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Original Research Article

Comparative Study of Fetomaternal Outcome in Women with GDM on Insulin and Women with Normal OGCT Value

A. Vijayalakshmi[1], R. Aarthikarasi[2], Susithra Saravanan[3], T. Suganya[4]

[1,2,3,4]Assistant Professor, Department of Obstetrics and Gynaecology, Govt. Dharmapuri Medical College Hospital, Dharmapuri, Tamil Nadu, India

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Corresponding Author: Dr. Vijayalakshmi A.

Conflict of interest: Nil

Abstract:

Background: Gestational Diabetes Mellitus (GDM) is clinically defined as "impaired glucose tolerance with onset or first recognition during pregnancy." This metabolic disorder is characterized by elevated blood glucose levels, posing challenges to maternal health. Globally, its prevalence ranges between 11-14%, impacting approximately 31.7 million individuals. In India, there is a concerning trajectory, with diabetes expected to surge to 79.1 million cases by 2030.

Amis and Objectives:

- The study aims to compare the maternal and perinatal outcomes in pregnant women with GDM on Insulin and women with normal OGCT values.
- This study aims to investigate maternal outcomes concerning associated comorbidities, insulin necessity, methods of induction, and delivery mode in cases of gestational diabetes mellitus (GDM).
- To study the fetal outcome in terms of Macrosomia, Shoulder Dystocia, Preterm labour, IUGR, Stillborn, and need for NICU care.

Materials and Methodology: This comparative study was undertaken on 120 pregnant women to compare the maternal and fetal outcome in pregnant women with GDM on insulin and women with normal OGCT value in Government Dharmapuri Medical College Hospital, Dharmapuri in a period of 6 months from May 2023 to October 2023.

Results: In our study, the maximum incidence of GDM occurred in the age group between 26 to 35 years. In this study, there is no statistical significance in primigravida and multigravida between both groups. In our study, 18.3 % of women with GDM had associated preeclampsia complicating pregnancy. Polyhydramnios is more common in GDM women and is a sign of poorly controlled blood sugar levels. In this study, the incidence of Polyhydramnios in women with GDM was about 43.3%. UTI is one of the most common complications associated with women with GDM. There was no statistical significance in this study between the two groups because of good glycaemic control. In our study, preterm labour was encountered in 13 women (21.7%). Among these, 7 women (11.7%) with preterm labour had associated UTI. More number of elective Inductions was done earlier in GDM women. Due to fear of complications of GDM, these women were not allowed to continue their pregnancies till the Expected date of delivery, whereas women without GDM were allowed till their EDD. The incidence of Macrosomia was 16.7%. Intrauterine death 2 (3.3%) was seen.

Conclusion: To conclude, based on the observations made in this study, women with GDM on Insulin is associated with adverse complications in both the mother and fetus. Therefore, all antenatal women attending the OPD should be offered a simple Oral Glucose challenge test, and if found.

Negative the test has to be repeated every trimester. Once diagnosed with GDM appropriate glycaemic control either via insulin or meal plans has to be achieved for good pregnancy outcomes and to prevent complications. Early diagnosis, patient education, a multidisciplinary approach, and better glycaemic control are the keys to successful Fetomaternal outcomes.

Keywords: Insulin, GDM, Pre-Eclampsia, PROM, Fetomaternal, UTI, Pre-Term Labour, OGCT

Introduction

Gestational diabetes mellitus is a disorder of carbohydrate metabolism characterized by high blood glucose levels. It is defined as “impaired glucose tolerance with onset or first recognition during pregnancy”. In the early 1900s, overt diabetes complicating pregnancy was associated with high morbidity and mortality for mother and fetus. According to World Health Organization estimates,

India has the highest number of cases of diabetes in the world. The worldwide prevalence Ranges between 11-14%. An estimated number of 31.7 million people. Diabetes in India is projected to increase to 79.1 million in 2030. Before the insulin discovery, with uncontrolled diabetes, there is a high risk of maternal and fetal morbidity and mortality. The introduction of insulin improved maternal and fetal outcomes. [1]

This comparative study was undertaken to compare the maternal and fetal outcomes in pregnant women with GDM on insulin and women with normal OGCT value in Government Dharmapuri Medical College Hospital, Dharmapuri in a period of 6 months from May 2023 to October 2023.

