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The Impact of Gestational Diabetes Mellitus on Maternal and Fetal Outcome

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Abstract **Original Research Article**

Objective: Gestational diabetes mellitus (GDM) is one of the major public health issues in developing countries. It occurs in 2-9 percent of all pregnancies [4-6]. The present study is aimed to determine whether maternal and neonatal outcomes in GDM women are different from those in the general obstetric population. ***Methods***: This descriptive Observational study was conducted jointly in the departments of Obstetrics Gynecology and Medicine, Nightingale Medical College, Ashulia from 1st January 2014 to 31st December 2016 (3 years). Fifty pregnant woman diagnosed by OGTT as GDM and fifty healthy pregnant women were enrolled as study subjects. They were followed regularly at the outpatient departments until delivery for detection of maternal and fetal outcome. ***Results***: Women with GDM were significantly older (mean age 31.5) than healthy pregnant women group (mean age 25.3). Multiparty, increased BMI and positive family history of DM were found commonly in GDM women than control group. GDM women were more prone to develop pregnancy induced hypertension (36% vs 20%), premature rupture of membrane (30% vs 14%), preterm labour (30% vs 10%) as compared to non GDM group. Rate of cesarean section was not significantly higher in GDM women than healthy women (64% vs 56%). Regarding neonatal complications there was increased risk of hyperbilirubinemia (46% vs 16%), hypoglycemia (20% vs 0) and macrosomia (30% vs 10%) in neonates of GDM women than those of non GDM women. ***Conclusion***: Our study indicates that maternal and neonatal complications are more in GDM women than healthy population. So early detection of GDM and multidisciplinary approach of treatment in the form of dietary advice, lifestyle modification, and insulin therapy can reduce adverse outcomes without increasing the rate of cesarean section.

Keywords: Gestational diabetes mellitus, maternal outcome, fetal outcome.

INTRODUCTION

Gestational diabetes mellitus (GM) is defined as any degree of dysglycemia that occurs for the first time or is first detected during pregnancy [1-3]. It occurs in 2 to 9 percent of all pregnancies and is associated with substantial rates of maternal and perinatal Complications [4-6].

If GDM is not properly treated, mothers are at risk of developing gestational hypertension, pre-eclampsia, recurrent Vulvovaginitis, increased incidence of Cesarean section, obstructed labor and development of type 2 diabetes mellitus and cardiovascular diseases in later life [1, 7-10]. Although the risk of perinatal mortality is not increased now-a-days [4] but babies born from GDM women are at risk of macrosomia, hyperbilirubinemia, congenital abnormalities, prematurity, birth trauma, neonatal hypoglycemia and diabetes mellitus in adult life [1, 7]. So, it is important to detect and treat GDM early for reduction of the burden.

GDM is becoming a major health problem in developing countries due to changes in life style, dietary habits and body mass index. The risk factors for GDM are age> 30 years, family history of DM, Previous history of macrosomia, unexplained intrauterine death, recurrent abortion, congenital malformations, and history of preeclampsia [11]. Maternal and neonatal morbidities and mortalities due to GDM can be prevented by proper antenatal care,

screening of high risk cases, fetal monitoring and appropriate management.

Diagnosis of GDM depends on oral glucose tolerance tact (OGTT). OGTT can be carried out by 75gm two-hour test (ADA) or 100 gm three-hour test (o' Sullivan). The threshold's for an elevated fasting glucose range from 5.1 to 7.8 mmol/L, while values for two hours after 75 gm glucose range from 7.8-11 mmol/L [1, 12-14]. The 75 gm two-hour test is more convenient than 100 gm three hour test as only one elevated glucose value is needed to diagnose GDM [1]. Treatment of GDM involves education regarding diet, exercise, and blood glucose self-monitoring and insulin self-administration [11].

The objective of our study was to compare maternal and fetal outcome among GDM and healthy pregnant women.

MATERIAL AND METHOD

This descriptive Observational study was carried out in the departments of Obstetrics Gynecology and Medicine of Nightingale Medical college hospital Ashulia, Dhaka from 1st January 2014 to 31st December 2016 (Three Years). 50 pregnant women at gestational age 28 weeks or more were diagnosed on the basis of glucose tolerance test (GTT) as diabetic and were enrolled as study subjects. The control group comprised 50 randomly selected Women who were not classified as having GDM or other medical problem and were at gestational age 28 Weeks or more. Women suffering from other conditions like multiple pregnancy, Type I and Type II DM, hypertension, Cardiac or renal diseases are excluded from this study. Both groups of pregnant women were registered and consents were obtained from them. Informations were collected from the registered women inpatient files and out patient records on a separate data entry form. Both GDM and healthy pregnant women were followed until delivery for reporting maternal and neonatal complications.

