Original Article

# Maternal and fetal outcomes in diabetic pregnant women

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**Objective**: To assess maternal and fetal outcomes in Jordanian women with known Diabetes Mellitus or Gestational Diabetes.

**Methodology**: Retrospective medical record review was conducted on 234 pregnant women who were followed at the National_Center for Diabetes Endocrinology & Genetics and Gynecological Department in Jordan University Hospital between 2004-2009. A total of 148 subjects had Gestational Diabetes Mellitus (GDM) and 86 were known diabetes mellitus (DM) (Type 1=28, Type 2=58).

**Results**: Cesarean section was more frequent in GDM subjects than in DM group (47.3% vs. 44.2%). The frequency of pre-term delivery tended to be higher in DM group than GDM group (9.3% vs. 8.1%). The abortion was more in DM group than GDM group (11.6 % vs.4%), macrosomia, hypoglycemia, hypocalcaemia, polycythemia and congenital malformation were more in DM group than GDM group.

**Conclusion**: DM group witnessed more abortion and pre-term delivery compared to GDM groups. The cesarean section was higher in GDM compared to DM group. GDM group had better fetal outcome thane DM group indicating that DM in pregnancy is a serious condition.(Rawal Med J 2013;38: 409-412).

**Key words:** Diabetes Mellitus, gestational diabetes, maternal and fetal outcome.

## INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as glucose intolerance that first occurs or identified during pregnancy.[1] The frequency of this condition is rising depending on varying characteristics of the population. Although GDM is a recognized marker for an increased risk of subsequent diabetes, its clinical significance with respect to various adverse pregnancy outcomes has been uncertain.[2-4] Women with GDM who have very elevated fasting blood glucose levels appear to be at an increased risk for fetal macrosomia and perinatal complications if treatment is not provided.[5] Women diagnosed with diabetes prior to pregnancy (pre-existing diabetes) will experience an increase in insulin demands during pregnancy.[4]

Diabetes can have significant impacts on maternal, fetal and neonatal outcomes. It can increase the risk of stillbirth by five times, and the risk of neonatal death by three times.[5] Studies have shown that perinatal mortality rates are two to three times higher amongst babies of diabetic women and they have higher rates of congenital anomalies in their babies.[6,7] The recent Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study showed a strong continuous association between maternal glucose concentrations and increasing birth weight, cord-blood serum C-peptide levels, and other markers of perinatal complications, even at glucose concentrations below those that are usually diagnostic of gestational diabetes mellitus.[6]

Several professional organizations have recommended screening for GDM for most pregnant women despite little evidence that the identification and treatment of mild carbohydrate intolerance during pregnancy confer benefit.[1,7] The Australian Carbohydrate Intolerance Study in Pregnant Women (ACHOIS), a large, randomized trial of treatment for GDM concluded that treatment reduces serious perinatal complications and may also improve health-related quality of life.[8] Despite these findings, the 2008 guidelines of the U.S. Preventive Services Task Force again concluded that current evidence is insufficient to assess the balance between benefit and harm with respect to the screening and treatment of GDM.[9] The objective

of this study was to assess maternal and fetal outcomes in Jordanian women with known Diabetes Mellitus or Gestational Diabetes.

## METHODOLOGY

Retrospective medical records review was conducted in all diabetic pregnant women who were followed at the National Center for Diabetes Endocrinology & Genetics and Gynecological Department in Jordan University Hospital between 2004-2009. Out of total of 234 diabetic pregnant women, 148 had GDM and 86 had known diabetes mellitus (DM) (Type 1=28, Type 2=58). In Gynecology Department, all pregnant women with high risk factors or fasting blood sugar ≥ 95 mg/dl, oral glucose tolerance test (OGTT) was performed (100-g oral glucose tolerance test, if two or more reading of the followings are abnormal FBS > 95 mg/dl, 1-hr > 180 mg/dl, 2-hr > 155 mg/dl ,3-hr > 140 mg/dl , OGTT is considered positive) and patients were referred to the diabetic clinic to be followed. If it was negative, reassessment at 24 to 28 weeks of gestational age was done. In diabetic clinic, fasting blood sugar, one hour post prandial blood glucose (PPBG) , HbA1c, blood pressure, urine for protein and fundoscopy were performed.

The Goals of our management was: FBG ≤95 mg/dl, 1 hr PPBG ≤ 140 mg/dl and 2 hrs.
PPBG ≤ 120 mg/dl., HbA1c value 4.2–6.2%. All women were followed monthly in the first and second trimester and every two weeks in third trimester. Patients were treated with diet or insulin injection (3 or more injection per day). All women delivered in Jordan University Hospital. Newborn babies were referred to the neonatal care unit. The fetal outcomes were assessed regarding hypoglycemia, hyperbilirubinemia, hypocalcaemia, polycythemia, macrosomia and congenital malformation. The pregnancy outcomes were assessed regarding cesarean section, pre-term delivery, pre-eclampsia and abortions. Chi-Square analyses was performed to test for differences in proportions of categorical variables between two groups and significance of observed association was tested. P <0.05 was considered as statistically significant.

