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ORIGINAL ARTICLE

Effect of Diabetes Mellitus on Cesarean Section Rate and Neonatal Outcome

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ABSTRACT

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Background: Diabetes in pregnancy represent a risk condition for adverse maternal and neonatal outcomes and many of these complications might occur during labor and delivery. The study aimed to evaluate the effect of diabetes mellitus on cesarean section rate and neonatal outcome at Zagazig Univesity Maternity Hospitals.

Methods: This prospective cohort study was carried out at Zagazig University Maternity Hospitals, Zagazig, Sharkia, Egypt, from January 2018 till April 2019 on 102 pregnant women, they were divided into two groups; 51 diabetic cases represent group A and another 51 non-diabetic cases represent group B. Full history was taken, general and abdominal examination and Trans-abdominal ultrasound were done to assess gestational age, presentation, fetal weight and fetal biophysical profile. Per vaginal examination to assess cervical condition by Bishop score at time of delivery. **Results:** The rate of cesarean delivery was significantly higher in diabetic group than non-diabetic group (49.0% VS 25.5%, p=0.014). Maternal complications regarding cervical lacerations, perineal tears and post-partum haemorrhage were higher in diabetic group but with no significant difference. Neonatal complications were significantly higher in diabetic group regarding macrosomia, low Apgar score, jaundice, hypoglycemia and neonatal intensive care unit admission.

Conclusions: Diabetic pregnant mothers are more exposed to complications during pregnancy and during delivery. Cesarean section rate is increased with diabetic patients. Neonates of diabetic pregnant mothers are at higher risk of macrosomia. They are also more exposed to hypoglycemia, hyperbilirubinemia and NICU admission.

Keywords: Diabetes; Cesarean section; Maternal complications ; Neonatal complications

INTRODUCTION

Diabetes Mellitus is a metabolic disorder characterized by the presence of hyperglycemia due to defective insulin secretion, defective insulin action, or both. It is the most common metabolic disorder that occurs during pregnancy. It has two clinical patterns; either pregestational diabetes. Pregnancy in women with diabetes mellitus is associated with an increased risk of congenital malformations, obstetric complication,s and neonatal morbidity [1].

In pregnant women with gestational diabetes mellitus (GDM), the overall cesarean section rate accounted for 35.3%. Simultaneously, compared with nondiabetic pregnant women, diabetic maternal acute cesarean section rate was reported 1.52 times of GDM [2].

Diabetes is an important risk factor for surgical incision infection, and for cesarean section,

diabetes is an important risk factor for maternal postoperative wound infection as well [3].

Maternal complications of diabetes mellitus include increase in asymptomatic bacteriuria, urinary tract infections, preeclampsia, polyhydramnios which may lead to preterm labor, abruption placenta, postpartum hemorrhage which in turn increases operational delivery. Fetal outcomes include intra uterine fetal death, respiratory distress syndrome, hypoglycemia, congenital malformations and hyperbilirubinaemia [4].

Pregnancies complicated by maternal diabetes are associated with adverse maternal and neonatal outcomes including increased rate of Cesarean section delivery, macrosomia, admission to neonatal intensive care unit (NICU), and perinatal mortality. Hence, it is important to estimate the burden of diabetes and its complication among pregnant women to direct health resource to

improve the outcomes for these high-risk pregnancies [5].

This study aimed to evaluate the effect of diabetes mellitus on caesarean section rate and neonatal outcomes in Zagazig University Maternity Hospitals.

METHODS

This prospective cohort study was carried out in Obstetrics & Gynecology Department at Zagazig University Maternity Hospitals, Zagazig, Sharkia, Egypt, from January 2018 till April 2019 on 102 patients, patients were presenting in labor including diabetic and non diabetic. they were divided into two equal groups; 51 diabetic patients (group A) and 51 non-diabetic patients (group B).

Sample size- assuming that rate of emergency C.S. in diabetic women 30%, rate of emergency C.S. in non-diabetics 9%, CI 95% and power of test 80% + sample size. So total sample size fulfilling the inclusion criteria was calculated by open EPI 102 patients. They were divided into 2 groups :

Group A (study group): 51 diabetic pregnant patients.

Group B (control group): 51 non- diabetic pregnant patients.

