International Journal of Pharmacy Teaching & Practices 2012, Vol.3, Issue 3, 345-351.

A Prospective Study on the Effect of Gestational Diabetes Mellitus on Maternal and Fetal Outcome

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Research Article

Please cite this paper as: Ritu Joy, V. Sivakumar. A Prospective Study on the Effect of Gestational Diabetes Mellitus on Maternal and Fetal Outcome. IJPTP, 2012,3(3),345-351.

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Abstract

The purpose of the study was to evaluate the effect of gestational diabetes mellitus on maternal and fetal outcome of gestational diabetes mellitus. 37 women diagnosed with Gestational Diabetes Mellitus (GDM) for the period of 7 months from June 2010 to December 2010 were taken into the study. Data on maternal and neonatal outcome, patient history and diabetic management were collected and analyzed. Overall prevalence of GDM was found to be 1.50%. Of the affected women, 16.66% were managed with diet alone and 81.09% were received insulin treatment. Increased BMI, weight, marital period and positive family history for Diabetes Mellitus shows definite influence on GDM. 83.78% of women underwent cesarean delivery only 16.22% were had normal delivery. There was 1(2.70%) macrosomic baby. All babies were born normal in health except for hyperbilirubinemia and hypoglycemia which is the conditions may push them to the risk for Diabetes Mellitus and GDM, hence future monitoring for obesity and Diabetes Mellitus will be advisable. We recommend the early screening before 24th week of gestation, for GDM regardless of any other risk factors and those women with increased BMI, age, weight and positive history of diabetes mellitus has to be considered as high risk group. All GDM diagnosed women should be closely monitored for glycemic control for good maternal and fetal outcome.

Keywords: *Prevalence, Risk factors, Maternal and Fetal outcomes, Gestational Diabetes Mellitus, BMI*

Introduction

The prevalence of diabetes mellitus is increasing globally and India is no exception. The WHO estimates the prevalence of diabetes mellitus which include gestational diabetes mellitus in India is around 40.9 million in 2006 and is expected to rise to 69.9 million by 2025.

Diabetes mellitus complicates 1-20% of all pregnancies worldwide which include pre gestational diabetes mellitus and gestational diabetes mellitus[1] Gestational diabetes mellitus is a medical condition complicating pregnancy, and in the face of the rising prevalence of diabetes, particularly in women of child bearing age, the problem is growing [2].

Gestational diabetes mellitus is the development of symptoms and signs of diabetes mellitus during pregnancy and the glucose intolerance revert to normal during puerperium. The prevalence of gestational diabetes mellitus varies from 1-16% according to the diagnosis criteria and population. When compare to Europeans, migrant Indians in Europe have greater predisposition to diabetes mellitus during pregnancy. The prevalence of Gestational Diabetes Mellitus in Indian women has increased to eleven fold when compared to European women [3].

The prevalence of gestational diabetes mellitus is more in south India when compared to other part of India and Southeast Asia. The prevalence of Gestational Diabetes Mellitus in south India has increased dramatically from 1% in 1998 to 16% in 2004 [4].
The prevalence [5] and outcome of [6] gestational diabetes mellitus changes with ethnicity and age. Women from ethnic groups such as black, Southeast Asian and Indian have higher frequency of gestational diabetes mellitus than White women [7].

In a community based study conducted by Seshiah V., in 2008 the prevalence of gestational diabetes mellitus varies in the urban, semi urban and rural areas in Tamil Nadu[8].

The risk factors for gestational diabetes mellitus are age >30 years, family history of diabetes mellitus, obesity, history of macrosomia, glycouria, previous unexplained neonatal death, unexplained recurrent abortion,Previous congenital malformations, history of hydramnios, history of stillbirth, history of gestational hypertension and history of pre-eclampsia [9.] Teenagers of mother who drank alcohol were less likely to have gestational diabetes mellitus [10.]

Gestational diabetes mellitus is associated with increased risk for mother and fetus during the pregnancy and birth and in later life. Maternal complications are Pre-eclampsia and cesarean delivery. Fetal complications are shoulder dystocia, birth injuries, neonatal hyperbilirubinaemia, hypoglycemia and respiratory distress syndrome [11].

For the mother, Gestational Diabetes Mellitus is a very strong risk factor for the development of type 2 diabetes mellitus,[13] metabolic syndrome and cardiovascular disease later in life [14] Around 35-60% of Gestational diabetes mellitus women develop type 2 diabetes within 10 years [15].
Gestational diabetes mellitus women are obese, hypertensive, dyslipidemia as well as subclinical atherosclerotic which were the risk factor for cardiovascular disease. Taken together, these findings suggest that gestational diabetes mellitus identifies a population of young women at increased risk for cardiovascular disease [16].
Specific treatments of gestational diabetes (dietetics, physical exercise, blood glucose self-monitoring, and insulin-therapy if appropriate) reduces severe perinatal complications such as fetal macrosomia and pre-eclampsia compared to women with absence of therapy [17].

