ORIGINAL RESEARCH PAPER

Obstetrics & Gynaecology

STUDY OF CORRELATION BETWEEN NEONATAL BIRTH WEIGHT WITH BLOOD GLUCOSE VALUES OF DIPSI SCREENING DURING PREGNANCY IN A TERTIARY CARE HOSPITAL

KEY WORDS: blood glucose level, Neonatal birth weight, DIPSI, GDM, Overt diabetes

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ABSTRACT

Introduction: Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance with onset or recognition during pregnancy, which is associated with adverse maternal and fetal outcomes. DIPSI as a cost effective screening method has been adopted by government of India for diabetes in pregnancy. **Objectives:** Present study was aimed to study correlation between neonatal birth weight with blood glucose values of DIPSI screening during pregnancy in a tertiary care hospital. **Methods:** Present study was prospective, observational study conducted in pregnant women who underwent DIPSI screening in our outpatient department at 24-28 weeks of gestational age & delivered at our hospital. **Results:** In this study, incidence of normoglycemic women was 68.83%, Glucose Intolerance and GDM was 14.71% each and overt DM 1.73%. Mean Neonatal Birth Weight for DIPSI value ≤140mg/dl was 2.71 kg, GDM was 2.74 kg and overt DM was 3.3 kg. **Conclusions** : There is no significant rise in neonatal birth weight till GDM but overt DM shows significant rise in neonatal birth weight.

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.[1] Pregnancy is considered to be a diabetogenic state, characterized by exaggerated rate and amount of insulin secretion associated with decreased sensitivity to insulin at cellular levels.[2]

Since the human fetus is highly dependent on glucose from the maternal circulation, glucose transported from the mother to the placenta is thought to be a major determinant of fetal development.[3] Substantial studies have shown that higher gestational blood glucose, whether in fasting or postprandial states in each trimester, is associated with an increased risk of adverse birth outcomes, even in nondiabetic pregnancies.[4,5,6]

In India, prevalence of GDM are estimated to be 16.55%, whereas in Maharashtra it is 7.7 % .[7] In Indian context, Universal screening for all pregnant women is essential as the Indian women have eleven fold increased risk of developing glucose intolerance during pregnancy compared to Caucasians.[8]

The DIPSI method of antenatal GDM screening is affordable, simple to use, patient-friendly, and convenient. The results of DIPSI exhibit great specificity and acceptable sensitivity when measured against the gold standard of the International Association of Diabetes and Pregnancy Study Group (IADPSG).[9,10] Hence, It is adopted by Ministry of Health (Government of India) for screening of GDM. Present study was aimed to correlate blood glucose values of DIPSI screening during pregnancy with neonatal birth weight.

MATERIAL AND METHOD(S)

This study was prospective, observational study conducted in department of Obstetrics and Gynecology, at government medical college & hospital, Chhatrapati Sambhajinagar, Maharashtra, India. Study duration was of 1 year (June 2023-May 2024). Institutional ethics committee approval was taken for this study.

Inclusion Criteria

- Pregnant Woman undergone DIPSI screening in our outpatient department during 24-28 weeks of gestational age and delivered at our hospital, willing to participate in this study.

Exclusion Criteria

- Woman had undergone DIPSI screening at different setting.
- Woman had undergone DIPSI screening at <24 or >28 weeks of gestational age.
- Woman delivered outside our hospital.
- 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.
- Woman not willing to participate in this study.

Study was explained to patient and an written informed consent was taken. Demographic, antenatal details as well as personal/past/family, obstetric history was noted in a performa. Examination (general, systemic, obstetric) findings were noted. Routine antenatal investigations were done in all patients along with all other necessary investigations.

Woman coming to our ANC OPD for antenatal care at 24-28 weeks were screened using DIPSI screening method. It is a Single step test done using 75 gm anhydrous oral glucose & measuring blood sugar 2 hours after ingestion is done. 75 gm glucose is to be given orally after dissolving in approximately 300 ml water whether the pregnant women comes in fasting or non-fasting state, irrespective of the last meal.
Women with positive test and blood glucose value ≥140mg/dl to 199mg/dl were treated with medical nutritional therapy for two weeks and if MNT failed to achieve control then insulin was initiated. Those with blood glucose ≥200 mg/dL were started on insulin along with MNT and were admitted for sugar monitoring. The patients were followed in antenatal period up to delivery. Appropriate maternal and fetal

monitoring and management were done for diabetic women. Mode of delivery was decided according to obstetric indications. Maternal vitals, fetal heart sounds along with maternal BSL and urine ketones were continuously monitored. All deliveries were attended by neonatologist. All antenatal, intrapartum, postpartum, and neonatal complications were noted and managed accordingly. Maternal and neonatal outcome were noted till 48 hours after delivery.

