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PREGNANCY OUTCOMES IN WOMEN WITH GESTATIONAL DIABETES COMPARED WITH THE GENERAL OBSTETRIC POPULATION

By

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is the most prevalent metabolic disorder during pregnancy. It is described as the vulnerability to impaired glucose tolerance of multiple severities, usually during pregnancy.

Objective: To compare pregnancy outcome in pregnant women with gestational diabetes mellitus and pregnant women in general population.

Patients and Methods: A prospective non-intervention observational study was conducted in Obstetrics and Gynecology Department, Faculty of Medicine, Al-Azhar University, Samanoud General Hospital and Private Clinics during the period from October 2017 to October 2020. This study included 200 primigravida singleton pregnant women between 24 weeks and 28 weeks of gestation divided into two equal groups: case group included pregnant women attended for their routine antenatal care and discovered to have gestational diabetes and control group included normal healthy pregnant women attended for their routine antenatal care.

Results: Fetal weight was significantly higher among study group than controls. Fetal complications in the form of Large for Gestational Age (LGA), premature, shoulder dystocia, hypoglycemia and hyperbilirubinemia were significantly higher among study group than controls. Neonatal Intensive Care Unit (NICU) admission was significantly higher among study group was (14%) than controls (3%).

Conclusion: Increased maternal and fetal morbidity is linked with maternity gestational diabetes. Early screening, diagnosis, closer monitoring, and intervention were also important to minimize short and long-term maternal and fetal adverse effects, in particular in populations that are high-risk.

Keywords: Gestational Diabetes, Pregnancy Outcomes, General Obstetric Population.

INTRODUCTION

Gestational diabetes mellitus (GDM) is the most prevalent metabolic disorder during pregnancy. It described as the vulnerability to the glucose of multiple severities, usually during pregnancy. It is usually diagnosed with an oral glucose tolerance test in the second trimester of pregnancy at 24 to 28 weeks of gestation *(Colberg et al., 2013).* Numerous epidemiological research suggests that, based on the demographic surveyed and the diagnosis criteria, this condition affects between 1 and 18% of pregnancies. Its results are increasing gradually *(Kaiser et al., 2013).*

Maternal risks of gestational diabetes mellitus (GDM) have also been

established as: having gestational diabetes mellite (GDM) history, diabetes family history, obesity, chronic urinary tract infections, treatment of miscarriage, unexplained neonatal mortality, macrosomal infants, late, pre-eclampsia and early maternal age *(Khan et al., 2013)*. Patients with prior experience of diabetes mellitus (chronic/chronic kidney disease) and obesity medical problems *(Al-Azemi et al., 2013)*.

In an effort to unite the gestational diabetes mellitus (GDM) criteria worldwide, the International Association of Diabetes and Maternity Research Groups (IADPSG) have adopted gestational diabetes mellitus (GDM) criteria. The IADPSG requirements require three samples: fasting, one hour, and two hours after 75g glucose, where two specimens, namely fasting, and two hours, are required as a WHO criterion *(Nallaperumal et al., 2013)*. Gestational diabetes mellitus (GDM) is a reversible disease and the risk associated with this is effectively minimized by women with a sufficient control of their glucose levels *(Bhat et al., 2012)*.

Pregnancies affected by GDM bear a chance of adverse effects such as a caesarean section needed due to fetal macrosomia. Macrosomia is leading to the accelerated fetal growth of maternal hyperglycemia *(Kamana et al., 2015)*. The prevalence of progression from GDM to abnormal glucose or type 2 diabetes varies greatly. The lifetime cumulative incidence of diabetes among women with GDM is about 60% *(Noctor and Dunne, 2015)*.

It is necessary to recognize pregnant women with GDM risk in the light of these associations in order to introduce preventive management such as lifestyle amendments *(Webber et al., 2015)*.

In this research, we intended to compare pregnancy outcomes in pregnant women with gestational diabetes mellitus and pregnant women in general population.

