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Review Article

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A Study of Neonatal Risks of Maternal Diabetes in Maternity University Hospital, Damascus, Syria

Raneem Haidar[1], Raghad Rustom[1] and Marwan Alhalabi[2,3]*

[1]*Faculty of Medicine, Damascus University, Damascus, Syria*

[2]*Division of Reproductive Medicine, Embryology and Genetics, Damascus University, Damascus, Syria*

[3]*Assisted Reproduction Unit, Orient Hospital, Damascus, Syria*

***Corresponding author**
Marwan Alhalabi, Division of Reproductive Medicine, Embryology and Genetics , Faculty of Medicine, Damascus University, Fayez Mansour St, Damascus, Syria. Mobile: +963966400055; E-mail: profalhalabi@icloud.com

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Abstract

To study the association between maternal diabetes and adverse neonatal outcomes of congenital malformations, neurological and respiratory problems and their relations to the type of diabetes mellitus.

Design: *A population-based retrospective cohort study.*

Setting: *Maternity University Hospital, Faculty of Medicine Damascus University, Damascus, Syria.*

Patients: *All newborns of maternal diabetes from January 2018- January 2019.*

Introduction

Several studies have been conducted on the prevalence of diabetes in pregnant women and its complications in newborns in some countries. The results indicate that in 25 - 50% of cases develop neonates' signs of hypoglycemia. This is a serious indicator that chronic diseases, especially diabetes, are causing high neonatal mortality in our country. The gestational diabetes mellitus has become one of the most common diseases affecting pregnant women and should be followed during pregnancy at birth and after birth due to its relationship with the incidence of congenital anomalies and other complications in the newborn of diabetes mother, such as neonatal jaundice, Acute Respiratory Distress Syndrome, hypoglycemia, fetal macrosomia, and myocardial infarction [1,2].

The incidence of fetal death in recent months has increased with the amniotic fluid, and systemic, cardiac, neurological, osteoarthritis, and type 2 diabetes are more frequent than normal [3]. Newborn of diabetes mother is never luckybecause death occurs 5% within the uterus up to 4 - 10% at birth and after birth, which is about 5 times more than natural mothers. The aim of our study was to assess the neonatal risks of maternal diabetes and to find solutions to alleviate it as much as possible.

In addition to their need for intensive care unit more than newborn of the natural mother [4]. The mother's excess amounts of blood glucose are transferred to the fetus during pregnancy. This causes the baby's body to secrete increased amounts of insulin, which results in increased tissue and fat deposits. The infant of a diabetic mother is often larger than expected for the gestational age. [4]

Methods

The study had an observational, retrospective, multicenter design. It involved neonates of pregnant women with diabetes in University Hospital Obstetrics in Damascus between January 2018 and January 2019.

Unlike insulin-dependent diabetes gestational diabetes generally does not cause birth defects. Women with gestational diabetes generally have normal blood glucose levels during the critical first trimester when the baby's organs form [5]. A newborn infant of a diabetic mother may develop one, or more, of the following:

The offspring of women with diabetes remain at increased risk for several complications, which includes congenital anomalies, fetal macrosomia, respiratory distress syndrome (RDS), and metabolic abnormalities as well as for long - term sequelae [6].

Macrosomia

Macrosomia refers to a baby that is considerably larger than normal. All of the nutrients the fetus receives come directly from the mother's blood. In 70% of the cases are due to increased insulin and in 25% the child is underdeveloped because of an advanced stage of diabetes in the mother, therefore, the disorder of vessels in the placenta reduces access to food after 37 weeks pregnant often.

These patients also have a threefold higher risk of having shoulder dystocia and, with it. the occasional brachial plexus injury.

If the maternal blood has too much glucose, the pancreas of the fetus senses the high glucose levels and produces more insulin in an attempt to use this glucose. The fetus converts the extra glucose to fat. Even when the mother has gestational diabetes [5]. The fetus is able to produce all the insulin it needs. The combination of high blood glucose levels from the mother and high insulin levels in the fetus results in large deposits of fat which causes the fetus to grow excessively large.