The data was compiled in master chart i.e. in MS-EXCEL Sheet and for analysis of this data; SPSS (Statistical package for social sciences) Version 20th was be used. Frequencies and percentages were calculated to show the distribution.

Observation(s):

In present study 231 women were studied.

Out of 231 woman, majority were normoglycemic (68.83%) followed by Oral Glucose Intolerance (OGI - 14.71%) and gestational diabetes mellitus (GDM- 14.71%) and least in case of overt diabetes (1.73%).

Table 1: Distribution Of Patients According To Dipsi Values

DIPSI value (mg/dl)	DIPSI Status	No. of cases (n=231)	Percentage (%)
<120	Normoglycemic	159	68.83
121-140	Oral Glucose Intolerance (OGI)	34	14.71
141-200	GDM	34	14.71
>200	Overt Diabetes	04	1.73

In present study, mothers in the high blood glucose group were more likely to be older. The transition of age difference was statistically insignificant upto impaired OGT, however the age difference was statistically significant after DIPSI value of >140mg/dl. All 4 groups were comparable with respect to residence and parity.

Table 2: General Characteristics

Fetal complications	Normoglycemic (n=159)		OGI (n=34)		GDM (n=34)		Overt Diabetes (n=04)	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	%
Pre-maturity	4	2.52	2	5.88	3	8.82	1	25
Macrosomia	2	1.26	1	2.94	4	11.7	1	25
Respiratory distress syndrome	4	2.52	1	2.94	2	5.88	0	0
Hyperbilirubinemia	2	1.26	4	11.7	8	23.5	2	50
Congenital anomaly	3	1.89	0	0	1	2.94	2	50
NICU admission >24 hour	7	4.40	2	5.88	3	8.82	3	75

In the present study, most common association is polyhydramnios that is 26 cases and 12 cases had pre-eclampsia, and 10 cases had uteroplacental insufficiency. All 3 of these were seen rising with rise in blood glucose value. 3 patients developed PPH, 2 patient had wound gap after caesarean section, 1 patient (GDM) had intra uterine fetal death, 1 patient(overt DM) developed diabetic ketoacidosis, 7 of them developed hypoglycaemia (Table 3). In our study perinatal mortality was observed in 12 cases of gestational diabetes mellitus.

Incidence of preterm deliveries in cases with Normal blood glucose was 9.4%, Glucose Intolerance group was 11.7% and GDM was 17.6% and 25% in overt DM which was statistically significant. Similarly, NICU admissions were seen more with more DIPSI Value. Respiratory distress was present in 7 babies who required supplemental oxygen or positive pressure ventilation 15 neonates were required NICU management.

Table 3: Distribution of cases according to maternal Complications

Maternal complications	Normoglycemic (n=159)		OGI (n=34)		GDM (n=34)		Overt Diabetes (n=04)	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Pre-eclampsia	9	5.66	5	14.71	8	23.53	0	0
Uteroplacental insufficiency	2	1.26	3	8.824	4	11.76	1	25
Polyhydramnios	4	2.52	8	23.53	12	35.29	2	50
Preterm delivery	4	2.52	2	5.882	3	8.824	1	25
Post-partum haemorrhage	1	0.63	1	2.941	1	2.941	0	0
Septicemia	0	0.00	0	0	1	2.941	0	0
Diabetic ketoacidosis	0	0.00	0	0	0	0	1	25
Wound gape	0	0.00	1	2.941	1	2.941	0	0
Intrauterine fetal death	0	0.00	0	0	1	2.941	0	0

Table 4: Distribution of cases according to Fetal Complications

Baseline characteristics		Normoglycemic (n=159)	OGI (n=34)	GDM (n=34)	Overt Diabetes (n=04)
Mean Maternal Age		24.07 ± 4.30	25.23± 4.41	26.70 ± 5.95	31 ± 2.44
Residence	Rural	51.57%	55.88%	52.94%	50%
	Urban	48.42%	44.11%	47.05%	50%
Parity	Nullipara	59.74%	55.88%	52.94%	50%
	≥ Primipara	40.25%	44.11%	47.05%	50%

The difference in mean birth weight was statistically insignificant upto DIPSI 200mg/dl but significant after DIPSI value of >200mg/dl.

Hence, in this study population, patients with blood glucose levels >200 mg/dl have increased risk of babies with increased birth weight and macrosomia when compared to patients with blood glucose values ≤200mg/dl.