Aims and Objectives:

- The study aims to compare the maternal and perinatal outcomes in pregnant women with GDM on Insulin and women with normal OGCT values.
- To study the maternal outcome in terms of associated Comorbidities, requirement of insulin, mode of induction, and delivery.
- To study the fetal outcome in terms of Macrosomia, Shoulder Dystocia, Preterm labour, IUGR, Stillborn, and need for NICU care.

Materials and Methods:

This comparative study was undertaken on 120 pregnant women to compare the maternal and fetal outcome in pregnant women with GDM on insulin and women with normal OGCT value in Government Dharmapuri Medical College Hospital, Dharmapuri in a period of 6 months from May 2023 to October 2023.

Study Design:

Prospective Observational Study

Purpose of the Study:

The prevalence of diabetes mellitus (DM) is increasing worldwide and more in developing countries including India. As women with gestational diabetes mellitus (GDM) and their children are at increased risk of developing diabetes mellitus in the future, special attention should be paid to this population, especially in developing countries [2,3,5]. Early detection and prompt management will help to decrease maternal and fetal morbidity and prevent long-term complications. All patients attending the Antenatal OPD with > 28 weeks of gestation at Govt. Dharmapuri Medical College Hospital was selected for the study. All pregnant women with GDM on insulin were selected as cases and those with normal OGCT values were selected as control. This Study involves 120 women (60 cases & 60 controls). Vitals, lab investigations, and examinations should be done at every visit. Glycaemic control was achieved on insulin and these patients are followed up from the antenatal period > 28 weeks of gestation till six weeks postpartum. Fetomaternal complications and perinatal outcomes are evaluated during the study period[4]

Inclusion Criteria:

- Pregnant women >28 weeks of gestation with GDM on insulin (Case group).
- Women with normal OGCT (control group) are included in the study.

Exclusion Criteria:

- The patient diagnosed with pregestational diabetes
- First and second-trimester patients.
- GDM patients on meal plan and Oral hypoglycaemic agents alone.

Statistical Analysis:

The results were presented in terms of tables. The descriptive statistics frequency and percentage were calculated. The association between the categorical variables was analyzed by a chi-square test with a 5% level of significance.

Results and Analysis:

Group A- Women with GDM on Insulin

Group B – Women with Normal OGCT

Table 1: Comparison of Age between Both Groups

Age	Group A		Group B	
	N	%	N	%
<25 Years	16	26.7	34	56.7
26 – 35 Years	34	56.7	23	38.3
>35 Years	10	16.6	3	5
Total	60	100	60	100

In this study, the majority of women with GDM on insulin were in the age group between 26 to 35 years (mean age 28.8).GDM in teenage pregnancy was encountered in 7 women (11.6%) and > 35 years was encountered in 10 women (16.6%). The maximum number of women without GDM was in the age group of < 25 years. [Table-1]

Table 2: Comparison of Parity between Both Groups

Parity	Group A		Group B	
	N	%	N	%
Primipara	20	33.3	22	36.7
Multipara	40	66.7	38	63.3
Total	60	100	60	100
Chi-square P value=0.702 (Not significant)				

In Group A, 20 women were primigravida (33.3%) and remaining 40 women were multigravida (66.7%). In Group B, 22 women were primigravida (36.7%) and 38 women were multigravida (63.3%). In this study, there is no statistical significance in primigravida and multigravida between both groups. .[TABLE-2]

Table 3: Comparison of Pre-Eclampsia between Both Groups

Pre-eclampsia	Group A		Group B	
	N	%	N	%
Yes	11	18.3	3	5.0
No	49	81.7	57	95.0
Total	60	100	60	100
Chi-square P value=0.023 (Significant)				

In Group A, 11women were associated with preeclampsia (18.3%). In Group B, only 3 women were affected by preeclampsia (5%). It was observed that preeclampsia was higher in GDM women on insulin when compared to women without GDM, which was statistically significant. .[TABLE-3]

Table 4: Comparison of Polyhydramnios between Both Groups

Polyhydramnios	Group A		Group B	
	N	%	N	%
Yes	26	43.3	11	18.3
No	34	56.7	49	81.7
Total	60	100	60	100
Chi-square P value=0.003 (Significant)				