Inhalation of the Meconium

Long and hard abscess leads to hypoxia, which in turn leads to intrauterine insomnia and the occurrence of effective breathing movements leading to the entry of the meconium into the fetus's lungs and the occurrence of amniotic fluid sterilization and thus inhalation [7].

Birth Injury

Birth injury may occur due to the baby's large size and difficulty being born.

Paralysis occurs during normal birth so the cesarean section is preferred to avoid fractures and paralysis [8].

Large Gestational Age

The newborn is large for gestational age and therefore birth is 36 weeks or 37 weeks due to the difficulty of being born in week 40 [5].

Hypoglycemia

Hypoglycemia refers to low blood glucose in the baby immediately after delivery. This problem occurs if the mother's blood glucose levels have been consistently high causing the fetus to have a high level of insulin in its circulation After delivery, the baby continues to have a high insulin level, but it no longer hasa high level of glucose from its mother, resulting in the newborn's blood glucose level becomes very low. The baby's blood glucose level is checked after birth, and if the level is too low, it may be necessary to give the baby glucose intravenously [5].

Polycythemia

In this case, the number of red erythrocytes is large so that the degree of dissolution is high and when dissolved gives amino acids, including glutamate, which stimulates the secretion of insulin, which causes hypoglycemia and neonatal jaundice, and the large red blood cells consume more sugar, which is the main food [5].

Lack of Blood Magnesium

The amount of normal blood magnesium in the newborn is 1,6 -2,8 % mg, but the newborn of maternal diabetes has a deficiency that leads to tetanus.

Congenital Anomalies

The most frequent types of malformations involve the central nervous system and cardiovascular, gastrointestinal, genitourinary, and skeletal systems, with cardiac malformations being the most common [9]. Congenital anomalies occur in 10 % to 16 % of pregestational diabetic pregnancies compared with about 3 % in non-diabetics. This is largely related to maternal glucose control during organogenesis, which in turn is indirectly reflected in the glycosylated hemoglobin (HbA1c) percentage.

For HbA1c values greater than 8.5 mg percent, the anomaly rate is over 20 %. Cardiac anomalies complicate approximately 27 in 1,000 diabetic pregnancies as compared with 8 in 1,000 innondiabetic pregnancies. Also, the rate of neural tube defects in diabetics is about 20 in 1,000 versus 1 in 1,000 in the overall population. Although the numbers are not as dramatic as the incidence of heart and spine anomalies, fetuses of diabetics also are at slightly greater risk for GI and genitourinary abnormalities.Caudal regression syndrome is the best-known anomaly to which diabetes is linked, and it occurs in 1 in 200 diabetic pregnancies;this condition can involve many or only a few spinal segments [6].

Cardiac Problems: 30 percent of births suffer from hypertensive myocardial infarction, which develops in 5-10 percent of cases of myocardial infarction. The occurrence of cardiac malformations is characterized by a hole between the ventricle ASD and the rectangle of the honor triangle and the exchange of the origin of large blood vessels [9].

Structural Problems: Deformities in the limbs and absence of the bones of the disability and the bones "bones below the spine". Renal problems in which one or both of the kidneys are not produced. Kidney failure, criteria, or thrombosis of the renal vein [10].

Gastrointestinal problems are often associated with anorexia, anal mastectomy, stenosis, as well as stenosis, as well as small left stenosis syndrome.

Nervous problems, you may have cerebral edema caused by suffocation or hypoxia around the birth.

Respiratory Disorders

Respiratory distress syndrome in infants or newborns is a syndrome of neonatal and early-born infants, which is caused by a deficiency in the production of surfactant and immaturity in the formation of the lungs.

This syndrome affects 1% of newborn infants and is the main cause of premature death. The risk of infection decreases as pregnancy progresses. If the gestational age at birth is 26 to 28 weeks, the probability of infection is 50%, but if it is 30 to 31 weeks, it is reduced to 25%. The incidence of this syndrome increases if the mother has diabetes and appears clinically in the form of an increase in the speed and number of breathing times accompanied by increased effort and the use of respiratory muscles. It may be associated with cough, blemishes, and bluishness in the face and mucous membranes. This condition is caused by several causes, including what we callhemodialytic disease (HMD).