PATIENTS AND METHODS

A prospective non-intervention observational study conducted in Obstetrics and Gynecology Department, Faculty of Medicine, Al-Azhar University, Samanoud general hospital and private clinics during the period from March 2017 to May 2020. This study included 200 singleton pregnant women between 24 weeks and 28 weeks of gestation divided into two groups:

- **Case group (100 pregnant)** included pregnant women attended for their routine antenatal care and discovered to have gestational diabetes.
- **Control group (100 pregnant)** included normal healthy pregnant women attended for their routine antenatal care.

Ethical approval:

The study was approved by the Ethics Board of Al-Azhar University and an informed written consent was taken from each participant in the study.

Inclusion criteria:

- Primi-gravida.
- Singleton pregnancies.

Exclusion criteria:

- Pre-existing diabetes and other endocrine diseases (e.g.,

hyperthyroidism, hypothyroidism and Cushing's syndrome).

- Multiple pregnancies.
- History of chronic hypertension, heart disease, hematological disease or renal disease.
- Taking corticosteroids.
- History of known fetal anomaly.

Methods:

All cases who met inclusion criteria had been subjected to the following:

- Full history taking: including personal, present, past, family, obstetric, contraceptive and menstrual history, gestational age is assessed by means of first day of last menstrual period (LMP).
- General examination and abdominal examination
- Investigations:
  - **Maternal investigations:** (CBC, FBS, 2-hour postprandial sugar and Urine analysis).
  - **Fetal investigations:** included obstetric ultrasound and CTG for fetal well-being.

Women had been screened for gestational diabetes using the 2-hour 75 g oral glucose tolerance test (OGTT). Diagnose gestational diabetes if the woman has either [15]:

- A fasting plasma glucose level of 5.6mmol/liter (100.8 mg/dl) or above or
- A 2-hour plasma glucose level of 7.8mmol/liter (140.4mg/dl) or above

In all women with gestational diabetes, HbA1c levels were assessed at diagnosis to determine which women may have prior type 2 diabetes. People with gestational diabetes have been taught blood glucose self-monitoring, and women with rapid plasma glucose levels below 7mmol/liter (126 mg/dl) were given diagnosis for dietary changes and workouts. In women with gestational diabetes with rapid plasma glucose of 7.0mmol/l (126mg/dl) or higher diagnoses, we proposed prompt insulin therapy and improvements in food and exercise. *(National Institute for Health and Care Excellence. 2015)*.

Statistical Analysis of Data:

The collected data organized, tabulated and statistically analyzed using are statistical package for social sciences (SPSS) version 22 (SPSS Inc, Chicago, USA). For qualitative data, frequency and percent distributions were calculated. For quantitative data, mean, standard Deviation (SD), minimum and maximum was calculated. Statistical significance was defined as P value < 0.05.

The following tests were done:

- **Independent-samples t-test** of significance was used when comparing between two means.
- **Chi-square test** for categorical variables, to compare between different groups.
- **Mann-Whitney U test** was used to compare age.

RESULTS

There was no significant difference regard age or Gestational Age. Mean BMI was significantly higher among study group (30.56±4.33) than control (25.23±3.28) (p=0.001) with significant higher percentage of obese among study group (47%). Also, study group had higher family history of diabetes than controls (p<0.001) **(Table 1)**.

Table (1): Basic demographic data distribution between groups at time of beginning of the study

Parameters \ Groups			Study (N=100)	Control (N=100)	P
Age			32.25±9.91	29.1±8.78	0.113
Gestational Age			27.46±1.35	30.4±1.32	>0.05
BMI group	**Average**	**N**	13	66	**<0.001**
		%	13%	66%	
	Overweight	**N**	40	26	
		%	40%	26%	
	Obese	**N**	47	8	
		%	47%	8%	
	Mean ±SD		30.56±4.33	25.23±3.28	**0.001**
Family history of diabetes	**-VE**	**N**	23	73	**<0.001**
		%	23%	73%	
	1ST degree	**N**	56	17	
		%	56%	17%	
	Relative	**N**	21	10	
		%	21%	10%	

BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); GDM, gestational diabetes mellitus; SD, standard deviation.

