 12 weeks after delivery

	PPBS at 6 weeks	PPBS at 12 weeks
<140 mg/dl	80(80%)	93(93%)
140-199 mg/dl	15(15%)	6(6%)
≥ 200 mg/dl	5(5%)	1(1%)
P value	<0.0001	<0.0001
Z score	9.2039	12.3043

We found that 80 (80.0%) patients had PPBS<140 mg/dl at 6 weeks and 93 (93.0%) at 12 weeks follow-up. 15 (15.0%) patients had PPBS 140-199 mg/dl at 6 weeks and 6 (6.0%) at 12 weeks follow-up. 5 (5.0%) patient had PPBS >200 mg/dl at 6 weeks and 1 (1.0%) at 12 weeks follow-up. PPBS at 6 weeks, the Z-Score is 9.2039. The p-value is <0.0001. The result is significant. PPBS at 12 weeks, the Z-Score is 12.3043. The p-value is<0.0001. The result is significant.

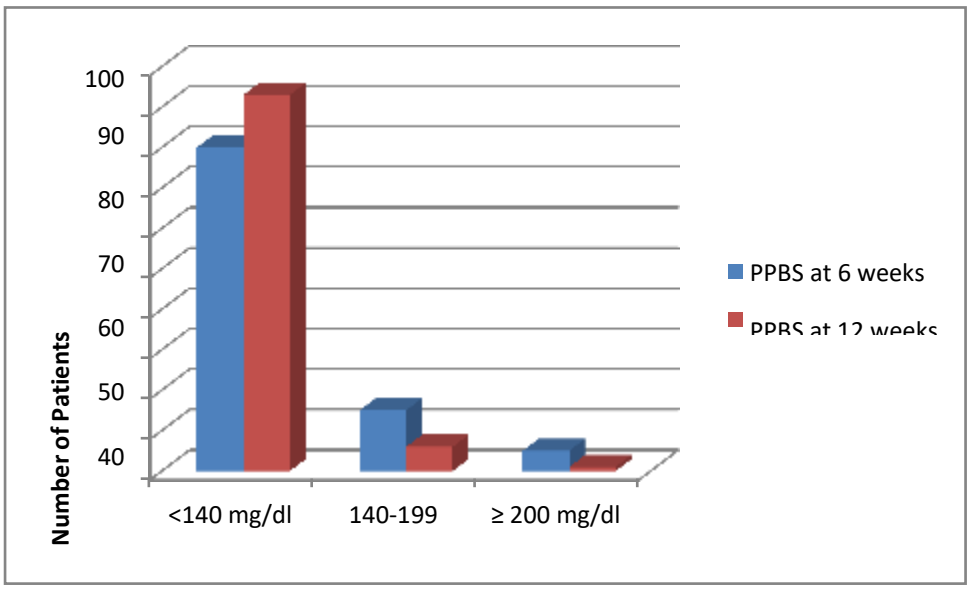

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Table 4: Distribution of PPBS 48 Hours VS. Gestational age of diagnosis of GDM

	GESTATIONAL AGE			
PPBS 48 HRS	**<24 weeks**	**24-28 weeks**	**>28 weeks**	**TOTAL**
<140 mg/dl	11	48	28	87
Row %	12.6	55.2	32.2	100.0
Col %	84.6	84.2	93.3	87.0
≥140 mg/dl	2	9	2	13
Row %	15.4	69.2	15.4	100.0
Col %	15.4	15.8	6.7	13.0
TOTAL	13	57	30	100
Row %	13.0	57.0	30.0	100.0
Col %	100.0	100.0	100.0	100.0

Chi-square value: 1.5215**; p-value:** 0.4673

Association of PPBS 48 hrs in gestational age of diagnosis of GDM was not statistically significant.

