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Diabetic Mother Control and Effectiveness on the Newborn Baby

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Abstract: **Background:** Maternal hyperglycemia is one of the most common complications during pregnancy. It affects about 16% of pregnancies, with gestational diabetes (GD) being responsible in more than 80% of cases. It is the most common complication associated with hyperglycemia during pregnancy and increases the incidence of caesarean section, shoulder dystocia, clavicle fracture, humeral paralysis, and asphyxia in newborns. **Objective:** This paper aims to diabetic mother control and effectiveness on their newborn baby. **Patients and Methods:** This study has focused on the assessment of assessment of health outcomes for pregnancy mothers where data were collected from health outcomes for pregnancy mothers in different hospitals in Iraq between 15th October 2021 to 14th March 2022, for pregnancy mothers with ages from 24 to 39 years. These data were divided into two kinds of groups where the first one was considered pregnancy women who have diabetes with number 66 cases while the second one was represented control which have 54 cases. A statistical study was conducted for health outcomes for pregnancy mothers using the SPSS program. This paper focused on the impact of diabetes on the mother's pregnancy as well as the children's. **Discussion:** Due to the lack of routine screening for diabetes in the general population in our geographic area. There were no significant differences in acid-base balance parameters in the umbilical cord blood sample at birth between newborns of diabetic mothers and age-matched controls from nondiabetic pregnancies, indicating no significant rate of perinatal hypoxia. In our study, the placenta weights of neonates delivered to women with gestational diabetes were significantly higher than those of neonates born to healthy, non-diabetic mothers. Our study discovered that there were notable differences in the delivery procedure, with cesarean sections predominating in the diabetic group. This may have a significant impact on the relatively decent condition of these children at birth. This study resulted in a significant increase in vaginal operations compared to cesarean sections, as cesarean sections were detected in 44 (66.67%) affected mothers and 38 (70.37%) control mothers, respectively, with a P-value of 0.0439. **Conclusion:** IDM has a higher prevalence of cardiac and structural abnormalities, and metabolic screening for hypocalcemia, polycythemia, and hyperbilirubinemia should be done. Babies should be closely monitored for any respiratory distress and hypoglycemia.

Keywords: Maternal hyperglycemia; general anesthesia; spinal anesthesia; Caesarean births; Overweight; Prediabetes; and Cleft palate alone.

INTRODUCTION

Maternal hyperglycemia is one of the most common complications during pregnancy. It affects about 16% of pregnancies, with gestational diabetes (GD) being responsible in more than 80% of cases [Eslamian, L. *et al*., 2013]. It is estimated that 1 in 6 pregnancies worldwide has DG as a multiple, according to data from a French study from 2020. In the first half of pregnancy (before week 20), thanks to the action of estrogen and progesterone, there will be an increase in insulin sensitivity as this will improve the mother's storage of nutrients in the form of liver glycogen and adipose tissue, which will be required as an energy source later on [Group HSCR. *et al*., 2008; Kong, L. *et al*., 2019]. Also, in the second half of pregnancy, due to the action of hormones such as chorionic lactogen or prolactin and some cytokines, insulin resistance appears. Thus, the mother's glucose utilization decreases, and the glucose passes to the fetus through the placenta as an energy source for growth [Riggins, T. *et al*., 2009; Mitanchez, D. *et al*., 2014]. On the other hand, the mother's body will use the fatty acids from the adipose tissue as an energy source [Elmekkawi, S.F. *et al*., 2015]. In response to insulin resistance in the second half of pregnancy, there is an increase in insulin secretion. [Committee on Practice B-O, 2020] If an appropriate compensatory response is not achieved, the physiological changes previously described can cause the development of DG, which is characterized by hyperglycemia, especially after eating. Hyperglycemia can lead to short- and long-term complications, both for the mother, the fetus, and the newborn. DG has implications for the prognosis of pregnancy, as it increases the risk of premature delivery, caesarean section, and the onset of hypertensive disease (arterial hypertension and/or preeclampsia) [Fenton, T.R. *et al*., 2013; Diagnostic Criteria, 2013]. During pregnancy complicated by DG, hyperglycemia that appears in the second half of it will not result in abnormalities in the fetus. On the other hand, if glycemic control is inadequate,