This condition is caused by several causes, including what we call hemodialytic disease (HMD), and the disease of Hellenic membranes produces a deficiency in the production of surfactant. This substance also keeps pneumonia open and prevents it from clogging atthe end of exhalation. The formation of this substance is completed in about 33-34 weeks of pregnancy. Therefore, this distress is found in neonatal of maternal diabetes, as the high secretion of the insulin hormone in the fetus reverses the production of the surfactant.

Symptoms: (shortness of breath, irregular heartbeat, insufficient oxygen of blood, skin color appears blue because of the low oxygen level in the skin, breathing is shallow and rapid).

Cyanosis develops and This is a sign of the lack of oxygen in the

blood. This in itself is a risk factor for the occurrence of brain damage, which is often irreversible and the damage of vital organs such as kidney, heart, and brain [11,12].

Statistical analysis

Maternal characteristics and baby outcomes were compared by mode of maternal diabetes using the X2 test. The rates of all outcomes were calculated for the offspring of mothers with type 1 or type 2 diabetes and gestational diabetes.

The first adjusted model included information on maternal age, smoking, parity, delivery, gestational age, hypertension, birth weight, sex of the baby.

In a second model, we additionally adjustedfor Study of the association between neonatalweight, Abagar test, cardiac and neurological respiratory problems, and maternal diabetes. Which may, in turn, reflect an increased risk of birth asphyxia-related complications. In stratified analyses, the risks of a low Apgar score and asphyxia-related neonatal.

In the last adjusted model, the assessment of neural reflexes (grasp reflex, Moro reflex and sucking reflex) and its relation to the type of maternal diabetes, which reflects damage to the nervous system.

The Apgar test is a comprehensive measuring system used to assess the health status of the newborn immediately after birth. The assessment is based on five categories: heart rate, respiratory voltage, muscle strength, reflexes, and skin color. A digital scale of 0-2 is used for each category and the overall scale is 10. Apgar scan is carried out in the first minute after delivery and five minutes after birth and can then be applied if its value is still low. Less than 3 is considered to be significantly low.

From 4 to 6 are considered relatively low.
From 7 to 10 are considered normal.

The low value at the first minute alerts us that the baby needs medical attention but does not necessarily indicate that there are long-term problems, especially if there is an improvement in the value of applying the score in five minutes.

If the result is still less than 3 at later times, such as 10, 15, or 30 minutes there is a risk that the child will suffer long-term damage to the nervous system. There is also a small but significant increase in the risk of cerebral palsy. However, the purpose of this test is to quickly determine whether neonates need immediate medical care if they were not designed to predict the health of the child in the long term [13].

Results

Maternal characteristics and baby outcomes are presented in table1. Among diabetic mothers, the highest percentage of cesarean delivery was of type 1 diabetes (75%), followed by gestational diabetes (74,1%). The highest rate of natural delivery was for type 2 diabetics (35,3%), followed by type 1 diabetes (25%). For the age of mothers with gestational diabetes and type 1, the greatest proportion of mothers aged 31-40, unlike those with type 2 diabetes, was the highest proportion between 21-30.

Table 1 Maternal characteristics and birth outcomes for born to women with diabetes 2018 - 2019

	Pre-existing diabetes				Gestational diabetes	
	Type 1	Type 2				
	N=32	(%)	N=34	(%)	N=54	(%)
Maternal age						
>20	6	19.2	0	0	0	0
20 – 30	12	37.5	16	47.1	20	17.1
31 – 40	14	43.3	12	35.3	30	54.5
>41	0	0	6	17.6	4	7.4
Smoking						
smoke during pregnancy	4	12.5	12	35.3	4	7.5
non smoke	28	87.5	22	64.7	50	92.5
Hypertension						
Gestational	14	42.75	14	41.2	14	25.9
Pre-exiting	0	0	6	17.6	2	3.7
preeclampsia	2	6.25	2	5.9	4	7.4
Non	16	50	12	35.3	34	63
Parity						
First born	12	17.5	4	11.7	2	3.7
Second or more	20	62.5	30	88.3	52	96.3
Delivery						
Caesarean section	24	75	22	64.7	40	74.1
Vaginal birth	8	25	12	35.3	12	22.2