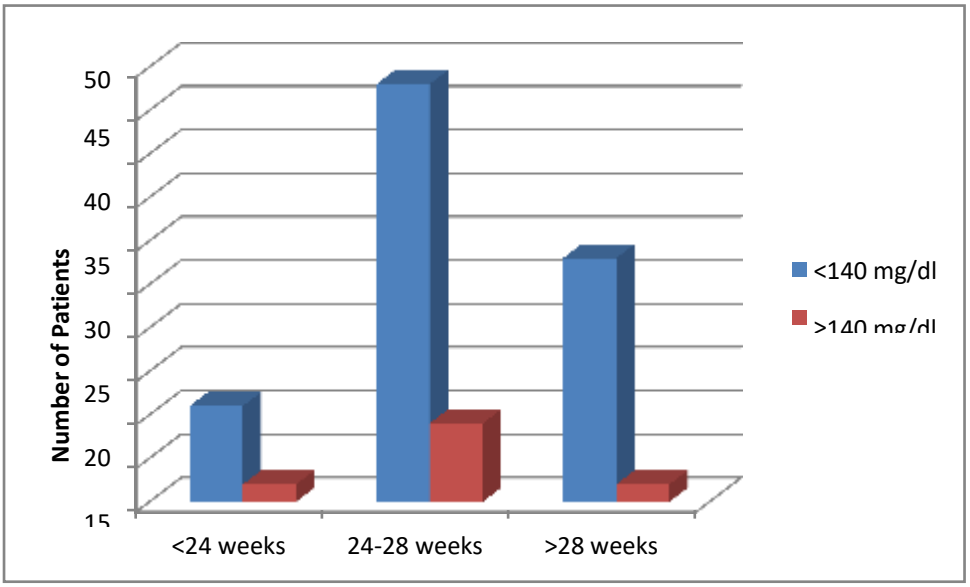

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Table 5: Distribution of PPBS at 6 Weeks after delivery vs. Gestational age of diagnosis of GDM

	GESTATIONAL AGE			
PPBS 6 WEEKS	**<24 weeks**	**24-28 weeks**	**>28 weeks**	**TOTAL**
<140 mg/dl	9	42	25	76
Row %	11.8	55.3	32.9	100.0
Col %	69.2	73.7	83.3	76.0
140-199 mg/dl	3	12	4	19
Row %	15.8	63.2	21.1	100.0
Col %	23.1	21.1	13.3	19.0
≥ 200 mg/dl	1	3	1	5
Row %	20.0	60.0	20.0	100.0
Col %	7.7	5.3	3.3	5.0
TOTAL	13	57	30	100
Row %	13.0	57.0	30.0	100.0
Col %	100.0	100.0	100.0	100.0

Chi-square value: 1.4410**; p-value:** 0.8370

Association of PPBS 6weeks in gestational age of diagnosis of GDM was not statistically significant.