Infants born to untreated Gestational Diabetes Mellitus mother has increased cesarean section rates, prematurity, larger for gestational age and macrosomic but most of the children were healthy but there is increased morbidity [18].
A study conducted by Crowther CA has found that treatment of gestational diabetes reduces serious perinatal morbidity and may also improve the woman's health-related quality of life [19].

Treatment of Gestational Diabetes Mellitus involves educating the patient about diet, exercise, blood glucose self-monitoring, and insulin self-administration. A successful pharmacist can counsel a gestational diabetes patient [20].

India has the largest number of diabetes patient in the world with an estimated number of 46 million in 2006 and it is estimated that around 2.5 million women in India are in reproductive age are affected by diabetes. However there has only little study conducted in India on gestational diabetes mellitus. In order for the better understanding about the disease and to find out the prevalence, risk factors and to find out the outcomes in gestational diabetes mellitus this study is conducted. The main objective of the study is to identify the prevalence, risk factors and to compare the maternal and fetal outcomes of gestational diabetes mellitus.

Material and Method

Study Design
Prospective observational study

Study Period
Nine months from April 2010 to December 2010.
Inclusion Criteria
Women diagnosed with gestational diabetes mellitus and whose expected date of delivery has to be before the end of the month of December 2010.

Exclusion Criteria
Women with pre-existing diabetes mellitus, hypertension, renal diseases and autoimmune diseases were excluded from the study.

Institutional Ethics Committee [IEC] Permission
The study was approved by KMCH Ethics Committee in order to conduct the study in Kovai Medical Centre and Hospital.

Data Entry Form
A separate data entry form was prepared and which consist of drug chart, laboratory investigations, family history and maternal and neonatal details.

Data Collection
Data were collected for the period of January 2003 to December 2010. The data were collected directly from patients, family members, inpatient files and outpatient medical records, maternal data include age, weight, height, blood group, marital period, family history, husband details, ultrasound report, obstetric history, past medical history, treatment, laboratory investigation and current diagnosis details were collected. Neonatal data include sex, weight, lenght, Apgar score, neonatal complications, Abdominal and head Circumference and blood sugar values were collected.

The maternal and fetal outcomes were analyzed by grouping the patients as follows.

1. Patients who were treated with diet alone and along with insulin.
2. Patients who were nullparous and multiparous.
3. Patient who had a normal and abnormal level of Hemoglobin. [Abnormal hemoglobin level is consider as level less than 12mg/dl and hemoglobin level between 12-15mg/dl is consider as normal level]
4. Patients who were diagnosed gestational diabetes mellitus at the early and late stage of gestation. [The week of gestation less than 28 is considered as early

diagnosed and greater than 28th week is considered as late diagnosed gestational diabetes mellitus].

5. Patients who had a positive and negative family history of Diabetes Mellitus.

Analysis of maternal and fetal parameters

1. The cut of value of fasting blood glucose level for gestational diabetes mellitus women 95mg/dl and155mg/dl for 2-hours post prandial blood sugar according to ADA
2. Preterm delivery - the delivery before 37th week of gestation.
3. Macrosomia - the birth weight of 4000grams or greater.
4. Hyperbilirubenemia - the increase in total bilirubin level more than 12mg/dl.
5. Neonatal hypoglycemia - capillary heel blood glucose levels of 40mg/dl or less.
6. Maternal weight gain is the amount of weight gained by the mother during the pregnancy period. According to Institute of medicine and nutrition the normal maternal weight gain during pregnancy is 11.5 – 16kg.
7. Large for gestational age (LGA) is those whose birth weight lies above the 90th percentile of weight for that gestational age.
8. Appropriate for gestational age (AGA) is those whose birth weight lies above the 10th percentile for that gestational age and below the 90th percentile of weight for that gestational age.
9. Small for gestational age (SGA) is those whose birth weight, length or head circumference lies below the 10th percentile of weight for that gestational age.
10. The universal screening for gestational diabetes mellitus is between 24 – 28 week. The gestational diabetes mellitus diagnosed between 24 -28 week or before 28th week were consider as early gestational diabetes mellitus and which is after 28 is consider as late GDM.

Results

PREVALENCE

Total of 2452 women were given birth for the period of 12 months from January 2010 to December 2010. Out of which 37 women were diagnosed as GDM which is account for 1.50% of whole delivery.

MATERNAL
RISK FACTORS

The average age of GDM women was 28.72 ± 4.57 years. Out of 37 women 16(43.24%) had an age limit of 25-29, 6 (16.21%) had an age limit of 20-24 and 9 (24.32%) had an age limit of 30-34 years. Regarding BMI the average value was 27.52 ± 3.30kg/m^2 and 21 (56.75%) women were falls between the range of 25-30, 8 (21.62%) had a BMI above 30 and 8 (21.62%) had a normal BMI.