Missing baby	0	0	0	0	2	3.7
Gestational age						
>32	0	0	4	11.8	4	7.4
32 – 36	14	43.75	18	52.9	18	33.3
≥37	18	56.25	12	35.3	32	59.3
Birthweight						
>2500	6	17.6	8	22.2	14	24.1
2500- 4000	26	76.5	26	27.8	34	58.6
<4000	2	5.9	2	5.6	10	17.3

For the effect of smoking, the highest proportion of type 2 diabetic patients was (35,3%) followed by type 1 diabetes (12,5%). For gestational age, patients with type 2 diabetes were the largest gestational age group under 37 weeks while those with gestational diabetes were higher than 37 weeks (59,3%). Compared with hypertension, we found that the highest percentage of gestational hypertension was associated with type 1 diabetes (42,75%), while the highest percentage of Pre-existing hypertension was associated with type 2 diabetes (17,6%), We also noted that gestational diabetes patients had the highest proportion of preeclampsia (7,4%). Birth weight disorders were the highest in gestational diabetes mothers, the neonatal rate was below 2500g and was higher than 4000g.

There are (12) deaths in neonates (4), including the case of dropping and two cases of twins and 4 deaths of pregnancy at birth, the largest proportion of mothers with type 1 diabetes. In Table 2 and 3, According to the Apgar test in the 5th minute, we observed that the highest rate of decrease was below 7 in patients with type 1 diabetes (37,5 %), and we found in the patients of Apgar under 7: In gestational diabetes, the highest proportion of neurological, respiratory and cardiac problems was found in neonates (60%), As well as in type 1 diabetes were (83,3%), But type 2 diabetes had the highest proportion of heart-respiratory problems (50%).

Table 2: Neonatal outcomes of born to women with diabetes during pregnancy after labor CS and vaginal birth, 2018 - 2019

	Pre-existing diabetes				Gestational diabetes	
	Type 1		Type 2			
	N= 32	(%)	N=32	(%)	N= 56	(%)
5 min apgar score >7	12	37.5	8	23.5	10	17.9
Complication of CVD and RS	0	0	4	50	0	0
Complication of SCN	0	0	0	0	2	20
CVD and SCN and RS	10	83.3	2	25	6	60
Normal	2	16.7	2	25	2	20
5 min apgar score ≥7	20	62.5	26	76.5	46	82.1
Complication of CVD and RS	4	20	8	30.8	6	13.1
Complication of SCN	10	50	6	23.1	14	30.4
CVD and SCN and RS	2	10	4	15.4	14	30.4
Normal	4	20	8	30.7	12	26.1

Table 3: Neurological and general condition of the newborn of born to women with diabetes during pregnancy after labor CS and vaginal birth, 2018 - 2019

	Pre-existing diabetes				Gestational diabetes	
	Type 1		Type 2			
	N=34	(%)	N=36	(%)	N=58	(%)
Sucking reflex						
weak	8	23.5	14	38.9	20	34.5
medium	20	58.8	14	38.9	24	41.4
complete	6	17.7	8	22.2	14	24.1
Moro reflex						
absent	8	23.5	2	5.5	6	10.3
partial	14	41.2	24	66.7	40	69
complete	12	35.3	10	27.8	12	20.7

Grasp reflex						
weak	8	23.5	6	16.7	4	6.9
medium	12	35.3	14	38.9	24	41.4
complete	14	41.2	16	44.4	30	51.7

In Abgar above 7: the ratio of two children with gestational diabetes was the same among neurological problems and heart, respiratory and neurological problems were (30,4%), and those with type 1 diabetes had the highest proportion of neurological problems (50%).Type 2 diabetic patients had the highest proportion of heart-respiratory problems (30,8%), we notice that the Primitive reflexes vary between the weak and the good. In Grasp reflex, it was weak in patients with type 1 diabetes, which is the largest proportion (23,5%), followed by type 2 diabetes (16,7%), As for Sucking reflex, it was weak in mothers with type 2 diabetes, which is the largest percentage (38,9%) followed by gestational diabetes mothers (34,5%), Moro reflex was different between absent, partiality and completeness. The highest rate of absence was found in type 1 mothers (23,5%), followed by gestational diabetes (10,3%).