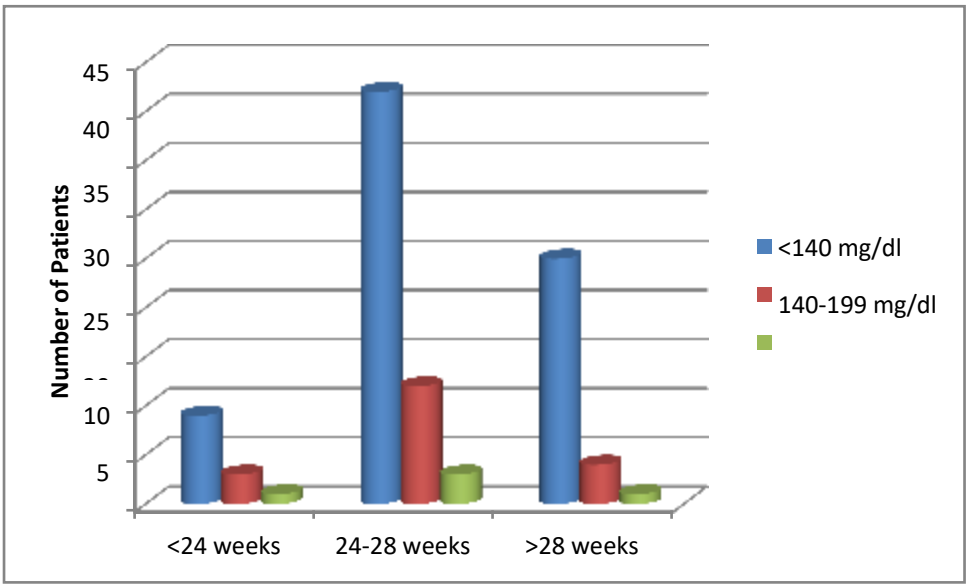

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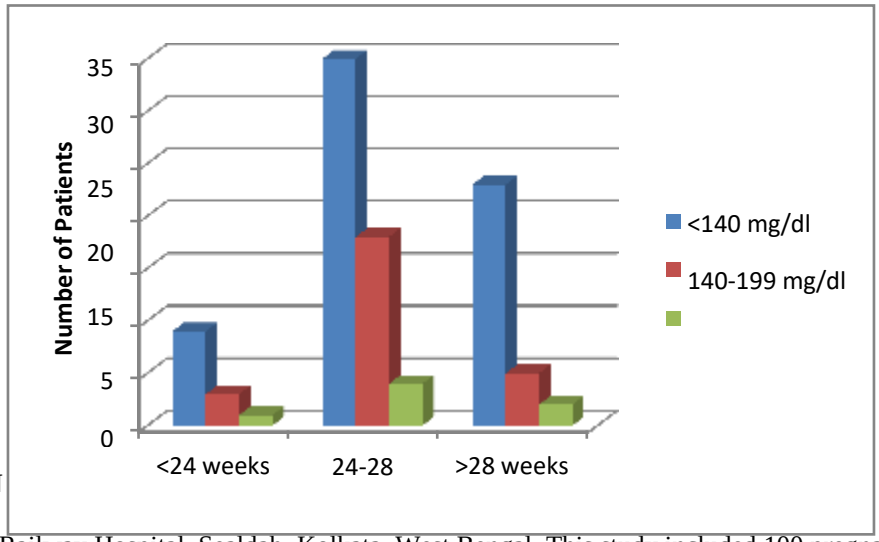
Table 6: Distribution of PPBS at 12 Weeks after delivery vs. Gestational age of diagnosis of GDM

	GESTATIONAL AGE			
PPBS 12 WEEKS	**<24 weeks**	**24-28 weeks**	**>28 weeks**	**TOTAL**
<140 mg/dl	9	35	23	67
Row %	13.4	52.2	34.3	100.0
Col %	69.2	61.4	76.7	67.0
140-199 mg/dl	3	18	5	26
Row %	11.5	69.2	19.2	100.0
Col %	23.1	31.6	16.7	26.0
≥ 200 mg/dl	1	4	2	7
Row %	14.3	57.1	28.6	100.0
Col %	7.7	7.0	6.7	7.0
TOTAL	13	57	30	100
Row %	13.0	57.0	30.0	100.0
Col %	100.0	100.0	100.0	100.0

Chi-square value: 2.4384**; p-value:** 0.6557

Association of PPBS 12weeks in gestational age of diagnosis of GDM was not statistically significant.



DISCUSSION

At B.R. Singh Railway Hospital, Sealdah, Kolkata, West Bengal. This study included 100 pregnant women with gestational diabetes mellitus and collected data from April 2016 to March 2018. 26.0% of Emma Morton Eggleston et al. (2019) patients were 15–29 years old. The majority of patients, 65.0%, were 30-39 years old. 9.0% were 40–44 years old. Cabizuca et al. (17) reported a mean patient age of 32 ± 5 years. The study found