About parity total of 20 (54.05%) women were nulliparous, 14 (37.83%) were primiparous and 3 (8.108%) women were more than one. Regarding gravidity 17 (45.94%) women were primigravida and 20 women (54.056%) were multigravida. Regarding past obstetric history 3 (6.97%) women had previous GDM and 1 women (2.32%) had previous PIH.

27.02% of women have the paternal history of diabetes mellitus and 27.02.% (10) have the maternal history of diabetes mellitus, 10.81% of women (4) have both and 35.13% of women (13) have none.

COMPLICATIONS

The co-morbidity complications like PIH were also reported. 10 women (27.02.%) were found with PIH, and 2 (5.40%) women with hypothyroidism.

Out of 37 women 30 (81.08%) were treated with insulin and 6 (16.21%) women were treated with diet alone and no women were treated with oral hypoglycemic drugs..

At the diagnosis of gestational diabetes mellitus the mean average value of fasting blood sugar was 99.18mg/dl and 2-hours post prandial blood sugar value was 148.56mg/dl, which were controlled to 93.88mg/dl and 137.64mg/dl fasting blood sugar and 2- hours post prandial sugar values respectively. The diet and insulin treated patient fasting blood sugar and 2- hours post prandial blood sugar values were 101.5mg/dl and 151.6mg/dl respectively and it were controlled to 97.8mg/dl and 145.3mg/dl fasting blood sugar and 2-hour post prandial blood sugar values respectively.

16(43.24%) of women were diagnosed between the week of 30-34, 8(21.62%) women were diagnosed week between 25-29 gestation, 4(10.80%) were diagnosed before 16th week, 2(5.40%) were diagnosed between 35-39 week of gestation, 10.80% (4) were diagnosed between 21-24th week and 3(8.10%) were diagnosed between 16-20th week of gestation.

Out of 37 deliveries 30 (78.94%) were cesarean delivery and 7(18.9%) were normal delivery.45.94% of women (17) had given delivery after 37th week of gestation and 43.24% (16) of women were in between 34-36 week of gestation whereas 8.10% of women (3) had given deliveries between 31st-33rd weeks of gestation and 1 had delivered before 30th week of gestation.

NEONATAL

All women had given live birth and totally 37 babies were delivered, of which 20 (54.05%) were male babies and 17(45.94%) were female babies. Out of 37 babies 14(37.83%) were born as term and 23 (62.16%) were born as preterm delivery. 10 (27.02%) babies were Large for gestational age, 23 (62.16%) were

Appropriate for gestational age and 4 (10.81%) babies were Small for gestational age.

Regarding the baby weight the mean weight is 2.64 ± 0.076 kg and the weight of 7(18.9%) babies was in between 2-2.5kg, 7 (18.9%) had birth weight in between 2.5-3 kg, 8 (21.62%) had birth weight between 3-3.5kg, 7(918.9%) had birth weight 3.5-4, 3(8.10%) had a birth weight between 1.5-2, and 1 (2.70%) had more than 4000kg.

15(40.54%) of babies had hypoglycemia, 13(35.13%) babies had hyperbilirubinemia and 9(2.43%) babies were normal with no complications.

Discussion

PREVALENCE

For the period of 7 months from January 2010 to December 2010 the prevalence of gestational diabetes mellitus was 1.50%. Approximately 1-14% of all pregnancies are diagnosed with gestational diabetes mellitus and the prevalence also keep on increasing from year to year. In South India, the prevalence of gestational diabetes mellitus has increased from 1% in 1998 to 16.55% in 2004 [21].

RISK FACTORS

Women of age more than 25 are being considered as risk factor. Our mean average age was 28.62±4.57 years. This is the same statement of many studies Seshiah V, Boriboonhirunsan D 22-23. The study by Getahun D reported that the prevalence of gestational diabetes mellitus largely driven by the increase in 25-35 years age group [24]. In our study population 68% of women were between the age group of 25-34 years.

The increase in BMI is also a risk factor for gestational diabetes mellitus Bhat M , Mohammed NB , Keshavarz M [21,25,26]. In our population the overall BMI value was 27.52 ± 3.30kg/m^2 and 21.62% of women were above the BMI of 30.

Parity and Gravidity were also shows influence on gestational diabetes mellitus. Lesser parity and primigravida have more risk for gestational diabetes mellitus [27,28]. In our study also the parity was less 68.4% and primigravida women were more 45.94% in number.

Family history of Diabetes Mellitus has a strong correlation with occurrence of gestational diabetes mellitus. Paternal only history of diabetes or parental history of Diabetes Mellitus have significant risk [29-,31]. In our study women with paternal and maternal history of diabetes were same in number

COMPLICATONS

PIH, and hypothyroid also has correlation with gestational diabetes mellitus [32-33] . In our study 27.02% of women were complicated with PIH.

