Neonatal Outcomes of Pre gestational And Gestational Diabetes Mellitus

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Abstract

Background: Diabetes in pregnancy is associated with an increased risk of complications in both mother and fetus. Our study aims to analyze the neonatal complications of pre gestational diabetes mellitus PGDM as opposed to gestational diabetes mellitus GDM.

Patient and methods: This cross sectional study included 70 pregnancies with diabetes mellitus among 2873 women admitted to the department of Obstetrics and Gynecology in Al-Khadhimya Teaching Hospital between the first of January to the first of July 2010, the mothers were divided in to PGDM mothers group and GDM mothers group. Data was collected by questionnaires.

Results: the percentage of neonatal complications in PGDM were ; (15.6%) congenital anomalies, (18.8%) respiratory distress syndrome, (25%) hypoglycemia, (6.3%) neonatal jaundice, (12.5%) macrosomia, (0%) polycythemia, (3.1%) hypocalcemia, (6.3%) prematurity, (9.4%) perinatal mortality rate. In infant of GDM the complications were ; (0%) congenital anomalies, (2.6%) respiratory distress syndrome, (26.3%) hypoglycemia, (15.8%) neonatal jaundice, (13.2%) macrosomia, (5.3%) polycythemia, (2.6%) hypocalcemia, (13.2%) prematurity, (5.3%) perinatal mortality rate. The percentage of maternal pregnancy induced hypertension PIH was significantly higher in PGDM (43.8%) than GDM (21.1%), the P. value was (0.04). There is a significant risk of PGDM than the GDM in regarding to the congenital anomalies and respiratory distress syndrome, P. value was 0.011, 0.025 respectively.

Conclusions: The percentage of maternal and neonatal complications was higher in

PGDM than GDM, so strict control of blood glucose level during pregnancy and education of the diabetic women is essential before and during gestation.

Key words: Pre gestational diabetes mellitus, gestational diabetes mellitus, neonatal complications of diabetic mother.

Introduction

Diabetes is the second commonest medical complication of pregnancy after hypertension[1].The term gestational diabetes mellitus GDM refer to hyperglycemia occurring for the first time during pregnancy, while the term pre gestational diabetes mellitus PGDM refer to patient who have diabetes before pregnancy, which is almost type 1 diabetes[2]. Maternal carbohydrate metabolism is significantly altered during pregnancy due to increased insulin resistance, in type 1 DM the insulin requirement increase[3]. Periconception glucose control reduces the risk of congenital anomalies and other adverse outcome, and the glucose control during labour reduce the risk of neonatal hypoglycemia[4]. Maternal hyperglycemia during early pregnancy increase the rate of spontaneous abortion at the 6^{th}-7^{th} week of gestation[5].

Neonatal effect:

Macrosomia which is defined as birth weight greater than 90^{th} percentile or above 4 kg, it occur in all types of diabetes in pregnancy except in those with vasculopathy that result in intrauterine growth retardation[6].

Pre mature delivery which occur in infant with poor maternal glycemic control and associated with high rate of urinary tract infections or have associated maternal preeclampsia leading to iatrogenic premature delivery[7].

Birth injury and asphyxia due to macrosomia which cause shoulder dystocia, clavicular or humeral fracture, perinatal asphyxia, cephaloheamatoma, subdural hemorrhage and facial palsy[8].

Respiratory distress syndrome increased incidence may relate to the antagonistic effect of insulin on stimulation of surfactant synthesis by cortisol[9]

Congenital anomalies incidence increase 3 folds in infant of DM mother, the cardiac malformations(VSD, ASD, TGV, double outlet right ventricle),and lumbosacral agenesis are the most common[10].

Metabolic disorders as hypoglycemia which defined as glucose level at which brain function begin to be impaired, generally in age of less than 48 hours plasma glucose level < 50-60 mg/dl, and in age more than 48 hours the plasma glucose level < 60-70 mg/dl is considered as hypoglycemia, (the whole blood glucose concentration is 10%-20% lower than plasma glucose)[11].Insulin dependent diabetic mothers tend to have lower plasma magnesium level throughout pregnancy, and infants have lower cord and 24 h postpartum plasma level of calcium and parathyroid hormone [12]. Also hyperbilirubinemia and polycythemia are

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common metabolic disorders in infant of DM mother[13].