## RESULTS

Maternal features of the study group showed that the ages of GDM and DM

were nearly similar. The GDM in previous pregnancy was frequently more for current GDM women compared to DM. The family history of DM is more in GDM group than DM group. Frequency of abortion was more among GDM women (Table 1). The FBG and HbA1c were lower in GDM group compared with DM group (Table 2).

**Table 1. Maternal features of the study group.**

| | GDM (n=148 | DM Type 1 (n=28) Type 2 (n=58) | p-value | Total (n=234) |
|---|---|---|---|---|
| Mean Age | 34.5±3.2 | 33.8±5.4 | 0.8 | 34.2 ±5.6 |
| GDM in previous pregnancy | 62(41.9%) | 30(34.9%) | 0.454 | 92(43.8%) |
| Family History of DM | 118(79.9%) | 66(76.7%) | 0.704 | 184(78.6%) |
| History of Baby wt ≥ 4 kg | 52(35.1%) | 18(20.9%) | 0.105 | 70(29.9%) |
| History of Pre-eclampsia | 20(13.5%) | 10(11.6%) | 0.768 | 30(12.8%) |
| History of abortion, Still birth, Intrauterine Fetal Death | 82(55.4%) | 34(39.5%) | 0.0978 | 116(49.6%) |

Table 3 demonstrates that the percentage of caesarean births, pre-eclampsia, and polyhydroaminos were more among GDM groups; pre-term labor and abortion were more in DM groups.

**Table 2. Diabetic profile of both groups.**

| | GDM group n=148 | DM group n=86 | p-value |
|---|---|---|---|
| F.B.G* Mean mg/dl ±SD | 107.7 ± 36.0 | 122.2 ± 41.84 | 0.050 |
| HbA1c** | 5.5% ± 1.80 | 6.1% ± 1.59 | 0.099 |

* FBG<95 mg/dl* ** HbA1c normal value :4.2-6.2 \

Diabetes mellitus group showed higher percentage for macrosomia, hypoglycemia, hypocalcaemia,

polycythemia and congenital malformation (Table 4). Tables 5 and 6 show that the results of this study were similar compared to literature.

**Table 3. Maternal outcome in GDM and DM groups.**

| | GDM n = 148 | DM n=86 | Total n = 234 |
|---|---|---|---|
| Caesarian section | 70 (47.3%) | 38 (44.2%) | 108(46.1%) |
| Pre-eclampsia | 16 (10.8%) | 6 (6.97%) | 22(9.4%) |
| Polyhydroaminos | 4 (2.7%) | 2(2.3%) | 6(2.6%) |
| Pre-term labour | 12(8.1%) | 8(9.3%) | 20(8.5%) |
| Abortion, IUFD& SB | 6(4%) | 10(11.6%) | 16(6.8%) |

**Table 4. Fetal outcome in GDM and DM groups.**

| | GDM n= 148 | DM n=86 | P value | Total n = 234 |
|---|---|---|---|---|
| Macrosomia (≥4000g) | 22 (14.9%) | 26 (30.2%) | 0.005* | 48 (20.5%) |
| Hypoglycemia ( <40 mg/dl) | 0 | 2 (2.33%) | 0.13 | 2 (0.85%) |
| Hyperbilirubinemia (>103µmol/L) | 16 (10.81%) | 8(9.3%) | 0.7 | 24 (10.25%) |
| Hypocalcaemia (< 7 mg/dl) | 0 | 4(4.6%) | 0.009 | 4 (1.71%) |
| Polycythemia (PCV> 65 %) | 4(2.7%) | 8(9.3%) | 0.03** | 12 (5.1%) |
| Congenital malformation | 4(2.7%) | 4(4.6%) | 0.32 | 8 (3.40%) |

*OR:2.48( 95% CI=1.24-4.98),RR: 2.03( 95% CI=1.23-3.36)
**OR:3.69( 95% CI=1.00-15.12),RR: 3.44( 95% CI=1.07-11.09)

**Table 5. Frequency of maternal outcome compared with other international studies.**

| | Our study n= 234 | Jensen et al * n= 143 | Huddle **n= 354 | P value | Collective studies *** |
|---|---|---|---|---|---|
| Caesarean Section | 108 (46.15%) | 46 (32%) | 178 (50.3%) | 0.0011 | 32-45% |
| Preterm Labor | 20 (8.5%) | 15 (10.5%) | - | 0.5 | 14-33% |
| Pre-eclampsia | 20 (8.5%) | 28 (19.6%) | - | 0.001 | 10-40% |
| Abortions | 16 (6.8%) | 2 (1.3%) | 23 (6.5%) | 0.050 | 3.8-13.5% |