The rate of cesarean delivery was increased significantly with gestational diabetes mellitus [34.35] the other co-morbidity conditions like PIH also trigger the cesarean delivery in gestational diabetes mellitus [36]. In our study the rate of cesarean delivery was high with 78.94% of whole delivery, 14.4% of gestational diabetes women found with PIH of which whole was cesarean delivery.

NEONATAL

The strict glycemic control in gestational diabetes mellitus women not shown any increased risk in preterm delivery [37,38] which is similar to our result in which 55% of women has accuquired glycemic control with diet and insulin therapy, overall preterm delivery was account for 62.1% and 45.94% accout for term delivery.

Gajgar in their study they had found that there is eight times more likely to have hypoglycemia and three times more likely to have hyperbilirubinemia in babies born to gestational diabetes mellitus women [39]. In our study 40.54% of babies had hypoglycemia and 35.13% of babies had hyperbilirubinemia. In other study conducted by Boriboonhirunsaran in which they found that 68.5% of neonates born to gestational diabetes mellitus women had hypoglycemia [40].

Xiong X in their study they had found out that babies born to gestational diabetes mellitus women were at high risk for large for gestational age. In our study 62.16% of babies were large for gestational age [41].

Conclusion

Overall prevalence rate of gestational diabetes mellitus was 1.50%. Increasing age, BMI, weight and marital period shows definite influence on developing gestational diabetes mellitus. *Average age was 28.72±4.57 years, BMI was 27.52 Kg/m2 and weight was 68.32kg.79.71% of women were more than 60kg of body weight at the time of confirmation of pregnancy.Based on BMI 80.62% of women were above the ideal body weight Overall average marital period was 3.81 years .*

Family history is also an important risk factor for the development of gestational diabetes mellitus.*64.86% of women had family history of diabetes mellitus, of which 27.02% of women had paternal history of diabetes* .Occurrence of gestational diabetes mellitus was early in stage of gestation, average week of diagnosis of gestation diabetes mellitus was 24.78 weeks.

Regarding mode of delivery cesarean delivery was more. *83.78% of deliveries were cesarean delivery.*

Gravidity does not have influence on development of gestational diabetes mellitus. *45.94% of women were pimigravida and 54.05% were multigravida.* Neonatal weight was found to be normal except 1 baby was macrosomic. *Overall average weight of the baby was 2.64kg* .Neonatal complications found hypoglycemia and hyperbilirubinemia. *35.13% of babies were affected with hyperbilirubinemia, 40.54% of babies were affected with hypoglycemia and 29.74% babies .*

GDM is a condition that should be treated aggressively and it is a problem that affects a significant number of women during pregnancy. Regardless of risk factors, early screening before 24th week of gestation, for gestational diabetes mellitus is strictly recommended.

Increasing age, BMI, weight, martial period and positive family history for diabetes are highly prone to gestational diabetes mellitus and those women has to be considered as high risk group. Strictly controlling of blood sugar level definitely gives good outcomes of gestational diabetes pregnancy.

It should be given equal importance to primigravida and multigravida women for the screening of gestational diabetes mellitus. Fetal exposure to hyperinsulinemia may push them to high risk group of diabetes mellitus and also for gestational diabetes mellitus. Hencefuture risk for obesity and diabetes mellitus to offspring of gestational diabetes mellitus women should be monitored.

Increased awareness of the magnitude and timing of the risk of type 2 diabetes after gestational diabetes among patients and clinicians could provide an opportunity to test and use dietary, lifestyle, and pharmacological interventions that might prevent or delay the onset of type 2 diabetes in affected women. A major part of GDM involves educating the patient about diet, exercise, blood glucose self-monitoring, and insulin self-administration.Pharmacists can optimize overall care of a gestational diabetes patient by educating, monitoring, and intervening or assisting the patient in the management of gestational diabetes. There is a need for pharmacist intervention in the prevention and management of GDM and to train nurses about the safety precautions required for the safe handling, administration of insulin and provide guidance to the patients of GDM regarding diet plan and exercise to prevent it.

In order to circumscribe and minimize potential complications to mother and child, screening, diagnosis, and management of hyperglycemia are critical. There is still work to be done to gain a better sense of what screening protocols are most efficacious and when they should be administered. Future studies will provide guidance as to what the optimal management choices are.

Acknowledgement

The author is indebted to the colleagues of the Department of Pharmacy Practice, KMCH, Coimbatore, Tamil Nadu, India.

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AUTHORS' CONTRIBUTIONS

Authors contributed equally to all aspects of the study.

PEER REVIEW

Not commissioned; externally peer reviewed

CONFLICTS OF INTEREST

The authors declare that they have no competing interests