ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Co-Relation of Neonatal Birth Weight with OGCT (DIPSI) in Primigravidas

Manisha Jain[1], Sowbhagya Laxmi[2], Mirza Shaharoon[3]

[1]Associate Professor, Department of OBG, Shadan Institute of Medical Sciences and Research Centre, Hyderabad, Telangana, India.
[2]Assistant Professor, Department of OBG, Shadan Insitute of Medical Sciences and Research Centre, Hyderabad, Telangana, India.
[3]Post graduate, Department of OBG, Shadan Institute of Medical Sciences and Research Centre, Hyderabad, Telangana, India.

Abstract

Background: Gestational diabetes mellitus complicates 1-14% pregnancies worldwide, it not only influences immediate maternal and neonatal outcomes but also increases the risk of future T2DM in the woman and her children. Aim of this study: To screen the primigravida, using 75gm OGCT one step, single value screening and diagnostic procedure and correlating their blood glucose values with neonatal birthweight. **Material and Methods:** Prospective observational study was done in the department of Obstetrics and Gynecology, Shadan Institute Of Medical Sciences, Teaching Hospital And Research Center for duration of 6 months that is from May 2022 to October 2022 on 100 primigravidae. **Results:** In this study, incidence of GDM was 11%, incidence of Glucose Intolerance was 12%, Mean Neonatal Birth Weight for normal glucose tolerance was 2.75kgs, impaired glucose tolerance was 3.03kgs and GDM was 3.22kgs, incidence of preterm labour with normal glucose tolerance was 6.4%, glucose intolerance was 8.3% and GDM was up to 18.2%, incidence of pre-eclampsia in normal blood glucose values was 10.3%, glucose intolerance was 16.6% and GDM was 18.2%,rate of caesarian section in normal glucose tolerance was 36.3%, impaired glucose tolerance was 75% and GDM was 63.6%, congenital anomalies among normal glucose tolerance was 0% and GDM was 9.1%, IUD among normal glucose tolerance was 1.1% and GDM was of 9.1%. **Conclusion:** In resource limited countries like India, DIPSI recommended one step, single value test irrespective of the last meal, is a very simple, cost effective and feasible procedure for universal screening and diagnosis of GDM. It is adopted by Ministry of Health (Government of India) for screening of GDM. The key finding here is that the risk of overweight and obese children rises in step with higher levels of blood sugar during pregnancy. By treating Gestational Diabetes, future risk of children becoming overweight, obese, PCOS, diabetes drops considerably.

Corresponding Author: Dr. Manisha Jain, Associate professor, Department of OBG, Shadan Institute of Medical Sciences and Research Centre, Hyderabad, Telangana, India.

Introduction

Diabetes Mellitus is a disorder of carbohydrate metabolism characterized by high blood glucose levels as a result of either inadequate insulin secretion or inadequate action of insulin. It is caused by a combination of hereditary and environmental factors. According to the Center's for Disease Control and Prevention (2020), nearly 27 million adults in the United States have been diagnosed with diabetes. Another 7.3 million are suspected to be undiagnosed, and an estimated 88 million have prediabetes. Prevalence of diabetes worldwide among adults was around 9.3% of global adult population (463million) in 2019. It is estimated to increase 10.2% in 2030 and 10.9% in 2045. In 2019, almost three in 10 women were considered obese prior to becoming pregnant (Discroll,2020). Prevalence of GDM in India varied from 3.8 to 41% in different parts of the country. It is estimated that

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

about 4 million women are effected by GDM in India, at any given point of time. Pregnancy induces progressive changes in maternal carbohydrate metabolism. As pregnancy advances, insulin resistance and diabetogenic stress due to the placental hormones necessitate compensatory increase in insulin secretion. When this compensation is inadequate, GDM develops. Due to the diabetogenic effect of hormones in pregnancy, it is likely to aggravate the diabetic conditions or bring out latency. Gestational Diabetes Mellitus is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. GDM not only influences immediate maternal (pre eclampsia, stillbirth, macrosomia, need for caesarian section) and neonatal outcomes (hypoglycemia, respiratory distress) but also increase the risk of future T2DM in the women and her children.

GDM poses short term and long term effects on both mother and child. The most important perinatal correlate is excessive fetal growth which may result in both maternal and fetal birth trauma.

