



A Study of Maternal and Perinatal Outcome in Women with and without Gestational Diabetes Mellitus According to International Association of Diabetes and Pregnancy Study Group (IADPSG) Criteria

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Abstract

Introduction: Gestational diabetes mellitus (GDM) complicating pregnancy is gradually becoming more and more common in this part of the world. In India, it is estimated that about 4 million women are affected by GDM at any given point of time^[1]. Hence, it is imperative to evaluate the implications of GDM on maternal and fetal health.

Materials and Methods: Between January 2016 to July 2017, a total 108 antenatal ladies were recruited in the study after taking informed consent. The study protocol was pre-approved from the Hospital's Scientific and Ethical Committee. Antenatal mothers attending OPD between 24-28 weeks of gestation underwent Oral Glucose Tolerance Test (OGTT) with 75 grams of glucose, and subjects were selected according to the IADPSG criteria. They were treated with medical nutrition therapy (MNT) with or without insulin. Maternal and perinatal outcomes in each case were recorded. Data analysed at the end of the study.

Results: Out of 108 recruited mothers, eight lost in follow up. Among the remaining 100 subjects, 23 mothers were diagnosed with GDM. Among them, 52.2% were diagnosed with gestational hypertension, 34.8% with hypothyroidism. 26% of the patients had preterm labour, 30.4% had PROM, 8.7% had IUFD, 43% had a baby weight of >3.5 kgs. 69.6% delivery was done by caesarean section.

Discussion and Conclusion: After applying the universal screening criteria of GDM as per IADPSG criteria, will increase the prevalence of diagnosis of GDM in India. Even after good glycaemic control, complications in GDM mothers in the form of PIH, preterm labour, PROM, prolonged labour and low APGAR score in newborns are often not reduced.

Keyword: Gestational Diabetes Mellitus, IADPSG criteria, maternal and Fetal Outcome.

Introduction

Gestational Diabetes Mellitus is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy^[2]. Diabetes complicating pregnancy has become more common worldwide. However due to advances in the management of diabetes and its complications,

there has been an overall improvement in fetomaternal outcomes. The reasons for the rise in the prevalence of diabetes in pregnancy are mainly due to lifestyle, dietary habits, older age at first conception, polycystic ovarian disease, obesity and more so due to the increased awareness and changing methodology in testing for the condition. Family history of diabetes, past history of

gestational diabetes and ethnicity, such as non Caucasians, Asian, African Americans, Mexican Americans, American Indians, native Hawaiians, etc, are also risk factors for Gestational Diabetes Mellitus^[3]. Pregnancy alters the carbohydrate metabolism in such a way that more glucose available for the fetus. The hormonal changes like increased placental hormones act as insulin antagonizers causing insulin resistance and decreased insulin sensitivity, which is further aggravated by increased body weight and calorie intake in pregnancy. Human placental lactogen (hPL) promotes lipolysis making free fatty acids available for mother's own metabolism ensuring availability of adequate glucose for fetus. Gestational diabetes occurs when the pancreas, despite the production of insulin fails to overcome the effect of these contra-insulin hormones^[4].

One of the most severe complications of GDM is the increased risk of pre-eclampsia (in 10% cases of GDM). Other complications include preterm labor, chorio-amnionitis, poly-hydramnios, oligohydramnios, intrauterine fetal death, increased operative delivery. The primary effect attributed to gestational diabetes is fetal macrosomia. Maternal hyperglycaemia prompt fetal hyper-insulinemia, particularly during the second half of pregnancy, this in turn stimulate excessive fetal growth. The excessive shoulder and trunk fat predisposes such infant to shoulder dystocia and caesarean delivery. Neonatal hyperinsulinemia may provoke hypoglycaemia within minutes of birth, hence these babies are closely observed. Other chemical imbalances seen in these babies are hypocalcaemia and hypomagnesaemia within 72 hrs of birth and hyperbilirubinemia. There is also increased risk of respiratory distress syndrome due to surfactant deficiency thus increases NICU admission^[5]. In women with gestational diabetes rates of fetal anomalies do not appear to be substantially increased (Sheffield, 2002). There is convincing evidence that even mild hypoglycaemia is also a risk factor for fetal morbidity; but it occurs only in minority of cases. Failure to recognize and treat these condition will result in unnecessary morbidity

in some pregnancies, whereas over aggressive approaches for detection and treatment will result in un-needed intervention in many others^[7]. It is controversial topic, whether to do universal screening or selective screening of high risk categories, and same for diagnostic criteria and management of GDM. In 2008-2009, the International Association of Diabetes and Pregnancy Study Groups (IADPSG) developed revised recommendations for diagnosis of GDM^[7]. According to IADPSG criteria, all women not known to have diabetes should undergo a 75 gm OGTT at 24-28 wks. of gestation. The IADPSG criteria are based on findings from hyperglycaemia and adverse pregnancy outcome (HAPO Study) [8], which did not take patient from India. So we need to apply this diagnostic criterion in our population. Beside this, diagnosis of GDM by DIPSI criteria leaves 22.63% undiagnosed which may easily be detected through IADPSG. As after applying DIPSI criteria would miss a substantial number of patients, it is suggested that the IADPSG criteria is better for screening in high risk ethnic zone like India [9] .