Regarding fasting blood glucose (FBG), 2 hours postprandial and HbA1c at diagnosis, there were significantly higher among study group than control group while at delivery, FBG and HbA1c were non significantly higher among study group than control group and 2 hours postprandial was significantly higher among study group than control group **(Table 2)**.

Table (2): Marker distribution between groups at diagnosis and delivery

Parameters \ Groups	Study (N=100)	Control (N=100)	P
At Diagnosis			
FBG	105.83±6.7	75.66±6.64	**0.000**
2 hours postprandial	166.66±7.39	132.06±8.77	**0.000**
HbA1c	6.29±0.48	5.36±0.35	**0.026**
At Delivery			
FBG	91.15±5.3	77.31±4.24	0.182
2 hours postprandial	158.37±8.46	126.84±6.27	**0.000**
HbA1c	6.08±1.35	5.76±1.18	0.105

FBG, fasting blood glucose.

As regard to maternal complications, pregnancy induced hypertension, prolonged 2nd stage; postpartum hemorrhage and genital tract injury were higher in study group than control. There was statistically no significant difference between both groups as regard to prolonged 2nd stage and postpartum hemorrhage **(Table 3)**.

Table (3): Comparison between both groups as regard to maternal complications

Parameters \ Groups		Study (N=100)	Control (N=100)	P
Pregnancy induced hypertension	**N**	2	1	>0.05
	%	2%	1%	
Prolonged 2nd stage	**N**	4	2	NS>0.05
	%	4%	2%	
Postpartum hemorrhage	**N**	1	0	NS>0.05
	%	1%	0%	
Genital tract injury	**N**	3	2	>0.05
	%	3%	2%	

There was significant difference between groups as regard to mode of delivery (p=0.001). CS rate was higher among gestational diabetes group (49%) **(Table 4)**.

Table (4): Obstetric characters distribution between groups

Parameters \ Groups			Study (N=100)	Control (N=100)	P
Mode of delivery	**CS**	**N**	49	30	**0.006**
		%	49.0%	30%	
	Vaginal	**N**	51	70	
		%	51.0%	70%	
Intra operative blood transfusion	**+VE**	**N**	2	1	>0.05
		%	2%	1%	
	-VE	**N**	98	99	
		%	98%	99%	

Regarding fetal outcome, fetal weight was significantly higher among study group (3850.0±513.7) than controls (3396.6±334) (p<0.001). Fetal complications in the form of LGA, premature, shoulder dystocia, hypoglycemia and hyperbilirubinemia were significantly higher among study group than controls. NICU admission was significantly higher among study group (14%) than controls (3%) (p=0.006) **(Table 5)**.

Table (5): Fetal outcome distribution between groups

Parameters \ Groups			Study (N=100)	Control (N=100)	P
Fetal weight	Mean ±SD		3850.0±513.7	3396.6±334.7	**<0.001**
Fetal sex	**Male**	**N**	44	47	>0.05
		%	44%	47%	
	Female	**N**	56	53	
		%	56%	53%	
Fetal complication	**No**	**N**	57	97	<0.001
		%	57%	97%	
	LGA	**N**	33	4	<**0.001**
		%	33%	4%	
	Premature	**N**	3	1	**>0.05**
		%	3%	1%	
	Neonatal death	**N**	1	0	**>0.05**
		%	1%	0%	
	Shoulder dystocia	**N**	4	0	**0.02**
		%	4%	0%	
	Hypoglycemia	**N**	3	0	**0.04**
		%	3%	0%	
	Hyperbilirubinemia	**N**	11	2	<**0.01**
		%	11%	2%	
NICU admission	**Yes**	**N**	14	3	<**0.006**
		%	14%	3%	
	No	**N**	86	97	
		%	86%	97%	

LGA, large for gestational age; NICU, neonatal intensive care unit.