In this study, out of 60 women in Group A, 26 women had Polyhydramnios (43.3%). Of these 26 women, 6 women (10%) had spontaneous rupture of the Membrane [PROM], and 8 women had preterm labour (13.3%).In Group B, out of 60 women, 11 women were associated with polyhydramnios (18.3%). Among these 11 women, 2 women had preterm labour (3.33%), and 2 women had spontaneous rupture of membrane (3.33%). By comparing these two groups, polyhydramnios was commonly associated with women with GDM on Insulin which was statistically significant. [Table-4]

Table 5: Comparison of UTI between Both Groups

UTI	Group A		Group B	
	N	%	N	%
Yes	18	30	14	23.3
No	42	70	46	76.7
Total	60	100	60	100
Chi-square P value=0.409 (Not significant)				

In Group A, 18 women had UTI (30%). Out of these, 7 women had preterm labour (11.6%) and gave birth to low birth weight babies and 8 women had spontaneous rupture of membrane (13.3%).In Group B, out of 60 women, 14 women had UTI (23.3%). Out of these 14 women, 5 women had preterm labour and gave birth to low birth weight babies (8.3%). 3women (5%) had spontaneous rupture of the membrane [PROM]. There was no difference in the occurrence of UTI between both groups. [TABLE-5]

Table 6: Comparison of Preterm Labour between Both Groups

	Group A		Group B	
	N	%	N	%
UTI	18	30	14	23.3%
Preterm Labour	13	21.7	11	18.3%
Preterm Labour associated with UTI	7	11.6	5	8.3%

13 women had preterm labour (21.7%) in group A**.** In Group B, 11 women had preterm labour (18.3%). Most of them had associated complications of UTI, indicating that this could be one of the Causative factors for preterm birth. In this study, preterm labour was statistically not significant between both groups. [TABLE-6]

Table 7: Comparison of Induction in Both Groups

Induction	Group A		Group B	
	N	%	n	%
Yes	42	70	24	40
No	18	30	36	60
Total	60	100	60	100
Chi-square P value=0.001 (Significant)				

In this study, more induction was done in Group A than Group B which was statistically significant.

Out of 60 women in Group A, Induction was done in 42 women (70%). Of these 42 women, 17(28.3%) women were delivered by Labour natural, 5 Women (8.3%) delivered by instrumental delivery, and 20 women (33.3%) delivered by Caesarean section. In Group B, out of 60 women, induction was done in 24 women (40%).

Of these 24 women, 11 women (18.3%) were delivered by labour natural, 2 women (3.33%) were delivered by instrumental delivery, and 11 women (18.3%) were delivered by Caesarean section. [Table-7]

Table 8: Comparison of Indication for Induction in Both Groups

Indication for Induction	Group A	Group B
PROM	15	12
Preeclampsia	8	3
Postdated pregnancy	Nil	9
GDM on Insulin	19	Nil
Total	42	24

In this study, In Group A, induction was done in 42 women (70%). The majority of the induction in Group A was induced because of GDM on insulin (31.7%). From this, it was clear that GDM women were not allowed to continue pregnancy till their EDD due to maternal and fetal complications associated with GDM complicating pregnancy. In Group B, the need for induction arises only when they have any associated complications like PROM, Preeclampsia, and post-dated pregnancy. [TABLE-8]

Table 9: Comparison of Mode of Delivery between Two Groups

Mode of delivery	Group A		Group B	
	N	%	N	%
NVD	18	30	38	63.3
Instrumental	5	8.3	4	6.7
LSCS	37	61.7	18	30
Total	60	100	60	100
Chi square P value=0.001 (Significant)				

In Group A, 18 women delivered by Normal Vaginal delivery (30%), 5 women delivered by Instrumental delivery (8.3%), 37 delivered by LSCS (61.7%) Majority of the women in Group A delivered by Lower segment cesarean section (61.7%). Out of these, 13 women (21.7%) had Elective LSCS and 24 women (40%) had emergency LSCS. [TABLE-9]

Table 10: Comparison of Foetal Outcome between Both Groups

Foetal outcome	Group A		Group B	
	N	%	N	%
Live Birth	55	91.7	59	98.3
IUD	2	3.3	1	1.7
Stillbirth	3	5	0	0
Total	60	100	60	100
Chi-square P value=0.176 (Not significant)				