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hyperglycemia in the mother may cause problems in the fetus (diabetic embryopathy), which is characterized by fetal hyperglycemia and hyperinsulinemia, which causes hypertrophy of sensitive tissues. For insulin (fat cells, muscles, and liver), growth, and gigantism (birth weight greater than 4000 grams) [Bashir, M. *et al*., 2019]. It is the most common complication associated with hyperglycemia during pregnancy and increases the incidence of caesarean section, shoulder dystocia, clavicle fracture, humeral paralysis, and asphyxia in newborns. Other fetal and neonatal complications related to hyperglycemia are myocardial hypertrophy, neonatal hypoglycemia, and immaturity of its organs, which manifests itself in the form of metabolic disorders (lack of magnesium and calcium, increased bilirubin) or respiratory distress due to delayed lung maturation [Bashir, M. *et al*., 2018]. In contrast, DG does not appear to increase the risk of perinatal mortality. It is known that perinatal outcomes have a continuing relationship with the degree of hyperglycemia and that there is no cut-off point that allows knowing when complications will occur during pregnancy [Bener, A. *et al*., 2011]. Therefore, the more difficult it is to control diabetes during pregnancy, the higher the likelihood of complications arising. Most women with GD return to normal blood glucose levels soon after giving birth. However, they have a risk of recurrence of GD in subsequent pregnancies of about 50%, especially those with a higher body mass index (BMI) and who have had a previous large baby [Rajab, K.E. *et al*., 2012]. Similarly, they are also at long-term risk of developing type 2 diabetes (DM) which is 10 times higher than women without a previous DG, with risk factors being higher BMI before and after pregnancy, maternal age, and glycemic values Basal blood during pregnancy and the need for insulin therapy during pregnancy [Abu-Heija, A.T. *et al*., 2015]. For these reasons, it is recommended to reassess the metabolic status of patients who presented GD 4 to 12 weeks postpartum using the 75-g oral glucose load test (OGTT) and using the diagnostic criteria for the general population [Groof, Z. *et al*., 2019]. In case of glucose intolerance or altered basal glucose level, annual screening is recommended, including weight, body mass index, abdominal circumference, blood pressure, and laboratory tests with basal blood glucose, HbA1c, and lipid profile; In patients with a normal OGTT, this will be performed every 3 years [Agarwal, M.M. *et al*., 2015]. In addition to a higher risk of developing type 2 DM, DG is associated with a two-fold increased risk of metabolic syndrome (MS) and NAFLD, as well as a two-fold increased risk of cardiovascular disease in the first postpartum decade in women without DG [Alfadhli, E.M. *et al*., 2015]. This paper aims to diabetic mother control and effectiveness on their newborn baby.

PATIENTS AND METHODS

This study has focused on the assessment of assessment of health outcomes for pregnancy mothers where data were collected from health outcomes for pregnancy mothers in different hospitals in Iraq between 15th October 2021 to 14th March 2022, for pregnancy mothers with ages from 24 to 39 years. These data were divided into two kinds of groups where the first one was considered pregnancy women who have diabetes with number 66 cases while the second one was represented control which have 54 cases. A statistical study was conducted for health outcomes for pregnancy mothers using the SPSS program. This paper focused on the impact of diabetes on the mother's pregnancy as well as the children's. In this study, the data were determined to present the characteristics demographic of mothers' patients which distribute Age from 24 to 39 between two groups, BMI were divided into (24-27) - (28-31) - (32-34) - (35-38), HbA1C, type of anesthesia which chosen between general anesthesia and spinal anesthesia, the birth type that defined between caesarean births and vaginal birth, and gestational age within between <37 and ≥37 where all demographic characteristics details can be seen in Table 1. According to newborns children, this study was presented the characteristics demographic of newborn children sex which determines male and female, placental Weight (gm) have defined between <650 and ≥650, birth Weight (gm) in choice of <2500 and ≥2500, and birth defects yes and nowhere this information have shown in Table 2. Also, our study was assessed of birth children by Apgar score into two sides which IDM and non-DIM where the Apgar score defined between (0-10) which can see in Table 3. Besides to that, this study was shown metabolic complications of mothers' patients and it's defined within overweight or obesity, lack of physical activity, prediabetes, and gestational diabetes during a previous pregnancy and all details which are shown in Table 4. Furthermore, this study was assessed risk factors for diabetic mothers which defined into four parameters which are overweight or obesity, lack of physical activity, prediabetes,