DISCUSSION

The elevated risk of pregnancy induced hypertension (PIH) with relative risk varies from 1.4 to 4.15. It has been correlated with gestational diabetes mellitus, although some reports indicate that the association between PIH and GDM was not well-understood. This further raised the cesarean delivery rate by up to 57,4% and has a higher influence in obese and/or prior cesarean section history cases. GDM has been linked with a risk of labor-induction of 33-38 percent, premature membrane breakdown, antepartum hemorrhage (APH) and postpartum hemorrhage (PPH) *(Kari et al., 2017).*

The present study showed that Fasting Blood Glucose (FBG), 2 hours postprandial and Hemoglobin A1c (HbA1c) were significantly higher among study group than control group. At delivery, FBG and HbA1c were non significantly higher among study group than control group, while 2 hours postprandial was significantly higher among study group than control group.

Our findings were confirmed by a study conducted by *Muche and Others (2019)* who suggested that plasma glucose levels were considerably different in women with GDM and standard glucose level in three oral glucose tolerance tests. *Capula et al. (2013)* found that the GDM treatment was effective in a wide decline

of the HbA1c distribution with regard to HbA1c during OGTT time.

The present research has shown that hypertension, extended 2nd stage, postpartum hemorrhage and genital tract injury in the study are more important than control for maternal complications. The disparity in terms of long 2nd stage and postpartum hemorrhages were not statistically important.

The influence of pregnancy-induced hypertension (PIH), hypothyroidism and polyhydramnios in diabetic pregnancies were further observed in the study of *Saxena et al. (2013).* But there was no substantial difference between both classes with respect to pre-eclampsia in the analysis of *Gracelyn & Saranya (2016)* and *Rezaie et al., (2016).*

The study of *Muche et al. (2019)* had at least one type of adverse maternal outcome. The proportion of adverse maternal outcome among mothers with and without GDM was 52.9% and 29.5%, respectively. The overall incidence of PIH was 5.3%, induction of labor was 13.5%, PROM was 9.9%, APH (Antepartum hemorrhage) was 7.5%, and PPH was 4.9%. The incidence of PIH, induction of labor, PROM, APH, and PPH (Postpartum hemorrhage) was higher among women with GDM compared to those with non-GDM. It might be because GDM has a negative effect on placenta previa and abruption placentae leading to APH.

In the study in our hands, there was significant difference between groups as regard to mode of delivery. Cesarean section (CS) rate was higher among gestational diabetes group (49%). Our findings were compatible with the research of *Saxena et al. (2011)* who observed that the delivery rate of caesareans was 71.4% to avoid potential shoulder dystocia, birth traumas and so on. The strategy is to take a cesarean option decision after an assessment of fetopelvic disproportion. The loss of work, failure to stimulate and irregular presentations are other explanations of cesarean delivery. In the research population there was minimal overall birth weight and fetopelvic disproportion, surgical and non-progressive delivery were not observed, likely because there were minimal samples and strict pregnancy range criteria.

The present study showed that fetal weight was significantly higher among study group than controls. Fetal complications LGA, premature, shoulder dystocia, hypoglycemia and hyperbilirubinemia were significantly higher among study group than controls. NICU admission was significantly higher among study group (14%) than controls (3%) which agree with a study of *slagjana et al. (2020)* that NICU admission in between pregnant women with GDM was significantly higher (about 12%) than in normoglycemic pregnant women.

Our results were supported by *Rezaie and Others (2016)* who found that the difference in macrosomy between the two groups was statistically significant. Macrosomal disorder, contributing to shoulder dystocia and brachial plexus trauma, and high cesarean section rates due to lack of progress at labor, was one of the most common complication of gestational diabetes.

Gracelyn and Saranya (2016) revealed that macrosomic baby with a weight of > 4 kg among pregnant women was 8.6%.

In the GDM pregnant, 42.37 percent were delivering macrosomic baby compared to 4.08 percent of non GDM, However, they considered GDM and previous macrosomia to be unfavorable.