Out of 60 GDM women in Group A, 55 were Live Births (91.7%), Intrauterine Death was seen in 2 women (3.3%), 3 were Still Birth (5%).In Group B out of 60 women, 59 were Live Births (98.3%) and Intrauterine Death was seen in 1(1.7%). No Still Births in Group B. In this study, the statistically significant fetal loss occurred in women with GDM on Insulin. IUD and Stillbirth occurred in women with poor glycaemic control. With good glycaemic control, we can reduce the incidence of fetal complications and improve the fetal outcome. [TABLE-10]

Table 11: Comparison of Birth Weight in Two Groups

Birth Weight (in Kg)	Group A		Group B	
	N	%	N	%
<3	20	33.3	34	56.7
3.1-4.0	30	50	23	38.3
>4	10	16.7	3	5
Total	60	100	60	100

Majority of babies born to women with GDM on Insulin were 3.1-4.0 kg. In group B, most of the babies born were under the birth weight of < 3 kg. It was statistically evident that LGA babies were common in women with GDM. Of GDM women, 10 were Macrosomia (16.7%), whereas in Women without GDM, 3 babies were Macrosomia (5%). More number of Macrosomic babies was born for women with GDM on Insulin. [TABLE-11]

Table 12: Comparison of Shoulder Dystocia in Two Groups

Birth trauma	Group A		Group B	
	N	%	N	%
Yes	3	13	1	2
No	20	87	41	98
Total	23	100	42	100
Chi-square P value=0.003 (significant)				

In women with GDM on Insulin, out of 23 Normal Vaginal Delivery (includes Labour natural & Instrumental), shoulder Dystocia occurred in 3 women, which was statistically significant between two groups. In women without GDM, out of 42 Normal vaginal deliveries [6], shoulder dystocia occurred in 1 woman. [Table-12]

Table 13: Comparison of NICU Care in Two Groups

NICU care	Group A		Group B	
	N	%	N	%
Yes	42	70	26	43.3
No	18	30	34	56.7
Total	60	100	60	100
Chi-square P value=0.003 (Significant)				

Out of 55 Live Births in Group A, NICU care was given for 42 babies (70%). Out of 59 Live Births in Group B, NICU care was given for 26 babies (43.3%).The majority of Babies born to GDM women were given NICU care. The need for NICU care was statistically significant between both groups. [TABLE-13]

The following were reasons for the need for NICU care:

- Macrosomia (Large baby)
- Birth asphyxia
- Meconium stained Liquor
- Shoulder Dystocia/ Birth trauma
- Sudden Hypoglycaemia

Table 14: Treatment in Group A

Group A		
Total insulin units	N	%
< 20	11	18.3
21-30	14	23.3
31-40	16	26.7
41-50	9	15
>50	10	16.7
Total	60	100

Out of 60 women in group A 10 women needed > 50 units of combination of both rapid and basal insulin [16.7%], 16 women needed > 31-40 units[26.7 %] insulin [TABLE-14]

Discussion

In our study, the maximum incidence of GDM occurred in the age group between 26 to 35yrs (mean age 28.8). which is as comparable to Ismail NA et al (27.9 years) and Zamir Iqbal et al (28.93).In this study, there is no statistical significance in primigravida and multigravida between both groups. In our study, 18.3 % of women with GDM had associated preeclampsia complicating pregnancy. It was comparable to Ameya R et al (26%) and contrary to study by Krishnamoorthy et al (30%) & Fareed P et al (44%). Yogevet al studied 1813 GDM patients and demonstrated that preeclampsia in GDM patients is diagnosed at a younger age during the first pregnancy and in those with higher gestational weight gain. The rate of Pre-eclampsia paralleled with the severity of GDM at diagnosis and also

with the level of glycaemic control. This data was strengthened by the results of HAPO study. Polyhydramnios is more common in GDM women and is a sign of poor controlled blood sugar levels [7] .In this study, the incidence of Polyhydramnios in women with GDM was about 43.3% which is comparable to Fareed P et al (47%) and contrary to our study by Ismail NA et al (2.65%) & Gaisim T et al (3.2%). 30% of women with GDM on Insulin had associated UTI in this study.