Maternal data include age height, weight, BMI, family history, any prenatal abnormalities (Urinary tract infection, PROM, Polyhydramnios, preeclampsia), obstetrical history, Past medical history, laboratory investigations, USG report, treatment (diet control and /or insulin), week of delivery, mode of delivery and Complications during delivery. Neonatal data include weight, Apgar score, neonatal complications (hypoglycemia, hyperbilirubinemia, birth trauma, RDS, congenital anomalies, stillborn).

At first, all women were advised for random blood glucose level (RBG). If RBG level >7 mmol/L the pregnant women were selected for GTT. The women having risk factors for GDM like age >35 years, obesity, positive family history, Previous H/O GDM, miscarriages, unexplained IUD, macrosomia, congenital malformed fetus, glycosuria- were also undergone GTT. Fasting and 75g two-hour oral glucose levels were determined. The thresholds for an elevated fasting glucose range from 5.1-7.8 mmol/L and values for two hours after 75g oral glucose range form 7.8-11.1 mmol/L.

Based upon blood glucose values, patients were either hospitalized or managed as out patients with diet control and or short acting insulin. Patients were instructed for regular ante natal checkup and glucose monitoring at home (4 samples - Fasting 2h ABF, 2 h. AL, and 2h. after dinner) every 3 days interval. At each antenatal visit, glucose home monitoring records were checked, maternal and fetal wellbeing were assessed and management was given if there was any complications. Decision about time and mode of delivery was made at 36 weeks .Patients with Controlled GDM and no complaints were allowed to continue beyond 37 weeks but not beyond EDD. Induction was carried out for them. But women with poor glycemic control, PE or Other risk factors (Bad obstetric history, macrosomia, Previous LUCS) were undergone elective LUCS. During labour and prior to LUCS, glycemic control was achieved by administration of insulin in dextrose saline, maternal plasma glucose was monitored routinely to maintain blood glucose level 6-8 mmol/L. All the newborn babies were assessed by a pediatrician after delivery.

RESULTS

A total of 1200 Women delivered during the study period at Obstetrics Gynecology department of Nightingale Medical College. 50 patients (4.2%) with GDM were included in this study. A number of 50 healthy pregnant women were randomly selected for comparison.

Table 1: Demographic Comparison of women with GDM and control group

	GDM Women (n=50)	Non GDM(n 50)
Maternal age	31.5	25.3
Multi parity	35 (70%)	20 (40%)
BMI >30	32 (64%)	12 (24%)
Family H/O DM	28 (56%)	12 (24%)
Insulin required	20 (40%)	nil
	DM: Diabetes Mellitus GDM: Gestational	

	diabetes mellitus CS : cesarean section

Table 1 showing GDM patients were significantly older (mean age 31.5) than the control group (mean age 25.3). Regarding parity 35 GDM patients were multiparous (having 1-5 children) while 20 non GDM women were multiparous. BMI was calculated >30 in 32 GDM women but in only 12 healthy women. Out of 50 GDM patients only 28 (56%) gave positive family history of DM in first degree relatives which is more significant than non GDM group (12 out of 50).GDM patients were treated with diet control but 20 of them required insulin for glycemic Control.

Table 2: Comparison of maternal outcomes in GDM and non GDM women

Variables	GDM Women	Non GDM Women
Pregnancy induced hypertension(PIH)	18(36%)	10(20%)
Premature rupture of membrane (PROM)	15(30%)	7 (14%)
Preterm labour	15(30%)	5 (10%)
Urinary tract infection	34 (68%)	30(60%)
Poly hydramnios	8(16%)	0
mean gestational weeks delivery	36.6	38.2
mode of delivery - vaginal -CS	 18(36%) 32(64%)	 22(44%) 28(56%)

Maternal outcomes are compared in Table-2. Despite good glycemic Control 35 patients developed complications. Statistically important differences between two groups were found in pregnancy induced hypertension, preterm labour and premature rupture of membrane. GDM patients were more prone to develop PIH (36%), premature rupture of membrane (30%) and preterm labour (30%). Difference in mode of delivery among two groups of women were not significant. 17 GDM patients were delivered at 38 weeks, 18 women at 37 weeks, 6 women at 36 weeks, 6 of them at 34 weeks, 2 women at 33 weeks and only 1 woman at 30 weeks. Mean gestational age at delivery was 36.6 in GDM patients while it was 38.2 in healthy pregnant women group.