Inclusion criteria: All women were more than 18 years, with singleton cephalic presentation and gestational age between 37-40 weeks.

exclusion criteria: women with previous cesarean section. Other pregnancy complications necessitate C.S. delivery (multiple pregnancy, malpresentations, placenta previa, elderly primigravida). Known fetal anomaly, Uncertain gestational age and Pre-term delivery (<37 wk)

Women diagnosed as pre-gestational diabetes and gestational diabetes in current pregnancy by investigations done in our hospital or her antenatal follow up sheets.

Written informed consent was obtained from all participants and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University (ZU-IRB#4188/6-12-2017). The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

All patients were subjected to:

Full history including personal and full obstetric history including frequency and route of delivery in a previous pregnancy, past history of DM or gestational DM in previous pregnancies and neonatal outcome.

General and abdominal examinations to assess the fundal level, fundal grip, umbilical and pelvic grip were done.

Full laboratory investigations including glucose challenge test and oral glucose tolerance test for diagnosis of gestational DM.

Transabdominal ultrasounds were done to assess gestational age, fetal weight by Hadlock's formula, fetal anomaly, fetal biophysical profile and Doppler study was done.

Per vaginal examination to assess cervical condition by Bishop score at time of delivery was done. Evaluation of any complications that occur during vaginal or cesarean delivery including shoulder dystocia, cervical lacerations, perineal tears or post-partum hemorrhage.

Shoulder dystocia is defined as : the inability to deliver the shoulder by normal mechanism; required additional obstetric maneuvers to deliver the fetus after the head was delivered

Evaluation of neonatal condition by Apgar score at 1st and 5th minutes, fetal body weight, hypoglycemia, hypocalcemia, hyperbilirubinemia, respiratory distress syndrome, and the need of neonatal intensive care unit admission were done by a pediatrician

Statistical analysis

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage , quantitative continues group represent by mean \pm SD , the following tests were used to test differences for significance;. difference and association of qualitative variable by Chi square test (X²). Differences between quantitative independent groups by t test. P value was set at <0.05 for significant results & <0.001 for high significant result.

RESULTS

Table (1) and fig (1), showed that there was no significant difference between groups A & B regarding age and GA, but regarding BMI there was a highly significant difference between studied Groups, also there was no significant difference between studied groups regarding any Obstetric history (Gravidity and History of abortion). Table (2) and figs. (2, 3), showed that there were 25 mothers delivered by cesarean section in group A (49.0%) versus 13 in group B (25.5%). Cesarean delivery was significantly

higher in diabetic mothers (group A) (P= 0.014). macrosomia was higher in group A with a highly significant difference between studied groups. There was a statistically significant difference between studied groups regarding Unfavourable induction. Also, failure of labor progress was significantly associated with group B (P=0.00) as 5 cases(38.4%) in group B vs 2 cases(8.0%) in group A delivered by CS due to failure of progress. Regarding intrapartum fetal distress; 3 cases (12.0%) in group A VS 2 cases (15.3%) in group B (P=0.56) were delivered by CS without significant difference between the studied groups.

Also, there was no significant difference between the studied groups regarding cervical lacerations during delivery, perineal tears, and post-partum hemorrhage. Table (3) and figs. (4), showed that there was a highly significant difference between the studied group regarding fetal macrosomia, Hypoglycemia of newborns, and NICU need. There was a significant difference between the studied group regarding Jaundice and Low_APGAR score, while there was no significant difference between studied group regarding RDS, Hypothermia, Shoulder dystocia and mortality

Table (1): Demographic data and Obstetric history distribution between studied groups:

		Group A (N=51)		Group B (N=51)		t		P	
Age (years)		26.6±5.43		27.27±6.73		-0.550		0.583	
GA (weeks)		37.95±0.74		37.86±0.74		0.069		0.98	
BMI (kg/m ²)		30.52±2.32		27.98±2.52		5.293		0.00**	
		A		B		Total			
		No.	%	No.	%	No.	%		
Gravidity	PG	29	56.9%	27	52.9%	56	54.9%	0.15	0.69
	Multi	22	43.1%	24	47.1%	46	45.1%		
History of abortion	No	44	86.3%	45	88.2%	89	87.3%	0.088	0.76
	Yes	7	13.7%	6	11.8%	13	12.7%		
Total		51	100.0%	51	100.0%	102	100.0%		

PG : Primigravida

Table (2): Mode of delivery, Indication of CS distribution Maternal outcome and complications distribution between studied groups.