IADPSG Criteria

Glucose concentration threshold

| Plasma glucose | mmol/lit | mg/dl |
|----------------|----------|-------|
| Fasting | 5.1 | 92 |
| 1 hr OGTT | 10.0 | 180 |
| 2 hr OGTT | 8.5 | 153 |

If any of the above value is positive, diagnosed as GDM.

Aims and Objectives

1. To compare the maternal outcomes in pregnant women diagnosed with GDM and euglycemic pregnant women.
2. To compare the perinatal outcomes in pregnant women diagnosed as GDM with that of normal pregnancies.

Materials and Methods

This prospective observational study was carried out in a tertiary care hospital between 1st of January 2016 to 1st of July 2017 after taking prior approval

from the Hospital’s Scientific and Ethical Committee. A total among 108 pregnant women were recruited following a 75 gms OGTT method interpreted by IADPSG criteria(8 antenatal mothers left study during follow up).Informed consent taken from the ladies before entry into the study.

All outdoor patients who attended antenatal OPD between 24-28 week were subjected to 75 gms OGTT, after applying exclusion criteria. The exclusion criteria were Presentational Diabetes Mellitus, Overt Diabetes detected first time during pregnancy, hypertensive disorders of pregnancy, Antepartum Haemorrhage, Chronic systemic illness (liver disease, renal disease, on steroid therapy), Auto-immune disease with pregnancy, Multiple pregnancy. A fasting blood sample was taken and patient was asked to take 75 gms of glucose dissolved in 1 glass of water slowly over 5-10 minutes. She was asked not to have anything in next two hours. Sugar levels at 1st and 2nd hours were measured in mg/dl. Then patient was screened by IADPSG criteria. Patients having normal glucose level according to IADPSG criteria included as control and patient with elevated glucose level according to this criterion were taken as cases. Patients with diagnosed GDM were advised to take MEDICAL NUTRITION THERAPY (MNT) for 2 weeks. After giving MNT patients with controlled GDM was advised to continue MNT; and patients with uncontrolled GDM was given insulin therapy. Maternal and Perinatal outcome between euglycemic and GDM mothers were evaluated during antenatal, intranatal and postnatal period. Patients with controlled GDM were allowed for trial of vaginal delivery and patients with poorly controlled GDM were advised caesarean section at 38 wks. Of gestational age. All patients were assessed till delivery for maternal and perinatal outcome.

Data analysed at the end of the study. Statistical analysis was done by using SPSS software version 17. The continuous variables were expressed as Mean+SD and categorical variables as percentages. STUDENT T TEST was used to compare continuous variables between GDM and non GDM patients. Chi square and Fishers exact test were used

for comparison of categorical variables. P <0.05 was considered as statistically significant.

Results

A total 108 antenatal ladies were recruited over a period of 18 months. 8 subjects were lost in follow up. Out of 100 antenatal mothers, 23 (23%) were diagnosed as a case of Gestational Diabetes Mellitus, and 77(77%) were without Gestational Diabetes Mellitus.

Table No. 1 Distribution according to demographic characteristics

| Maternal Baselines characteristics | Women with GDM (n=23) | Women without GDM (n=77) | P-Value |
|------------------------------------|-----------------------|--------------------------|---------|
| Age(years) | 25.61± 4.72 | 20.3±2.4 | 0.52 |
| Family H/O DM | 56.5% | 9.1% | <0.05 |
| BMI | 26.8±2.8 | 20.5±2.4 | <0.01 |

Table No. 2 Maternal Outcome

| Maternal Parameters | Women with GDM (n=23) | Women without GDM (n=77) | P-Value |
|----------------------|-----------------------|--------------------------|---------|
| PIH | 52.2% | 5.2% | <0.05 |
| Hypothyroidism | 34.8% | 3.9% | <0.05 |
| Preterm delivery | 26% | 3.9% | 0.004 |
| PROM | 30.4% | 7.8% | 0.010 |
| Prolonged Labour | 30.4% | 2.6% | <0.05 |
| Mode of Delivery- CS | 69.6% | 7.8% | <0.05 |
| Sepsis | 26.1% | 0.0% | <0.001 |