UTI is one of the most common complications associated with women with GDM. There was no statistical significance in this study between the two groups because of good glycaemic control. In our study, preterm labour was encountered in 13 women (21.7%).Among these, 7 women (11.7%) with preterm labour had associated UTI. It was contrary to HAPO study (6.9%), Krishnamoorthy et al(9%), and comparable to the Fareed P et al study (23%). By treating UTI and with good glycaemic control, the incidence of preterm labour can be reduced. PROM was observed in 25% of our study. A lower incidence of PROM was observed in the Krishnamoorthy et al study (8 %). In our study, Induction of Labour was done in 42 women (70%) of the study population. Of these 42 women, 20 women delivered by Caesarean section. More number of elective Inductions was done earlier in GDM women. Due to fear of complications of GDM, these women were not allowed to continue their pregnancies till the Expected date of delivery, whereas women without GDM were allowed till their EDD. Muche et al studied (20.7%) which was contrary to our study [8].In our study also; the rate of cesarean section was higher (61.7%) in GDM women than in normal women. Our study was comparable to Muche et (67%), and Mutummatou leidi et al (52%). Contrary to this study was observed in Jensen DM et al (33%), Bener AB et al (27.9%), Saxena P et al (42%), and Yasmine Yakouta Atoui et al (35.2%). It becomes evident that Caesarean section is a priority choice in many obstetricians due to different maternal and fetal complications due to GDM, and fear of the rupture of the uterus that may be associated with the risk of fetal macrosomia. In our study, more babies born to women with GDM were in birth weight between 3.1 to 4kg (50%) whereas Fareed P et al observed (75%) that Macrosomia is a risk factor for increased Caesarean section rate as well as shoulder dystocia. The incidence of Macrosomia was 16.7% in our study which is comparable to Fareed P et al (17%) and f Wahi P et al .(16.2%), whereas higher incidence was noted in the other studies (40% in the study by Ameya et al and 23 % in the study by Mutummatou et al). Lower incidence was observed in Bener AB et al (10.3%).The most dangerous condition related to macrosomia is shoulder Dystocia. In this study, Shoulder Dystocia was only 5%, which is contrary to Lager et al (21.8%).In our study, Intrauterine death (3.3%) was seen, which is comparable to Zamir Iqbal et al (3.3%).70% of babies born to GDM women were given NICU care in this study, which is contrary to our study by Fareed P et al (53%), Rabinder D et al (3.4%) and Patterson G et al (3%).

The lower incidence of shoulder dystocia in this study was due to more number of elective Caesarean sections done for macrosomia babies. In this study, Stillbirth and IUD were seen in uncontrolled GDM women with high doses of Insulin (> 40 units). With a well-controlled glycaemic profile, IUD and Stillbirth incidence can be reduced. Among these 70%, more babies were born to women with high doses of insulin. Babies born to GDM women were admitted to NICU for Routine neonatal care, to monitor hypoglycemia, to rule out congenital Anomalies. However, their neonatal outcome was good after 2 weeks of NICU care [9.10]

Conclusion

To conclude, based on the observations made in this study, women with GDM on Insulin is associated with adverse complications in both the mother and fetus. Therefore, all antenatal women attending the OPD should be offered a simple Oral Glucose challenge test and if found Negative the test has to be repeated every trimester. Once diagnosed with GDM appropriate glycaemic control either via insulin or meal plans has to be achieved for good pregnancy outcomes and to prevent complications. Proper counseling should be given to all GDM women regarding their sugar control in their postpartum period. Our main goal is to maintain optimal glycemic concentration. Women with GDM should be encouraged to self-care through a healthy diet physical activity and self-monitoring. Hyperglycaemia during the period of organogenesis is responsible for congenital malformations and miscarriages peculiar to known diabetic patients. GDM usually develops in the second half of the pregnancy and the period of organogenesis is over so it is unlikely that patients manifest such a problem. Pregnancy in women with known diabetes should be planned and pre-pregnancy counseling should be offered to these patients. They should be given folic acid supplementations and the target should be optimum glycaemic control during the period of organogenesis. Early diagnosis, patient education, a multidisciplinary approach, and better glycaemic control are the keys to successful Fetomaternal outcomes.

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