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that 15.0% of patients were under 20. Twenty participants, 20.0% of the population, were aged 21–25. Fifty-five patients—55.0% of the sample—were 26-30 years old. Finally, 10.0% of the sample, 10 patients, were 31–35 years old. The current study's findings were similar to those of a Pakistani hospital-based inquiry, which found that half of the females diagnosed with gestational diabetes mellitus were between 25 and 30 years old. (18,19) A Bangladeshi study found that 57.5 percent of GDM cases were in people between 21 and 29 years old. (20)Seshiah et al. (21) found the same. Rajesh Rajput et al. (22) found that upper and upper-middle class women had a higher prevalence of gestational diabetes mellitus (GDM). 25% (5/20) and 16.8% (20/119) were the incidence rates. The difference between lower-middle (4.6%, 10 out of 219) and upper-lower (3.4%, 8 out of 230) females was statistically significant (P<0.001). The research found that 49.0% of upper middle socioeconomic women had gestational diabetes mellitus (GDM). Rajesh Rajput and colleagues (2013) found that women from higher socioeconomic classes were more likely to develop gestational diabetes mellitus (GDM) (25% and 16.8%, respectively) than those from lower-middle (4.6%) and upper-lower (3.4%) classes. Cheung et al. (23) found a link between lower socioeconomic status and gestational diabetes mellitus (GDM), which contradicts my findings. Keshavarz et al. (2014) found a significant association between low socioeconomic status and GDM in Iranian pregnant women. 30 patients—30.0% of the sample—had a BMI below 25 kg/m2. Fifty-one participants (51.0%) had a BMI of 25–30 kg/m2. 19.0% of the population had a BMI between 30.0 and 35.0 kg/m2. All subjects had BMIs below 35.0 kg/m2. A Danish study found that postpartum glucose abnormalities are associated with a body mass index (BMI) of 25 kg/m2 or higher. My research found that all pre-pregnancy BMI groups had postpartum glucose irregularities. BMI <25 kg/m2, 25-30 kg/m2, and >30 kg/m2 had rates of 33.4%, 36.2%, and 35.2%, respectively. Nadine Farah et al. (2019) found that 2.4% of patients had BMIs below 18.5 kg/m2, while 52.2% had BMIs between 18.5 and 25.0 kg/m2. 26.9% of patients had a BMI between 25.0 and 30.0 kg/m2, 10.0% between 30.0 and 35.0, and 7.4% over 35.0 kg/m2. The study found that 62 patients, or 62.0%, had a family history of diabetes mellitus. Cabizuca et al. (2018) found that 48.7% of participants had a family history of type 2 diabetes. My study and Letícia Schwerz Weinert et al. found that 59% of people had a family history of diabetes mellitus. This study examined GDM diagnosis timing in a selected group. Thirteen participants received a gestational diabetes mellitus (GDM) diagnosis before 24 weeks, 57 between 24 and 28 weeks, and 30 after 28 weeks. Berkowitz and colleagues found that 29% of 99 women with gestational diabetes mellitus (GDM) were diagnosed before 24 weeks, while 71% were diagnosed after 24 weeks. Like my research. Soheilykhah et al. (2019) found that most of the sample (n=110) had different gestational ages. 33.6% (n=37) were under 24 weeks, 38.1% (n=42) were 24-28 weeks, and 28.2% (n=31) were over 28 weeks. Out of 176 participants, Samar Banerjee et al. found a group with gestational diabetes mellitus (GDM). In this cohort, 25% (n=44) were identified before the 24th gestational week and 18.2% (n=32) between 24 and 28 weeks. 40.9% (n=72) of cases were found between 29 and 34 weeks. 15.9% (n=28) of cases were identified after 34 weeks. Cabizuca et al. (2018) found that 42.1% of their study cohort received insulin therapy, 6.6% received oral hypoglycemic drugs, and 51.3% achieved glycemic control solely through diet. 34 patients received insulin, 30 received oral hypoglycemic drugs, and 36 received dietary control, according to the study. 15 patients, 15.0% of the sample, had a gestational period of less than 37 weeks. The study found that 73 patients, or 73.0% of the sample, delivered between 37 and 39 weeks. Twelve patients (12.0%) had a gestational period over 39 weeks at delivery. Turki Gasim found 11.4% of gestational diabetes mellitus patients delivered prematurely. Delivery averaged 38 weeks. (24) Rajab and Mehdi found that women with gestational diabetes mellitus (GDM) were more likely to deliver preterm (before 37 weeks) than the control group. (25) Berkowitz et al. (26) found that women with gestational diabetes mellitus (GDM) were more likely to deliver prematurely (19.6% vs. 7.6%). Medha Kanani et al. (27) found that 57.14% of patients had Fasting Blood Sugar (FBS) levels below 95 mg/dl after six weeks. 42.86% of patients had FBS levels below 95 mg/dl at the 12-week follow-up after dietary therapy. Half of the 12 participants (50.0%) had Fasting Blood Sugar (FBS) levels below 95 mg/dl throughout the 6-week monitoring phase. In the 12-week post-insulin therapy monitoring phase, 54.55% of the 11 patients had FBS levels below 95 mg/dl. Kanani et al. (27)found that three patients (21.43%) had a postprandial blood sugar (PPBS) level of 120 mg/dl or lower at the six-week follow-up, but only one patient (7.14%) did at the 12-week follow-up after dietary therapy. After insulin therapy, participants' postprandial blood sugar (PPBS) was monitored at 6-week and 12-week intervals. 4 patients (33.33%) had PPBS levels <120 mg/dl at the 6-week follow-up, but only 1 (9.09%) did at the 12-week follow-up. Letícia Schwerz Weinert et al. (28) found that 82 (76%) of 108 women reevaluated had normal postpartum glucose tolerance, while 26 (24%)