Table 5: Comparison of birth weights with various blood glucose levels

DIPSI status	Mean Birth Weight	SD
Normoglycemic	2714.63	537.73
OGI	2714.47	467.06
GDM	2743.5	546.44
Overt Diabetes	3328.25	629.19

In this study, 27.70% of cases underwent Caesarean Section, out of which lowest rate was seen amongst normoglycemics (25.15%) and same for impaired glucose tolerance and GDM (i.e. 35% each) and none in overt DM. However, this was statistically insignificant.

Table 6: Comparison of mode of delivery with various blood glucose levels

DIPSI status	Vaginal	LSCS
Normoglycemic	74.85%	25.15%
OGI	67.64%	32.35%
GDM	64.70%	35.29%
Overt Diabetes	100%	0

DISCUSSION

The importance of GDM is that two generations - the woman herself and her children are at risk of developing diabetes in the future.[11]

In present study 231 women were studied. By using single step diagnostic test, out of 231 woman, 68.83% of cases were normoglycemic, 14.71% were glucose intolerant and GDM

each. There were only 1.73 % cases of overt diabetes in this study i.e. blood glucose values ≥ 200mg/dl. The prevalence of GDM observed is Similar to the study conducted by Manju Yadav et al, V Balaji et al, they found prevalence rate of 13.5% and 13.4% respectively [12,13] while Wahi et al found the prevalence rate of 6.94%[14] which is less than our study. Difference among these prevalence rates could be because of geographical, racial, socio-demographic differences in the studied population.

This study shows that mothers in the high blood glucose group were more likely to be older as mean age for blood glucose values ≥ 200mg/dl was 31 ± 2.44 yrs where as in for ≤ 200mg/dl the mean age was 25.33 ± 4.88 yrs. Similar findings were seen in studies by Shraddha Patil et al, Seshiah et al and Kalra et al.[15]

Most common complications observed were preeclampsia (9.52%), uteroplacental insufficiency (4.32%), polyhydramnios (11.2%) in this study. In the present study incidence of polyhydramnios was 35.29%, preeclampsia was 23.53%, preterm labor was present in 8.82% patients in cases of gestational diabetes mellitus and it was comparable with the study by Patel TL et al and Jindal et al in which 36.67% and 44% women with GDM had polyhydramnios respectively.[20,21]

In this study population, patients with blood glucose levels >200 mg/dl have increased risk of babies with increased birth weight and macrosomia when compared to patients with blood glucose values ≤200mg/dl. Hence, people with higher blood glucose values have shown significant increase in neonatal birth weight and this is similar to the studies done by Zhao D et al[16] and Jain M et al [1]. Women with diabetes in pregnancy are at higher risk both for delivering an infant with excessive weight and leading to delivery complicated by macrosomia and shoulder dystocia.

Incidence of preterm deliveries increased with rise in blood glucose which is similar to studies done by Jain M et al [1], Alfadhli E.M. et al.[17] Infants of diabetic mothers are prone to respiratory distress due to increased risk of preterm delivery and late maturation of type-II alveolar cells. High levels of insulin in fetus antagonizes the action of cortisol causing blunted production of surfactant.[22] Study by Nigam et al showed incidence of hyperbilirubinemiain 14.2% newborns, macrosomia was found in 14.2% neonates.[23] In study by Patel TL et al[20] macrosomia noted in 6% neonates, hyperbilirubinemia was present in 16% neonates. In present study macrosomia noted in 11.76% neonates, hyperbilirubinemia was present in 5.88% neonates. The study was comparable to the observations of Wahi et al and Bener et al where macrosomia was seen in 16.2%, and 10.3% respectively.[24,25]

In this study, however statistically insignificant, caesarean Section rate increased with rise in blood sugars which was in accordance with other studies done by Jain M et al [1] and Mutummatou Leidi et al [18].

One step DIPSI test gives the advantage to be implement irrespective of fasting status. Screening of all pregnant women for glucose intolerance helps to diagnose the diabetes cases early so that, timely intervention and treatment can prevent all maternal and fetal complication. Thus short- and long-term (obesity and diabetes in adulthood and subsequent pregnancy) consequences in both the mother and the newborn can be greatly reduced with early detection and timely therapy of this illness.[12,19]

CONCLUSIONS

Blood glucose values by DIPSI screening during pregnancy correlates with neonatal birth weight. Also, women with higher DIPSI blood glucose levels showed an increased incidence of preeclampsia, uteroplacental insufficiency, polyhydramnios, preterm labour and an increased rate of cesarean section.

Higher birth weight neonates required NICU admissions for multiple reasons as compared to average birth weight neonates.

Health education and pregnancy care for women of childbearing age should be strengthened, and corresponding measures should be actively taken to prevent and treat hyperglycemia to promote prenatal and postnatal care.

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