Diagnosis:

Glucose level monitoring at the first hour of life, then every one hour for 8 hours, then every 4-6 hour for 24 hour of age[14].

Serum calcium level should be checked at the first 48 hr., if low, then check serum magnesium[15].

Serum bilirubin level and hematocrit should be checked also.

Radiological and echocardiography performed if there is respiratory, cardiac or skeletal problems.

Management:

Any patient develop hypoglycemia, intravenous bolus of 2ml/kg of 10% glucose water should be started, then glucose infusion should be given at rate of 6-8mg/kg/min., if still hypoglycemia then administer Diazoxide, and if still no response then Octereotid could be useful[16].

Patient with hypocalcemia, 10% calcium gluconate can be given by slow intravenous infusion, it usually improve in 3-4 days[17].

Neonatal jaundice should be frequently checked and treated by phototherapy and exchange transfusion if needed. Patient with symptomatic polycythemia with PCV more than 65% may need partial exchange. Also good management needed for patient with respiratory distress syndrome to maintain normal O_2 and CO_2 level by using the least invasive technique[18].

Prognosis:

Neurodevelopmental outcome of infants of well controlled DM mothers is similar to normal infant, however, poorly controlled DM mothers may have infants with developmental abnormality especially if they have prolonged recurrent and severe symptomatic hypoglycemia[19].

Patient and Methods

This is across sectional study done in Al-Khadhimya teaching hospital from the first of January to the first of july 2010. During this period 2873 neonate were delivered, 70 of them were infants of diabetic mothers IDMs .Thirty two were infants of pre gestational diabetic mothers PGDM and thirty eight were infants of gestational diabetic mothers GDM .

The mothers were interviewed to determine their age,gravida, parity, type of D.M, history of previous affected baby (still birth, hypoglycemia, congenital anomalies . .), antenatal care, presence of associated hypertension, drug history for the treatment of D.M or other diseases, also we investigated for the smoking history .

The neonates were studied for the type of delivery (C.S or NVD) and examined for the body weight , gestational age , signs of birth trauma, respiratory distress, hypoglycemia , hypocalcemia,

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polycythemia , cardiac and gross congenital anomalies .Full investigations were carried out including :

Blood suger : Done for all neonats by heel prick and read by glucometer , in the first hour of life and repeated every hr. in the first 8 hours and then every 4-6 hr. in the first 24 hr. of life.

Total serum bilirubin : Done for all patients , by heel prick and read by the bilirubin meter, in the first day of life and follow up was done according to clinical examination.

PCV: Done for all patients, samples aspirated from the peripheral vein, in the first hr., 4 hr., 24 hr. of life.

Serum calcium level: Done for patient with jitteriness or convulsion with normal blood sugar, samples were aspirated from the peripheral vein without tornica.

Chest X ray: Done for patient with signs of respiratory distress.

Echo study: Done for patients who suspected to have cardiac anomalies.

Statistical analysis was performed using SPSS version 10 program, counts with percentage and pearson X^2 test were used, for categorical variables, a P. value less than 0.05 was considered significant.

Results:

Among 2873 deliveries , 70 infants were delivered to diabetic mothers , 32(45.7%) of them for pre-gestational diabetes and 38(54.2%) for gestational diabetes , 44(62.9%) of the infants were males and 26(37.1%) were females.

The GA in 63(90%) patients was > 37 week while 7(10%) infantswere < 37 week , birth weight of 5(7.1%) patients was of low birth weight (< 2.5 Kg) while 9(12.9%) patients had birth weight > 4 Kg and considered macrosomic babies, while 56(80%) neonates were weighting 2.5-4 kg, as shown in tables 1 , 2 .

Table.1: Distribution between the types of diabetes with the gestational age .

	type of diabetes mellitus	Total

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GA	PGDM	GDM	
Above 37 week	30	33	63
	93.8%	86.8%	90.0%
Below 37 week	2	5	7
	6.3%	13.2%	10.0%
Total	32	38	70

Table.2: Distribution between the types of diabetes and the birthweight

	type of diabetes mellitus		Total
Birth weight	PGDM	GDM	
Weight 2500-4000	24	32	56
	75.0%	84.2%	80.0%
Weight >4000	4	5	9
	12.5%	13.2%	12.9%
Weight <2500	4	1	5
	12.5%	2.6%	7.1%
Total	32	38	70

The percentage of morbidities in our study depended on the chief complaint by which the patient required intervention . Our study showed 18(25.7%) patients with hypoglycemia , 8(11.4%) patients with neonatal jaundice, 2(2.9%) with polycythemia , 2(2.9%) with hypocalcemia , as seen in tables 3,4 .