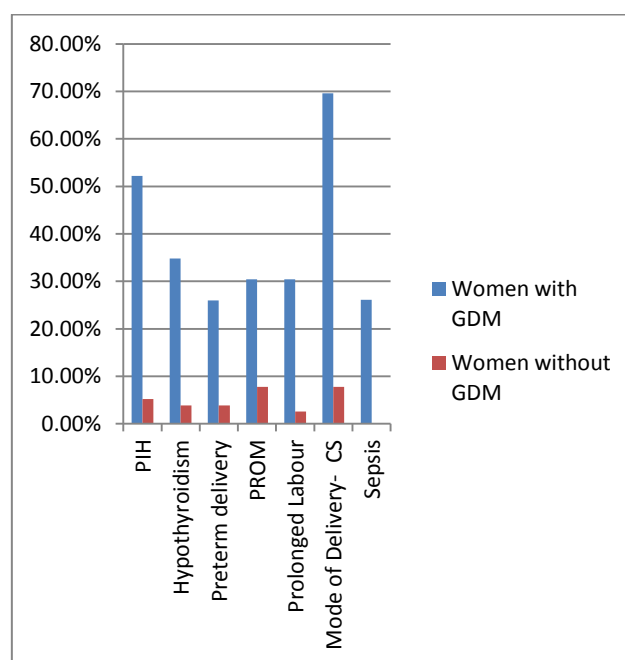


Figure No. 1 Maternal Outcome

Table No.3 Fetal Outcome

| Fetal Outcome | Women with GDM (n=23) | Women without GDM (n=77) | P-Value |
|------------------------|-----------------------|--------------------------|---------|
| Birth WT >3.5KG | 43.47% | 16.3% | <0.01 |
| LOW APGAR | 30.4% | 13% | 0.063 |
| IUFD | 8.7% | 1.3% | 0.131 |
| NICU Admission | 95.7% | 3.9% | <0.001 |
| Metabolic Complication | 8.7% | 0.0% | 0.051 |
| RDS | 13% | 0.0% | 0.011 |

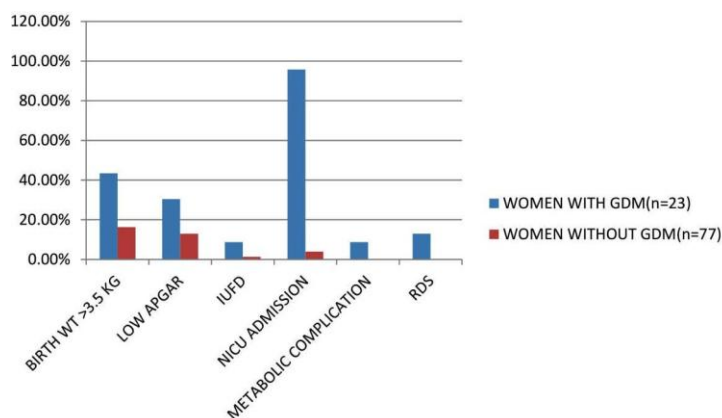


Figure No.2 Fetal Outcome

Discussions

Gestational Diabetes Mellitus is widely prevalent in India. Exact burden of the disease is difficult to determine because of high number of non-institutional deliveries and also due to lack of awareness. The incidence of GDM in the current study is 23%. The prevalence of GDM has been reported to ranging between 3.8% and 41% in various states of India [10,11].

It was anticipated that there will be significant increase in the incidence of GDM diagnosed by IADPSG criteria leading to “medicalization” of pregnancies previously categorized as normal. This fact was also confirmed in current study which showed which showed an 23% incidence of GDM. The different studies from all over the world have been established the superiority of IADPSG criteria over WHO, ADA and DIPSI. [12,13,14]

In our study, 83% of women with GDM were above the age of 25 yrs. Mean age of GDM patients was 28.30+ 4.24 years. Median age was 28 years, ranging between 19-36 years. Maternal age>25 years was associated with increased risk of Gestational Diabetes Mellitus. Literature showed an

increased incidence of carbohydrate intolerance with aging [15].

A significant percentage of ladies (56.5%) with GDM had family history of type 2 diabetes mellitus in first degree relatives, which is significantly higher than non-diabetic ladies (9.1%). This indicates towards a possible genetic linkage as well as some common environmental factors. Infact couple of studies showing almost similar incidence of family history, had cited the genetic susceptibility of type 2 DM as possible explanation for development of future GDM [16].