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had dysglycemia. 20% (22 people) had impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), while 4% (4 people) had diabetes. Bhavadharini B et al. (2017) found a 95.8% success rate (203 out of 212) for postpartum oral glucose tolerance testing. 161 women (79.3%) attended postpartum follow-up testing within 6 to 12 weeks. After the initial testing, 42 women (20.7% of the sample) underwent the same testing from 12 weeks to one year after childbirth. The test took 6 to 12 weeks for 161 female participants, 79.3% of the sample. 2 individuals (1.2%) had DM, 5 had isolated IFG, 13 had isolated IGT, and 5 had combined IFG/IGT. 84.5% of the 136 participants had NGT restored. The 42 women who returned within a year had 5 (11.9%) DM, 10 (23.8%) isolated IFG, and 1 (2.4%) combined IFG/IGT. 61.9% (26 people) reverted to NGT, while 38.1% (16 people) did not. 25 (15.5%) female participants had dysglycemia between 6 and 12 weeks, and 16 (38.1%) between 12 weeks and 1 year. 20.2% (41/203) of women had dysglycemia within a year of delivery. Bhavadharini B et al found that 136 patients (84.5%) had normal glucose tolerance, while 23 (14.3%) had dysglycemia. Two patients (1.2%) developed diabetes. After six weeks, 80.0% of the sample had Fasting Blood Sugar (FBS) levels below 95 mg/dl. 90 patients (90%) had the same outcome at 12 weeks. 14 patients (14.0%) had fasting blood glucose values above 95-125 mg/dl after six weeks. At the 12-week post-treatment evaluation, 9 participants (9.0% of the study population) had elevated fasting blood glucose. Six patients (6.0%) had fasting blood sugar levels above 125 mg/dl at six weeks. However, during the 12-week follow-up, only 1 patient (1.0%) had fasting blood sugar levels above this threshold. After 6 weeks, 80 patients (80.0% of the sample) had PPBS levels below 140 mg/dl. During the 12-week follow-up, 93 participants—93.0% of the sample—had identical results. 15 participants (15.0%) had postprandial glycemic levels between 140 and 199 mg/dl at the 6-week post-intervention assessment. The figure dropped to 6 at 12 weeks post-intervention, 6.0% of the study population. Five patients (5.0%) had postprandial blood sugar levels above 200 mg/dl at the 6-week follow-up. One patient (1.0%) had blood sugar levels above this threshold at the 12-week follow-up. Our research found no statistically significant association between gestational diabetes mellitus and 48-hour PPBS levels. The statistical analysis found no significant correlation between gestational diabetes mellitus (GDM) and postprandial blood sugar (PPBS) at 6 weeks of gestation. The statistical analysis found no significant correlation between gestational diabetes mellitus (GDM) and the timing of the postprandial blood sugar (PPBS) test at 12 weeks gestational age.

Conclusion- In conclusion, rates of 6–12 week postpartum GTT completion among patients with gestational diabetes is unacceptably low. Further studies are needed to determine whether appropriate postpartum assessment may be improved by using the early GTT as a screening test that triages women with normal results to routine care and heightens awareness in women with abnormal results regarding the need for follow-up testing and care. This strategy may provide the best hope of both capturing this high-risk population before they are lost to follow-up, and improving their long-term health status.

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