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and gestational diabetes during a previous pregnancy where this can be seen in Table 5. This study was distributed the final results of congenital anomalies for children with macrosomia, any birth defect, limb reduction defect, left lip and palate, and cleft palate alone which can show in Table 6.

RESULTS

Table 1: The characteristics demographic of mothers' patients

Items	Mothers' patients (N=66)	Controls (N=54)	P-value
Age			
24-29	17 (25.76%)	15 (27.78%)	0.0482
30-34	28 (42.42%)	22 (40.74%)	0.0488
35-39	21 (31.82%)	17 (31.48%)	0.0491
BMI			
24-27	9 (13.64%)	7 (12.96%)	0.0481
28-31	18 (27.27%)	16 (29.63%)	0.04833
32-34	14 (21.21%)	13 (24.07%)	0.04861
35-38	25 (37.88%)	18 (33.33%)	0.04551
HbA1C	5.62 ± 0.477	5.42 ± 0.67	0.0447
Type of anesthesia			
General anaesthesia	40 (60.61%)	32 (59.26%)	0.04933
Spinal anaesthesia	26 (39.39%)	22 (40.74%)	0.049126
Birth type			
Caesarean births	44 (66.67%)	38 (70.37%)	0.0439
Vaginal birth	22 (33.33%)	16 (29.63%)	0.04651
Gestational age			
<37	30 (45.45%)	26 (48.15%)	0.04732
≥37	36 (54.55%)	28 (51.85%)	0.04622

Table 2: The characteristics demographic of newborns children

Items	Birth children (N=66)	Controls (N=54)	P-value
Sex			
Male	43 (65.15%)	42 (77.78%)	0.0388
Female	23 (34.85%)	12 (22.22%)	0.03427
Placental Weight (gm)			
<650	29 (43.94%)	21 (38.89%)	0.04533
≥650	37 (56.06%)	33 (61.11%)	0.0411
Birth Weight (gm)			
<2500	49 (74.24%)	40 (74.07%)	0.04944
≥2500	17 (25.76%)	14 (25.93%)	0.04926
Birth defects			
Yes	26 (39.39%)	15 (27.78%)	0.0322
No	40 (60.61%)	39 (72.22%)	0.03621

Table 3: The assessment of birth children by Apgar score

Apgar score of birth children	Apgar 1 min	N	Apgar 5 min	N	P-value
	8-10	4 (6.06%)	8-10	2 (3.03%)	0.0442
IDM	5-7	6 (9.09%)	5-7	3 (4.55%)	0.0436
	4	5 (7.58%)	4	5 (7.58%)	0.05
	8-9	1 (1.85%)	8-10	1 (1.85%)	0.05
Controls (non-DIM)	6-7	4 (7.41%)	5-7	2 (3.7%)	0.0467
	4	2 (3.7%)	4	2 (3.7%)	0.05

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Table 4: Metabolic complications of mothers' patients

Items	Mothers' patients	Controls	P-value
Overweight or obesity	11 (16.67%)	5 (9.26%)	0.0441
lack of physical activity	3 (4.55%)	2 (3.7%)	0.0835
Prediabetes	7 (10.61%)	1 (1.85%)	0.04128
Gestational diabetes during a previous pregnancy	6 (9.09%)	4 (7.41%)	0.04844