Discussion

The aim of this study was to assess the effect of maternal diabetes (gestational or Pre-existing) on pregnancy in a sample of Syrian women arriving at the in-University Hospital Obstetrics in Damascus.

The study included 120 pregnant women in a range of 20 to 50 years. Pregnant women between 31 and 40 years of age were the largest proportion of the study sample about 30 women (55>5%). In the United States, preexisting diabetes occurring in 4-8 percent of all pregnancies and gestational diabetes occurring in 0.08 percent of all pregnancies. Approximately 106,000 American women were diabetic during pregnancy in 1999, and approximately 50,000–150,000 infants are born to diabetic mothers each year [14,15].

In our study, the proportion of pregnant women with gestational diabetes was the largest proportion of the whole sample (45%). Cesarean delivery was the highest proportion in diabetes cases and the highest percentage in type 1 diabetes (75%).

Our study showed that missing babies were the highest in gestational diabetes (3,2%) and childbirth deaths in type 1 diabetic. For gestational age, gestational age less than 32 weeks was the highest in type 2 diabetics (11,8%). The previous patients' women were associated with the highest preoperative hypertension (17,6%). Which indicates the significant relationship between type 2 diabetes, hypertension, and preterm delivery.

Our study showed that gestational diabetes was associated with the highest percentage of cases of preeclampsia, showing the relationship between gestational diabetes and preeclampsia.

We found that birth weight in gestational diabetes patients was the least weight and the largest, the percentage of newborns weighing less than 2,500 g (24,1%) and proportion of femtogram was (17,3%).

We noticed that the percentage of Multiple births in diabetic patients reached the highest percentage (96,3 %) and this shows the important relationship between macrosomia, parity and gestational diabetes.

The evaluation of the APGAR test in our study was high for most newborns, but we found that in cases of decline below 7, gestational diabetes and type 1 had the highest proportion of neurological, cardiac and respiratory problems together, and type 2 diabetes had the highest proportion of cardiac and respiratory problems.

We also found the presence of these problems when Abagar test is normal up 7, especially the neonates of mothers with gestational diabetes was the greatest proportion of the problems of nerve, cardiac and respiratory together, and in the neonates of mothers with type 1 diabetes was the problems of nerve and the neonates of mothers with the type 2 diabetes was the problems of respiratory and cardiac. Of the neurological problems that we found in newborns are the lower back of the spine, lumbar sacral myelomeningocele, severe Hydrocephalus infant hypotonia, lack of movements and weakness of reflexes.

Cardiac and respiratory problems appeared in Central Cyanosis, delayed screaming, Dyspnea, Intercostal retractions under the ribs and the need for oxygen. Our study showed the importance of reflexes and their relation to the health and safety of the nervous system.

We found that the greatest proportion of neonates who have a weak of Grasp reflex in the mothers of diabetes type 1 (23,5%) and found that the greatest proportion of neonates who have a weak of sucking reflex in the mothers of diabetes type 2 (38,9%) and found that the greatest proportion of neonates who was absent of Moro reflex in the mothers of diabetes type 1 (35,3%).

Conclusion

Use one of the contraceptive methods to be ready to start Trying to have a child. (Ask your doctor if this is the method the most reliable form of contraception is for you). Let your goal for HbA1c be less than 53 mmol/mole (7%) if you are People suffering from type 1 diabetes, or 42 mmol / ml (6%) or less if You suffer from type 2 diabetes. Do a complete check of all complications of diabetes and blood pressure.

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