We noted that 52.2% of GDM mothers and 5.2 % of non GDM mothers were diagnosed with hypertension after 20 weeks of gestation. Pregnancy induced hypertension was significantly higher in GDM than normal mothers. Various studies have shown that there was increased incidence of hypertensive disorders in pregnancy associated with GDM affecting 6-45% of antenatal mothers [17].

A 34.8% of GDM mothers and 3.9 % non GDM mother s were having coexisting hypothyroidism. Studies has reported quite a high incidence of hypothyroidism in GDM mothers, although the underlying mechanisms were poorly understood.

A significant proportion of subjects in our study (26 % of GDM patients) had preterm onset of labour which was quite high than their normal counterparts (3.9%). The DEPOSIT study done by Ray et al [18] showed a mean gestational age of 36.1 weeks at delivery. A study by Bhat et al [19] showed that 11.6% of preterm delivery was occurred with GDM patients which is matching our study results. The higher incidence of preterm deliveries are largely due to infection and associated premature rupture of membrane.

Premature rupter of membrane in GDM mother is a reported complication which has an incidence as high as 30.4%. GDM mothers had PROM in this study which is significantly higher than normal counter parts [2.6 %]. Reason behind premature rupture of membrane are infection, polyhydramnios etc.

Intrauterine fetal demise is a devastating outcome of pregnancy with its myriad consequences to mothers

health if neglected. Sudhangshusekhar Nanda and Karuna Das et al noted a 3.84% incidence IUFD in GDM patients^[20] In our study, IUFD was diagnosed in 8.7% of GDM mothers, whereas 1.3% of non-diabetic mothers had IUFD. It has been seen that among 8.7% of IUFD, 4.3% were associated with high TSH levels. Besides this cause of sudden IUFD in these GDM mothers are multifactorial, but final event being hypoxia and lactic acidaemia.

The incidence of cesarean section in current study was 69.6% in GDM mothers and 7.8% in normal mothers. There are multiple risk factors elaborated in literature for higher rates of cesarean section. [farooq et al; nanda et al]^[15,20]. In our study high rate of CS was primarily due to associated risk factors like PIH, hypothyroidism, increased induction, high rate of induction failure and suspected fetal macrosomia.

30.4% babies in current study experienced a low APGAR score (<7). Thomas et al^[21] showed that in their study, low APGAR score was recorded in 33.62% of newborns of GDM mothers .

We observed that proportion of babies with birth weight more than 3.5kg was significantly higher in GDM mothers (43.47%) than that of normal mothers (16. 7%).A study by MU Farooq et al^[15] showed association of birth weight more than 3.5 kg in 40% cases of GDM and quoted fetal hyperinsulinemia as a possible factors responsible for fetal macrosomia.

Among GDM mothers, 17.3% was associated with birth weight <2.5 kg. It has been seen that these mothers also developed PIH which can be explained by the fact that GDM leads to placental circulation insufficiency and resultant PIH. In our study, among the GDM and normal mothers, NICU admission rates were 95.7% and 3.9% respectively. This is partly due to the existing institutional protocol of routine monitoring macrosomic baby in NICU and to some extent due to higher incidence of preterm labour, and low APGAR score among newborns of GDM mothers in the present study. Among the GDM cases, incidence of respiratory distress syndrome in neonates was 13%. due to fetal hypersulinemia as stated by literature.

A significant number of babies from GDM mothers developed hypoglycaemia (<45mg/dl) during perinatal period and needed intravenous correction in (8.7% cases), whereas none of the babies of normal mothers developed metabolic complications. We found that sepsis due to urinary tract infection, post-surgical site infection of caesarean and episiotomy wound in 26.1% cases, which needed extended IV antibiotics, thereby increasing their hospital stay and morbidity.

The duration of hospital stay was higher in GDM mothers than non-diabetic mothers due to higher C-Section rate, increased preterm delivery, associated PIH and sepsis.

Conclusion

Applying the universal screening criteria of GDM and diagnosing as per IADPSG criteria will lead to increase in figures of GDM prevalence in India. Even after good glycaemic control, complications in GDM mothers in the form of Pregnancy induced hypertension, Preterm labour, Premature rupture of membrane, Prolonged labour, Low APGAR are not reduced and rate of caesarean section remains high.

Conflict of interest- nil

Funding- nil

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Abbreviation

GDM-Gestational Diabetes Mellitus, MNT-Medical Nutrition Therapy, PIH-pregnancy induced hypertension, OGTT- Oral Glucose tolerance test, CS- Caesarean section, IUFD-Intrauterine fetal death. RDS-Respiratory distress syndrome.