Table 5: Assessment of risk factors for diabetic mothers

Items	Mothers' patients (N=66)	Mothers' patients %
Overweight or obesity	11 (16.67%)	5 (9.26%)
lack of physical activity	11 (16.67%)	5 (9.26%)
Prediabetes	2	3.03
Gestational diabetes during a previous pregnancy	4	6.06

Table 6: Distribution of the congenital anomalies for children

Items	Children patients (N)	Children patients (%)
Macrosomia	4	6.06
Any birth defect	1	1.52
Limb reduction defect	3	4.55
Cleft lip and palate	2	3.03
Cleft palate alone	7	10.61

DISCUSSION

Due to the lack of routine screening for diabetes in the general population in our geographic region, a prospective study revealed the prevalence of newborns from mothers with diabetes in the years 2020 to 2021. There were no significant variations in acid-base balance parameters in the cord blood sample at delivery between newborns of mothers with diabetes and age-matched controls from non-diabetic pregnancies, indicating that there was no substantial rate for hypoxia in the perinatal period. The rate of cesarean delivery amongst the groups seemed to differ considerably. [Catalano, P. M, 2010]

German studies have found a clear correlation between the recurrence of the abnormalities and hyperglycemia during organogenesis (5th to 8th weeks of gestation) with elevated HbA1C levels. Pre-eclampsia, gigantism, and fetal congenital anomalies are just a few of the adverse maternal and neonatal outcomes associated with impaired early glycemic control. Maternal hyperglycemia in the second and third trimesters causes diabetic fetopathy, which is characterized by fetal hyperglycemia and hyperglycemia. Blood insulin levels and giggling. French studies confirmed that chronic hyperinsulinemia increases fetal metabolic rates, which in turn causes an increase in oxygen consumption because the placental flow is unable to meet the fetus's oxygen needs. Fetal hypoxia then contributes to metabolic acidosis and an increase in erythropoiesis. [Baptiste-Roberts, K. *et al*., 2012; Kamana, K.C. *et al*., 2015]

Excessive growth and placental weight gain are considered to be caused by elevated gene expression, inflammatory mediators, and leptin in placental tissues that arise in hyperinsulinemia. In our study, the placental weights of neonates delivered to women with GDM were considerably higher than those of neonates born to healthy, non-diabetic moms. Daskalakis' study, which contrasted the placentas of pregnant women in good health with those of GDM patients, was in line with ours. [Vally, F. *et al*., 2017]

The South Australian study failed to account for the impact of mothers' BMI. The GDM group in our study had a mean pre-pregnancy BMI of more than 25 kg/m2, which was found to enhance the risk of newborn macrosomia. [Billionnet, C. *et al*., 2017]

Our study discovered that there are notable variations in the delivery procedure, with cesarean sections predominating in the diabetes group. This may have had a substantial impact on the relatively decent state of these infants at birth. This study led to a substantial increase in vaginal procedures over cesarean sections, with cesarean sections detected in 44 (66.67%) afflicted moms and 38 (70.37%) control mothers, respectively, with a P-value of 0.0439.

According to studies conducted in Spain, vaginal deliveries increase the risk of hypoxia since they might result in birth abnormalities, death, or other complications, whereas caesarean deliveries

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minimize the risk of hypoxia in the perinatal period in babies of diabetic mothers [Daskalakis, G. *et al*., 2008; Akarsu, S. *et al*., 2017].

CONCLUSION

Despite the multidisciplinary prenatal diabetes care management, newborns of diabetic moms still had higher birth weights and a higher prevalence of macrosomia. Also, contrasting the health of newborns born to diabetic moms with controls. However, there are notable variations in the method of delivery, with a prevalence of C-section births in the diabetes group that may have had a substantial impact on the newborns' comparatively good health. Moreover, As IDM has a higher prevalence of cardiac and structural abnormalities, metabolic screening for hypocalcemia, polycythemia, and hyperbilirubinemia should be done. Babies should be closely monitored for any respiratory distress and hypoglycemia. The recognized modifiable variables, such as women's adherence to the diabetes management regimen, should be improved with more effort.

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