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Table.3: Distribution between the types of diabetes and the blood sugar

Blood sugar	type of diabetes mellitus		Total
	PGDM	GDM	
above 40 mg/dl	24	28	52
	75.0%	73.7%	74.3%
below 40 mg/dl	8	10	18
	25.0%	26.3%	25.7%
Total	32	38	70

Table.4: Distribution between types of diabetes and risk of jaundice

	type of diabetes mellitus		Total
jaundice	PGDM	GDM	
No jaundice	30	32	62
	93.8%	84.2%	88.6%
Jaundice present	2	6	8
	6.3%	15.8%	11.4%
Total	32	38	70

This study showed 7(10%) patients with RDS, 5(7.1%) with congenital anomalies, this morbidity is more in infants of PGDM with significant difference compared with GDM in the incidence of RDSand congenital anomalies (P. value <0.05) , as shown in tables 5,6.

Table.5: Risk of RDS with the types of diabetes

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	type of diabetes mellitus		Total
RDS	PGDM	GDM	
No RDS	26	37	63
	81.3%	97.4%	90.0%
RDS	6	1	7
	18.8%	2.6%	10.0%
Total	32	38	70

The P.value is 0.025

Table.6: Risk of congenital anomalies with the types of diabetes

	type of diabetes mellitus		Total
Congenital anomalies	PGDM	GDM	
No congenital anomalies	27	38	65
	84.4%	100.0%	92.9%
Congenital anomalies	5	0	5
	15.6%	.0%	7.1%
Total	32	38	70

The P.value is 0.011

Most of the mothers in our study were with advanced age (> 35 years) and parity (multipara) , 53(75.7%) of them with positive antenatal care , 40(57.1%) of them treated by insulin , 24(34.3%) treated by diet only while 6(8.6%) mothers

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treated by insulin and antihypertensive drugs as shown in table 7.

Table.7: Treatment regimen with the types of diabetes

treatment	type of diabetes mellitus		Total
	PGDM	GDM	
diet only	3	21	24
	9.4%	55.3%	34.3%
insulin	26	14	40
	81.3%	36.8%	57.1%
insulin +antihypertensive drugs	3	3	6
	9.4%	7.9%	8.6%
Total	32	38	70

There are 16(22.1%) mothers have hypertension which occurred during pregnancy (PIH) , also there are 27(38.6%) mother with history of previously affected babies (abortion , still birth , macrosomia , hypoglycemia . . .) , regarding these two maternal conditions , our study showed significant risk in PGDM than in GDM with p. value < 0.05 as shown in tables 8 , 9 .

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Table.8: Risk of PIH with the types of diabetes

	PGDM	GDM	
no PIH	21	33	54
	65.6%	86.8%	77.1%
PIH present	11	5	16
Total	34.4%	13.2%	22.9%

The P.value is 0.042

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Table.9: Presence of history of previous affected babies with thetypes of diabetes

HX of previous affected babies	type of diabetes mellitus		Total
	PGDM	GDM	
Negative HX	15	28	43
	46.9%	73.7%	61.4%
Positive HX	17	10	27
	53.1%	26.3%	38.6%
Total	32	38	70

The P.value is 0.022

Discussion:

The rate of PGDM and GDM appearing to be increasing overtime, clinicians should be aware about the adverse outcome and arrange referral to appropriate services[19].

Regarding the neonatal complications, our study showed a significant risk of congenital anomalies (CNS and CVS) seen in PGDM(15.6%) more than GDM(0%). This result was also seen in a study in California at 2013 which found increase fetal CNS anomalies in PGDM versus GDM[20]. Also a study in Ireland at 2008 found the CVS and the CNS anomalies are the most common anomalies in PGDM[21].

Our study found a significant risk of RDS in PGDM (18.8%) than GDM (2.6%), the same result was seen in a study in Pakistan in 2008 which showed the percentage of RDS is higher in PGDM than GDM[22].

The metabolic changes in our study (hypoglycemia, hypocalcemia) and polycythemia was more common in PGDM than GDM, but it was not statistically significant, A study in Oman in 2015 found the neonatal hypoglycemia, neonatal jaundice were higher in PGDM than GDM and was significant statistically[23].