* D.M. Jensen et al (Denmark) Diabetic Medicine 2000; 17:281-286
**K.R.Huddle. (South Africa). Diabetes International 1999; 9(3):53-55
***Up to Date 10.1. 2002

**Table 6. Frequency of fetal outcome of diabetic mothers compared to other international studies.**

| | Our study n= 234 | Jensen et al * n= 143 | Hod et al ** n=878 | P value | Collective studies *** |
|---|---|---|---|---|---|
| Macrosomia | 48 (20.5%) | 20 (14.0%) | 157 (17.9%) | 0.27 | 9-28% |
| Hyperbilirubinemia | 24 (10.25%) | 15 (10.5%) | 145 (16.5%) | 0.01 | 11-29% |
| Hypoglycemia | 2 (0.85%) | 34 (24%) | 45 (5.1%) | 0.0000 | 5-25% |
| Hypocalcaemia | 4 (1.71%) | - | 48 (5.5%) | 0.01 | 4% |
| Polycythemia | 12 (5.1%) | - | 117 (13.3%) | 0.0005 | 5-33% |
| Congenital malformation | 8 (3.4%) | 34 (24%) | 26 (3.0%) | 0.00000 | 1.7-9.4% |

* D.M. Jensen et al (Denmark) Diabetic Medicine2000; 17:281-286
**K.R.Huddle .(South Africa). Diabetes International 1999; 9(3): 53-55
***Up to Date 10.1. 2002

## DISCUSSION

The results showed that CS were more frequent in GDM group than in DM group (47.3% vs. 44.2%) which is statistically significant (P=0.0011) compared with international studies. The frequency of pre-term delivery tended to be higher in DM group than GDM group (9.3% vs. 8.1%) (Table 3); percent of preterm labor in both groups was (8.5%) which is not statistically significant when compared to international studies.

Abortion was more in DM group than GDM group (11.6 % vs.4%) and this was due to uncontrolled BS in type 1 DM, type 2 DM before planning for pregnancy. Percent of abortion in both groups was (6.8%), which is statistically significant (P value =0.050) compared with international studies (Table 5). Pre-eclampsia was defined as blood pressure 140/90mmHg and proteinuria on a urine protein test strip (equal to 1.0 g/l).[10]

Pre-eclampsia was more frequent in GDM group than in DM group (10.8% vs6.97%) (Table 3) which is statistically significant when compared to international studies (P value =0.001).

Our study confirms that poor metabolic control before and during pregnancy is associated with perinatal mortality, intra uterine fetal death, still birth and congenital malformations. We found an increased risk of macrosomia, despite earlier

delivery in women with type 1diabetes. One fifth of the diabetic women delivered macrosomic infants (birth weight >4000g). Macrosomia was (20.5% vs 9-28%) in our study compared with collective studies which is not statistically significant P value (P=0.27).[11] These outcomes were predated by inadequate maternal self-care (home monitoring of blood glucose) and professional care (preconceptional guidance).

Women with adverse pregnancy outcome seemed to have slightly more in DM group than GDM group, hypocalcaemia (<7 mg/dl, normal 8.2-10.2 mg/dl), polycythemia (PCV> 65 %, normal value<55%) were more in DM group than GDM group, which is statistically significant (P value =0.0005) compared with international studies (Table 6). Hypocalcemia was 1.71% compared with collective studies 4% which is statistically significant (P=.01). Hypoglycemia (<40 mg/dl) were less in our group than international group 0.85% vs 5-25%.[12]

Hyperbilirubinemia was similar to international studies.[13] Hypoglycemia, hypocalcemia, polycythemia and congenital malformation were more in DM group than GDM group. When compared to international studies, our results were similar to these studies in regard to caesarean section, pre-term labor and pre-eclampsia. Abortion rates was higher in our group than the European rates but approaching the rates from South Africa.[14] As far fetal outcomes, results of our study were nearly similar to other international rates in regard to macrosomia and congenital malformations. Hypocalcaemia and polycythemia were lower than other international rates.[15]

## CONCLUSION

Diabetes mellitus in pregnancy is associated with higher rates of adverse maternal and fetal outcomes than GDM indicating that DM in pregnancy is a serious condition. Strict glycemic control is of paramount importance in reducing these adverse outcomes. Our data suggest that glycemic control, self-care, and education of the patient still need to be improved significantlywith adequate control using daily glucose monitoring in all patients.

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**Conflict of Interest:** None declared
Rec. Date: Apr 24, 2013 Accept Date: Jul 15, 2013

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