The 75gm and 100gm OGTTs are currently among the most widely used methods for diagnosing diabetes during pregnancy. These methods are derived from the work of O'Sullivan and colleagues who were trying to predict the long term risk of diabetes in women. O' Sullivan first used the term Gestational Diabetes Mellitus in 1961.According to Predictions of WHO, developing countries like India are bound to bear the majority of the diabetes epidemic in the 21st century (rise estimated to 98million by 2030). GDM represents 90% cases of all pregnancies complicated by diabetes and it is well accepted that women with GDM have an increase in the risk of future diabetes. GDM represents primary prevention level to evaluate and possibly prevent T2DM in two generations. The most recent 2019 definition of GDM is by the American College of Obstetrics and Gynecology defining GDM as "carbohydrate intolerance of variable severity with onset or first recognition during pregnancy. During the second-half of gestation more glucose molecules are passing through the placenta to meet the demands of the growing fetus. This gradually results in a shift of the placental concentration gradient and the decrease of glucose in the maternal circulation. As a consequence of this the placenta is thought to release hormones that increase insulin resistance and hepatic glucose production in the mother thereby ensuring the placental glucose gradient at a level sufficient for the fetus to keep growing. The increased insulin resistance in the mother during the last two trimesters is counterbalanced by compensatory increase in insulin secretion keeping them euglycemic. The cause of insulin resistance may be rising levels of HPL, cortisol, prolactin, leptin, progesterone and estrogen.

Maternal complications in GDM during pregnancy include: Hyperglycemia contributes substantially to the spontaneous abortions, pre eclampsia, polyhydramnios, preterm labour, prolonged labour, shoulder dystocia, perineal injuries, birth injuries, postpartum hemorrhage, increased operative interference, increased cesarean section, puerperal sepsis, lactation failure. Maternal complications in later life include T2DM, hypertension and cardiovascular diseases.

Complications in offspring during fetal life are malformations, macrosomia, IUGR, IUD, Iatrogenic prematurity, spontaneous preterm. During neonatal life complications like hypoglycemia, hypocalcemia, polycythemia, respiratory distress syndrome, hyperbilirubinemia, cardiomyopathy.

The "Pederson hypothesis" postulates that maternal hyperglycemia and poor diabetes control, gives rise to fetal hyperglycemia and hyperinsulinemia, macrosomia, decreased oxygen availability as well as increased fetal adiposity. The pathologic conditions in the late gestation fetus, newborn and infant of diabetic mother are the result of fetal hyperglycemia, hyperinsulinemia, or the combined effects the two.

Woman with diabetes are also at increased risk of having an IUGR baby especially in presence of accompanying pre eclampsia. In these cases, fetal surveillance must be done

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

using techniques like Umbilical Artery Doppler, Ultrasound, Fetal Cardiotocography and Biophysical profile(BPP).

Screening And Diagnosis: International workshop conference on Gestational Diabetes endorsed use of selective screening. ACOG 2019a recommends universal screening.
IADPSG (2010) adopted a test using 75gm OGCT with patients undergoing this test should be coming in fasting state and the test included three values. This strategy was greatly influenced by HAPO study. ADA 2019a supports this test. This 75gm OGCT cut-offs were derived to give an odds ratio of 1.75 times the likelihood of adverse outcome at mean glucose level of HAPO study.
WHO recommends universal screening using a 2-hour 75gm OGCT with a threshold plasma glucose concentration of greater than 140mg/dl at 2 hours.

Diagnostic Criteria for GDM with their respective glucose values:

Guidelines	Fasting PG mg/dl (mmol/l)	Glucose challenge	1-hourPG mg/dl (mmol/l)	2-hour PG mg/dl (mmol/l)	3-hour PG mg/dl (mmol//)
WHO 1999#	>/=126(7.0)	75gOGTT	-	>/=140(7.8)	-
ACOG##	>/=95(5.3)	100gOGTT	>/=180(10.0)	>/=155(8.6)	>/=140(7.8)
IADPSG###	>/=92(5.1)	75gOGTT	>/=180(10.0)	>/=153(8.5)	-
DIPSI#	-	75gOGCT	-	>/=140(7.8)	-

#One value sufficient for diagnosis, ##Two or more values required for diagnosis, ###Two or more values required for diagnosis.

Indian Criteria: DIPSI: A 75 gm OGCT with a one step single value universal screening procedure irrespective of the fasting state was proposed by Seshiah et al.
Advantages of DIPSI: The pregnant women need not be fasting. Serves both screening and diagnostic procedure. Causes least disturbance in a pregnant woman's routine activities.

Aim of the study:
The aim of this study was to screen the primigravidae using 75gm OGCT one step, single value screening and diagnostic procedure and correlating their blood glucose values with neonatal birth weight.