Saxena et al. (2011) recorded that the average birth weight for diabetic maternal neonates was 3.1±0.9 kg and for control groups was 2.7±0.5 kg. Biochemical and metabolic investigations have shown that neonates from diabetic mothers had slightly high hypocalcemia, hyperbilirubinemia and polycythemia. Congenital abnormalities have been significantly elevated even in neonates with diabetes women and have been seen in non-diabetic neonates. Several anomalies were found, including palate splinters, foot drop (n=1), pericardial splash, and anencephaly meningocele.

CONCLUSION

Increased maternal and fetal morbidity was linked with maternity gestational diabetes. Early screening, diagnosis, closer monitoring, and intervention were also important to minimize short and long-term maternal and fetal adverse effects, in particular in populations that were high-risk.

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مقارنة ناتج الحمل في السيدات الحوامل المصابات بسكري الحمل مع أقرانهن الغير مصابات

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خلفيـــة البحـــث: داء ســكري الحمــل هــو اضــطراب التمثيــل الغــذائي الأكثــر انتشـــارًا أثنـــاء الحمـــل. يوصـــف بأنـــه قابليـــة الإصـــابة بضـــعف تحمـــل الجلوكوز متعدد الشدة، ويظهر عادة أثناء الحمل.

الهــدف مــن البحــث: مقارنــة نتــائج الحمــل عنــد النســاء الحوامــل المصــابات بداء سكري الحمل والنساء الحوامل في عموم السكان.

المريضـــات وطـــرق البحـــث: تـــم إجـــراء دراســـة قائمـــة علـــى الملاحظـــة دون تـــدخل مســـتقبلي فـــي قســـم أمـــراض النســـاء والتوليـــد، كليـــة الطـــب، جامعـــة الأزهـــر، مستشـــفى ســـمنود العـــام والعيـــادات الخاصـــة خـــلال الفتـــرة مـــن أكتـــوبر 2017 إلـــى أكتـــوبر 2020. وقـــد تضـــمنت هـــذه الدراســـة 200 مـــن الســـيدات اللاتـــي حملـــن لأول مـــرة فـــي جنـــين مفـــرد ومـــدة الحمـــل بـــين 24 أســـبوعًا و28 أســـبوعًا مقســـمة إلـــى مجمـــوعتين متســـاويتين: مجموعـــة المصـــابات وتضـــمنت نســـاء حوامـــل حضـــرن لرعـــايتهن الروتينيـــة قبـــل الـــولادة واكتشـــفن أنهـــن مصـــابات بســـكري الحمـــل ومجموعـــة الضـــوابط وتتضـــمن النســـاء الحوامـــل الأصـــحاء اللائـــي حضـــرن للرعايـــة الروتينيـــة قبل الولادة.

نتـــائج البحـــث: كـــان وزن الجنـــين أعلـــى بشـــكل ملحـــوظ بـــين مجموعـــة المصـــابات مـــن مجموعـــة الضـــوابط وكانـــت المضـــاعفات الجنينيـــة فـــي شـــكل

كبير بالنسبة لمدة الحمل والخدج وعسر ولادة الكتف ونقص السكر في الدم وفرط بيليروبين الدم أعلى بشكل ملحوظ بين المجموعة المصابة والمجموعة الضابطة وكان الحجز في وحدة العناية المركزة لحديثي الولادة أعلى بشكل ملحوظ بين المجموعة المصابة (14%) من المجموعة الضابطة (3%).

الاستنتاج: زيادة المضاعفات المرضية للام والجنين مرتبطة بسكري الحمل. والفحص المبكر والتشخيص والمراقبة الوثيقة والتدخل مهمًا أيضًا لتقليل آثار المضاعفات القصيرة وطويلة الأمد على الأم والجنين، لا سيما في الفئات السكانية الأكثر عرضة للإصابة بسكري الحمل.

الكلمات الدالة: سكري الحمل، نتائج الحمل، الحوامل من السكان.