The birth weight and gestational age in our study was of no significant difference between the two groups, but a study in Thailand in 2006 found the PGDM associates with higher risk of macrosomia[24],

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الخلفية والاهداف:

داء السكري في الحمل يسبب زيادة في خطورة حدوث المضاعفات للام والطفل، نحن نهدف من خلال ه\ا البحث ان نقارن بين مضاعفات داء السكري للامهات المصابات بداء السكري قبل الحمل والمصابات بداء سكري الحمل.

الموضوع وطريقة العمل:

تمت الدراسة على سبعين امراة مصابة بداء السكري بوقت الولادة وعلى مواليدهم الجدد في مستشفى الكاظمية التعليمي للفترة مابين ١-١-٢٠١٠ الى ١-٧-٢٠٢٠ وتم تقسيمهن الى مجموعتين : مجموعة امهات اصيبوا بداء السكري قبل الحمل والمجموعة الاخرى اصيبوا بداء سكري الحمل، وتم عمل

while a study in Saudi Arabia in 2017 found increased risk of premature delivery (between 34-36 weeks of gestation) in PGDM than GDM[25] .

Birth trauma in our study was more in PGDM than GDM , the same result was seen in California study in 2013 which found that infants of PGDM mother have more incidence of shoulder dystocia than infants of GDM mothers[20].

Perinatal mortality rate in our study was more in PGDM than GDM, a study in Oman in 2010 also have the same result[26].

In regarding to maternal complications, our study found increased risk of pregnancy induced hypertension in PGDM than GDM, the same result seen in a study in America in 2000[27], also the study in Saudi Arabia in 2017 found PIH increased in PGDM than GDM mothers[25]

Our study found that the PGDM have a significant history of previously affected babies than GDM, this result was also seen in a study in Al-Mosel-Iraq in 2007 [28].

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ومتلازمة عسر التنفس الولادي حيث ان درجة الاهمية كانت ٠.٠١١ ، ٠.٠٢٥ على التوالي .

الاستنتاج :

نسبة حدوث المضاعفات للام والطفل اعلى في الامهات المصابات بداء السكري قبل الحمل من الامهات المصابات بداء سكري الحمل وعليه ولذلك يجب ان نحافظ على مستويات سكر طبيعية اثناء الحمل مع ملاحظة ان تثقيف الامهات المصابات بداء السكري عن خطورة هذا المرض على الحمل هي خطوة مهمة قبل بداية الحمل .

Conclusions

1. Diabetes during pregnancy have a serious effect on the neonates and the mothers.

2. The PGDM have more neonatal effect than GDM due to the higher risk of development of congenital anomalies and RDS.

3. The PGDM have more maternal morbidity than GDMbecause of higher risk of associated PIH and this may give a double negative effect on her infant.

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الدراسة من خلال استبيان المعلومات عن الام والطفل.

النتائج:

اولا: نسبة الاصابة بارتفاع ضغط الدم المصاحب للحمل في النساء المصابات بداء السكري قبل الحمل كانت (٣٤.٤%)، بينما في الامهات المصابات بسكري الحمل هي(١٣.٢%).

ثانيا: نسبة حدوث المضاعفات في المواليد الجدد للامهات المصابات بداء السكري قبل الحمل هي: التشوهات الخلقية (١٥.٦%)، متلازمة عسر التنفس الولادي (١٨.٨%)، هبوط السكر (٢٥%)، اليرقان الولادي (٦.٣%)، التضخم الجسدي (١٢.٥%)، احمرار الدم (٠%)، هبوط الكالسيوم (٣.١%) ولادة مبكرة (٦.٣%)، ونسبة الوفيات كانت (٩.٤%). بينما النسب في الامهات المصابات بسكري الحمل هي: التشوهات الولادية (٠%)، متلازمة عسر التنفس الولادي (٢.٦%)، هبوط السكر (٢٦.٣%)، اليرقان الولادي (١٥.٨%)، التضخم الجسدي (١٣.٢%)، احمرار الدم (٥.٣%)، هبوط الكالسيوم (٢.٦%)، ولادة مبكرة (١٣.٢%)، ونسبة الوفيات كانت (٥.٣%) .

ثالثا: هناك خطورة واضحة على مواليد الامهات المصابات بداء السكري قبل الحمل من حيث نسبة الاصابة بالتشوهات الخلقية

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