Material and Methods
This is a prospective study conducted during the period of May 2022- October 2022 at Shadan Institute Of Medical Sciences. Among all the antenatal cases attending OPD, 100 primigravidae were randomly selected.

Inclusion Criteria
Primigravida attending the antenatal OP at our hospital for their first antenatal visit, respective of maternal age.

Exclusion Criteria
- All multigravidae patient.
- Known diabetic patients before pregnancy (OVERT DM).
- Patients with history of use of drugs that affect glucose metabolism like corticosteroids or progesterone.
- History of cardiac or respiratory or hepatic and other medical disorders.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Methodology

Prospective observational study was done on 100 primigravidae and demographic details of patients attending the antenatal op for their first antenatal visit. Blood sugar levels were estimated using DIPSI test at first antenatal visit among the primigravidae who were between 14-28weeks.

RESULTS

Table 1: Distribution of patients according to OGTT values:

Blood glucose values (mg/dl)		**Sample size (n)**	**Percent (%)**
<120	Normal glucose tolerance	77	77%
120-139	Decreased gestational glucose tolerance	12	12%
140-199	Gestational diabetes mellitus	11	11%
≥ 200		0	0%
Total		100	100%

In our study oral glucose 75 grams was given 100 primigravida patients irrespective of their fasting status and after two hours, single blood glucose value was measured. Patients were distributed into different groups according to the blood sugar levels following DIPSI criteria. Out of 100 patients, 77 patients had normal glucose tolerance,12 patients had decreased gestational glucose tolerance and 11 patients were found to have GDM (i.e. blood glucose levels ≥ 140mg/dl). There were no cases of overt diabetes in this study i.e. blood glucose values ≥ 200mg/dl.

The incidence of GDM was found to be 11% in this study.

Table 2: Comparision of birth weights with various blood glucose levels

Blood Glucose Levels(mg/dl)	**Birth Weight(Kg)**	
	Mean	**S.D**
<120	2.75	0.38
120-139	3.03	0.43
140-199	3.22	0.31
P value		0.001 Significant

In this study, the mean birth weight for people with Normal blood glucose values was 2.75kgs, and Impaired glucose tolerance was 3.03kgs and GDM was 3.22kgs. The P value 0.05 was statistically significant. In the study population, patients with blood glucose levels ≥140 mg/dl have increased risk of babies with increased birth weight and macrosomia when compared to patients with blood glucose values, <140 mg/dl values as shown in the following table.

Table 3: Mean comparision of birth weights for blood glucose values ≥140 AND <140

Blood Glucose Levels (mg/dl)	**Birth weight(Kg)**		**Mean difference**	**t value**	**P value**
	Mean	**SD**			
<140	2.80	0.44	0.4	0.003	0.05

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

≥140	3.22	0.31			

Table 4: Comparison Of BMI with various blood glucose levels

Blood Glucose Levels (mg/dl)	BMI(Kg/m^2)	
	Mean	S.D
<120	23.02	1.28
120-139	23.71	1.04
140-199	24.72	1.43
P value		0.001

The mean BMI for blood glucose values ≥140 mg/dl was higher (24.72) when compared to other blood glucose values. The P value was 0.001 which is statistically significant. This shows that women with higher BMI are at increased risk of higher blood glucose values.

Table 5: Comparison of Pre-Eclampsia with Various Blood Glucose Values

Blood Glucose Levels (mg/dl)	Pre-eclampsia
<120	8
120-139	2
140-199	2
Total	12

Table 6: Comparision of Pre-Eclampsia for Blood Glucose Values <140 And ≥140

Variable	Glucose levels		P Value
	<140 n(%) n=89	≥ 140n(%) n=11	
Pre-eclampsia	10 (11.2%)	2(18.2%)	0.22

In the study population, the incidence of pre-eclampsia among people with Normal blood glucose values was 10.3%, Glucose intolerance was 16.6% and ≥140mg/dl was 18.2%. The P value 0.22 was statistically non-significant.

Table 7: Distribution of Preterm Deliveries According to Various Blood Glucose Levels

Blood Glucose Levels(mg/dl)	Preterm Deliveries
<120	5
120-139	1
140-199	2
Total	8

Incidence of preterm deliveries in pts with Normal glucose tolerance was 6.4%, Glucose Intolerance group was 8.3% and GDM was 18.2%.