Table-3: Comparison of fetal outcomes in GDM and Non GDM, women group

Variables	GDM (n=50)	Non GDM (n=50)
Hyperbilirubinemia	23 (46%)	8 (16%)
Macrosomia	15 (30%)	05 (10%)
hypoglycemia	10 (20%)	0
Congenital anomaly	03 (6%)	1 (2%)
Respiratory distress syndrome (RDS)	6 (12%)	2 (4%)
Still birth	2 (4%)	0
Birth trauma	2 (4%)	0

Table-3 shows neonatal complications in GDM Women in comparison to healthy non GDM women. It was observed that out of 50 babies, 25 babies had no complications in GDM patients while 40 babies were absolutely healthy in non GDM women group. Babies born to GDM women were at increased risk of hyperbilirubinemia (46%), macrosomia (30%) and hypoglycemia (20%). Congenital anomalies were not significantly higher in GDM group. Babies of GDM mothers also developed complications like RDS (12%), birth trauma (4%) and still birth (4%) but babies of healthy women group suffered none of these complications.

DISCUSSION

GDM is becoming a major health problem in developing countries. It occurs in 2-9 percent of all pregnancies [4-6]. In our study 4.2 percent patients were diagnosed as GDM among total number of women delivered babies during the study period. This study shows that outcomes of pregnancy in GDM women are different from those in healthy pregnant group. Early detection of GDM and good glycemic control during antenatal period in joint consultation with obstetrician and diabetologist can reduce maternal and neonatal complications.

Table I indicates mean maternal age with GDM was 31.5 where in non GDM group was 25.3.

Increasing maternal age was associated with GDM as carbohydrate tolerance deteriorates with age[7]. Farooq, MU *et al*., [7] and other studies [1, 15-17] also found that GDM developed more in advanced maternal age group. Multiparty is another risk factor for GDM.

Our study shows 70% GDM Women were multiparous whereas only 40% in non GDM group. This observation correlates with other studier [7, 17] which showed 76% and 80% GDM patients are multiparous accordingly.

Obesity is one of the main factors in development of GDM and BMI is used to measure the severity of obesity. In our study BMI was >30 in 64% GDM women but only 24% non GDM women had BMI >30. Lee *et al*., also described that prevalence of GDM was increased in obese women [1]. Onset of GDM has a familial tendency and this suggests that there is a genetically predisposition to develop GDM [1, 18-20]. Our study also shows that 56% patients had positive family history of DM whereas only 24% of non GDM women gave such family history.

Management of GDM consists of diet control, life style modification, self-blood glucose monitoring and insulin if target blood glucose levels are not achieved on diet therapy. 40% patients received insulin therapy in our study. In a study conducted by Randhawa *et al*., insulin requirement was 40% 17 and in Farooq *et al*., study it was 64% [7]. Such a high number in these studies may be due to illiteracy, ignorance about principles of glycemic control and Consumption of carbohydrate rich diet in our subcontinent. Several obstetric problems occur in GDM patients compared to normal healthy pregnant women showed in Table 2. Complications are directly related to quality of glycemic control. Despite good diabetes control PIH developed in 36% patients, PROM in 30% cases and polyhydramnios in 16% cases of GDM group. In a study by R. Khan *et al*., PIH and preeclampsia were found in 38.8% patients, PROM in 19.4% Women [21]. In other studies polyhydramnios was found to be common complication [7, 22]. All these complications were found in few cases (20%, PIH, 14% PROM, 0% polyhydramnios) of healthy pregnant women. In our study Urinary tract infection (UTI) was found in most of Cases (68%) which may be due pregnancy related hormonal cause and hyperglycemia. Rahdia *et al*., [21] also found UTI was commonly occurring complication in GDM group. UTI was also increasingly found in non-GDM Women (60%) in our study which may be due to progesterone induced dilatation of pelvi calyceal system. Preterm labor occurred in 30% GDM women in our study. But it was 20% in a study conducted by Gilmer *et al*., [23] and 38% in a study by Parveen *et al*., [22]. The reason for this higher incidence may be due to PROM, polyhydramnios, recurrent UTI, macrosomia.