Table 8: Comparision of Preterm Deliveries for Blood Glucose Values <140 And ≥140

Variable	Glucose Levels		P Value
	<140 N	>/=140 N	
Preterm	6	2	0.02

In the study population, the Incidence of preterm deliveries among people with blood glucose values<140 was 6.7% and ≥140 was 18.2%. The P value was 0.02 was statistically significant.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

Table 9: Comparision of IUD and Congenital Anomalies with Various Blood Glucose Values

Blood glucose levels(mg/dl)	IUD	Congenital Anomalies
<120	1	0
120-139	0	0
140-199	1	1
Total	2	1

In the study population, the risk for IUD among people with blood glucose values <140 mg/dl was 1.1% and ≥140 mg/dl was 9.1%. The P value was 0.07 which is not statistically significant. The risk for congenital anomalies among people with blood glucose values <140 mg/dl was 0% and ≥140 mg/dl was 9.1%. The P value was 0.004 which is statistically significant.

Table 10: Comparison of Vaginal Delivery (VD) and caesarean section (CS) with various blood glucose values

Blood glucose values	Vaginal delivery	%	Caesarean delivery	%
<120	49	63.6	28	36.3
120-139	3	25.0	9	75
140-199	4	36.4	7	63.6
Total	56		44	

In this study, VD and CS for normal blood glucose values was 63.6% and 36.3% for impaired glucose tolerance was 25.0% and 75% for GDM was 36.4% and 63.6%

DISCUSSION

DIPSI recommends a one step procedure with single glycemic value to diagnose GDM in the community. It recommends 75 gram OGCT irrespective of fasting status and GDM is diagnosed if 2hour plasma glucose is >/=140 mg/dl. This test correctly identifies subjects with GDM, as well as woman with decreased glucose tolerance and normal glucose tolerance.

Gestational Diabetes Criteria Recommended by DIPSI

Criteria	In pregnancy
2hours>/=200mg/dl	Diabetes Mellitus
2hours 140-199mg/dl	Gestational Diabetes Milletus(GDM)
2hours 120-139mg/dl	Decreased gestational glucose tolerance(DGTT)

The usual recommendation for screening is between 24 and 28 weeks of gestation. The recent concept is to screen for glucose intolerance in the first trimester itself. If found negative at this time, the screening test is to be performed again around 24th to 28th week and finally around 32 to 34weeks period of gestation.

This study was intended to determine the use of 75gms, 2-hr OGCT in primigravidas attending the antenatal OP for the first-time using DIPSI guidelines and correlating their blood glucose values with neonatal birthweight. This is a prospective study conducted at Shadan institute of Medical Sciences from October 2020 to June 2022. Among all the

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

antenatal patients attending OP, 100 primigravida were enrolled and DIPSI test was conducted.

Among the 100 deliveries that occurred during the period of study, 11% of them were complicated with GDM. The incidence of different studies is in the range of 3-18% and the incidence in the present study is 11%. The incidence in this study is corresponding and more or less similar to the previous research and studies carried by different authors earlier.

Study	**Incidence**
V.Sesaiah	17.7%
Vanita Das et al.	4%
Mamta Bhat et al.(Chennai Study)	9%
Kevin Johns et al (Canada study)	3-10%
F Akhlaghi et al.(Iran study)	3-5%
J.G.Ray et al.(Deposit Study)	11%
Banjara et al.(Kolkata Study)	3-5%
Present study	11%

In this study, the main neonatal birthweight amongst patients with blood glucose level >/=140mg/dl was 3.22 which indicates increase in neonatal birthweight with increasing blood glucose values. In this study, people with higher blood glucose values have shown significant increase in neonatal birth weight and this is similar to the studies done by Schmidt et al., G.Blake MC. Laughlin DO et al, Jennifer M.Walsch et al, Patrick M.Catalano et al., Sudhanshu et al. Breschi et al. Sermer et al. Berkus et al.[1-10]

Pre term labour as an outcome of diabetic pregnancies was significant i.e 6 times more common in GDM than non diabetic groups. The relationship between the preterm deliveries in this study groups to that of higher levels of blood glucose values was (i.e>/=140mg/dl was 18.2%) increase, which is similar to studies done by Ray et al, Sanjaykumar patil et al, Sudhanshu et al, Sibai et al.

The relationship between pre-eclamsia to that of higher blood glucose levels in this study group(i.e.,>/=140mg/dl was 18.2) was increased, the results of which are similar to studies done by lavin et al, Sibai et al, Sanjay kumar et al, joffe et al, sudanshu et al, Criss L Bryson et al, Ottanelli S et al.

Study	**Caesarean section %**
Martin et al.(1987)	50%
Kitzmiller et al.(1978)	69%
Schneider et al.(1980)	70%
Levine et al.(1979)	81%
Canada study Kevin John et al.(2001)	36.3%
K kuch study Malak M. Alhakeem et al.(2006)	21%

In this study, the rate of caesarian section was high among people with blood glucose values>/=140mg/dl, accounting to about (63.6%) compared to people with blood glucose values <140mg/dl (41.5%) which was in accordance with other studies done by Sanjay kumar patil et al, Sudhanshu et al, Raori Gorgal et al.

Congenital anomalies in blood glucose values >/=140mg/dl was found to be 9.1% and there were no congenital anomalies in subjects with blood glucose levels <140mg/dl. This was not in accordance with studies done by Sanjaykumarpatil et al, Akhlaghi et al (3.7%) which showed lesser incidences.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

In this study, rate of fetal deaths was 1.1% in patients with blood glucose levels<140mg/dl and 9.1% in patients with blood glucose levels>/=140mg/dl. This is not in accordance with HAPO study, Seshiah et al, Akhlaghi et al, Sudhanshu et al.[11-15]

CONCLUSION

This is a prospective study conducted at Shadan institute of Medical Sciences during the period of 6 months in which 100 primigravida women attending antenatal OP were enrolled. This study was done to screen the primigravidas using 75 grams,2hr OGTT and correlating their blood glucose levels with neonatal birthweight.

- Most of the pregnant women accepted the test readily and no adverse effects were observed.
- Incidence of GDM in this study population was 11%, Glucose intolerance was 12%.
- The mean birth weight of patients with blood glucose levels >/=140mg/dl was higher (3.22) when compared to patients with blood glucose levels <140 mg/dl reflecting increased risk of neonatal birthweight with higher blood glucose levels.
- Inspite of variable factors affecting neonatal birthweight, maternal glucose values remain an independent risk factor.
- Women with higher blood glucose levels(i.e.,>/=140mg/dl) showed an increased incidence of preeclampsia (18.2%)and preterm labour (18.2%).
- There was an increased rate of cesarean section (63.6%)in women with blood glucose levels >/=140mg/dl.
- There was an increased incidence of congenital anomalies (9.1%) and IUD (9.1%) in women with blood glucose levels >/=140mg/dl.

References

1. American Diabetes Association (2021) Management of diabetes in pregnancy; standards of medical care in diabetes-2021. Diabetes Care 44(supplement 1):S200-S210
2. Saeedi P, Peterson I, Salpea P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2044. International Diabetes Federation Diabetes Atlas,2019; Volume 157(107843).
3. American Diabetes Association, ”Diagnosis and classification of diabetes mellitus”. Diabetic care 2009.32:62-67.
4. American Diabetes Association “Diagnosis and classification of diabetes mellitus”.
5. Diabetes Care 2014;37 supplement: S81-S90.
6. Mithal A, Bansal B, Kalra S. Gestational diabetes in India: science and society. Indian Journal of Endocrinology and Metabolism.2015;19(6):701.
7. International diabetic federation atlas,9th edition 2019.
8. Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study Cooperative Research Group. Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study: Pre-eclampsia. Am J Obstet Gynecol.2010;202:255.e1-7.
9. Ottanelli S., Napoluli A., Festa C., Clemenza S, et al. Gestational Diabetes mellitus: A decade after the HAPO study. Frontdiabetes. Basel, karger, 2020;vol 28,171-182.
10. Committee on practice B-O. practice Bulletin No.137: Gestational Diabetes Mellitus. Obstet Gynecol.2013;122(2 pt 1):406-16.
11. Mishra S, Bhadoria AS, Kishore S, Kumar R. Gestational Diabetes mellitus 2018 guidelines: An update. J Family Med Prim Care.2018;7(6):1169-1172.
12. Seshiah V, Balaji V, Shah SN, et al. Diagnosis of Gestational Diabetes mellitus in the community. J Assoc Physicians India. 2012;60:15-7.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

13. Seshiah V, Balaji V, Madhuri S Balaji, Panneerselvam A, Arthi T, Thamizharasi M et al. Prevalence of GDM in south India(Tamil Nadu)- A community bade study. JAPI 2008;56:329-333.
14. WHO Study group. Prevention of diabetes mellitus. Report of a WHO Study group. No 844 of Technical Reports series. Geneva, Switzerland: World Health Organization;1994.
15. American Diabetes Association. Gestational diabetes mellitus. Diabetes care 2002;25:94-96.
16. Zargar AH, Sheikh MI, Bashir MI,et al. Prevalence of Gestational Diabetes Mellitus in kashmiri women from the Indian subcontinent. Diabetes Res Clin pract.2004;66:139-45.