With good glycemic Control mean gestational weeks of delivery in GDM Women was 36. 6 where in healthy Women group it was 38.2. Parveen et al showed mean gestational age of delivery was 39-40weeks [22]. GDM women with no complications proceeded to term and had vaginal delivery. We conducted vaginal delivery in 18 (36%) GDM patients and 22 (44%) of non GDM patients. CS was done in 64% GDM Women which was done in 56% of healthy women. Rate of CS was significantly higher in GDM than healthy women in many other studies [7, 15, 21]. Increased Percentage of CS was due to fetal macrosomia, chance of birth trauma, previous CS, bad obstetric history, Babies born to GDM mothers had more complications than those born to non GDM women (Table 3). In our study hyperbilirubinemia was found in 23 (46%) babies of GDM mothers where only in 8 (16%) babies of non GDM women. Phototherapy required in 10 babies from both groups. In many other studies hyperbilirubinemia was the most common neonatal complication occurred in 25-40% [21, 22, 24] but incidence was lower (18%) in a study by Farooq et al [7]. The reported incidence of macrosomia is 25-40% [7, 21, 24] which is comparable to our study with 30%. This high figure may reflect maternal hyperglycemia leads to fetal over growth during third trimester. Prevention of macrosomia should be main aim of GDM control as it is associated with birth trauma, increased rate of CS, obesity and diabetes in later life [21, 25]. In non GDM group macrosomia was found in 10% babies which may be due to constitutional causes like maternal height, age, parity, obesity, ethnicity [15]. Hypoglycemia was found in 10(20%) babies of GDM women whereas no babies had hypoglycemia in non GDM group. Good glycemic control during pregnancy and at the time of delivery can decrease the risk of neonatal hypoglycemia as it was found in a study by Caroline A *et al*., 4 and other studies [7, 15].

When women develop GDM in mid trimester the developing embryo expose to hyperglycemia and develop malformation [7]. The lower incidence of congenital anomaly (6%) in our study may be due to late onset of GDM in most cases. Our figure correlates with other studies reporting 2%7, 3.85 [22], but higher (11.7%) in a study by Rahdia *et al*., [21]. Although common in GDM but we found RDS in 4 (8%) babies, still birth in 2 (4%) and birth trauma in 2(4%) babies of GDM mothers. These complications are least or absent in healthy Women. Babies with RDS were sent to NICU. Only one of them who born at 30 weeks had not survive. Gellis *et al*., [26] and kitz miller *et al*., [27] reported declining incidence of RDS from 31% to 5.5% with good glycemic control in the same clinic observed for long period of time Only 2 babies were found still born which may reflect their ignorance for routine antenatal checkup, negligency for insulin taking, poor glycemic control and low income status. 2 babies had birth trauma as they were macrosomic.

CONCLUSION

Our current study indicates that maternal and perinatal complications occur more commonly in GDM women than healthy women. Increasing maternal age, high BMI, multiparty and positive family history of DM show definite influence on developing GDM. Despite good glycemic control complications occurred in more

than half GDM women, among these UTI and PIH were common. About half of neonates suffer from some complications in which hyperbilirubinemia and macrosomia were common. So detection of GDM and multidisciplinary approach of treatment provided by obstetrician, dialectologist and nutritionist in the form of dietary advice, blood glucose monitoring, changes in life style, insulin therapy can reduce adverse out comes without increasing the rate of Cesarean section. It is apparent that available data cannot estimate the incidence and consequences of GDM at the community level because of differences in Criteria for diagnosis, initiation of appropriate treatment, ignorance, and lack of antenatal care. GDM women attending hospital and clinics for antenatal care obtain early detection and appropriate treatment. Maternal and neonatal outcomes are relatively better in them than the GDM women who have no facilities to for ante natal care. To assess the true incidence and outcomes the condition a well designated, population based study is required.

RECOMMENDATION

We recommend that clinician screen for GDM by doing OGTT as early as possible in high risk women. If results are negative, the test should be repeated 24- 28 weeks of pregnancy. So that treatment can be provided early. As offsprings of GDM mothers are prone to develop obesity and DM in future life so awareness must be created regarding diet, life style and should be monitored subsequently.

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