		Group				Total		X ²	P
		A		B					
		No.	%	No.	%	No.	%		
Mode of delivery	Vaginal	26	51.0%	38	74.5%	64	62.7%	6.03	0.014*
	CS	25	49.0%	13	25.5%	38	37.3%		
Total		51	100.0%	51	100.0%	102	100.0%		
				Group		Total	X ²	P	
				A	B				
Indication	Macrosomia	No.	18	3	21	25.2	0.00**		
		%	72.0%	23.1%	55.2%				
	Unfavorable induction	No.	2	3	5	7.21	0.007*		
		%	8.0%	23.1%	13.1%				
	Failure of progress	No.	2	5	7	19.52	0.00**		
		%	8.0%	38.4%	18.4%				
	Intrapartum fetal distress	No.	3	2	5	0.33	0.56		
		%	12.0%	15.3%	13.1%				
Total		No.	25	13	38				
		%	100.0%	100.0%	100.0%				

		Group				Total		X ²	P
		A		B		No.	%		
		No.	%	No.	%				
		Group				Total		X ²	P
		A		B		No.	%		
		No.	%	No.	%	No.	%		
Cervical laceration	No	40	78.4%	46	90.2%	86	84.3%	2.66	0.102
	Yes	11	21.6%	5	9.8%	16	15.7%		
Perineal tear	No	46	90.2%	47	92.2%	93	91.2%	0.12	1.0
	Yes	5	9.8%	4	7.8%	9	8.8%		
Post-partum Hg	No	40	78.4%	42	82.4%	82	80.4%	0.24	0.61
	Yes	11	21.6%	9	17.6%	20	19.6%		
Total		51	100.0%	51	100.0%	102	100.0%		

CS: cesarean section

Table (3): Neonatal outcome and complication distribution between studied groups:

		Group				Total		X ²	P
		A		B		No.	%		
		No.	%	No.	%				
<u>Macrosomi</u> a	No	33	64.7%	48	94.1%	81	79.4%	13.49	0.00**
	Yes	18	35.3%	3	5.9%	21	20.6%		
Jaundice	No	36	70.6%	45	88.2%	81	79.4%	4.85	0.028*
	Yes	15	29.4%	6	11.8%	21	20.6%		
<u>RDS</u>	No	45	88.2%	46	90.2%	91	89.2%	0.102	0.75
	Yes	6	11.8%	5	9.8%	11	10.8%		
<u>Low APG</u> <u>AR</u>	No	36	70.6%	45	88.2%	81	79.4%	4.85	0.028*
	Yes	15	29.4%	6	11.8%	21	20.6%		
<u>Hypothermi</u> a	No	44	86.3%	48	94.1%	92	90.2%	1.77	0.18
	Yes	7	13.7%	3	5.9%	10	9.8%		
<u>Hypoglyce</u> <u>mia</u>	No	36	70.6%	48	94.1%	84	82.4%	9.72	0.001**
	Yes	15	29.4%	3	5.9%	18	17.6%		
Shoulder dystocia	No	44	86.3%	46	90.2%	90	88.2%	0.37	0.53
	Yes	7	13.7%	5	9.8%	12	11.8%		
<u>NICU</u>	No	26	51.0%	42	82.4%	68	66.7%	11.29	0.001**
	Yes	25	49.0%	9	17.6%	34	33.3%		
Mortality	No	49	96.1%	51	100.0%	100	98.1%	1.04	0.24
	Yes	2	3.9%	0	0.0%	2	1.9%		
Total		51	100.0%	51	100.0%	102	100.0%		

RDS : respiratory distress syndrome

NICU : neonatal intensive care unit

DISCUSSION

Diabetes is a metabolic disease determined by defects in insulin secretion, insulin action, or both which causes a chronic hyperglycemia with a long term damage, dysfunction, and failure of different organs. The American diabetes association had published a classification of diabetes, which considered four major classes; type1 diabetes, type2 diabetes, gestational diabetes mellitus and other specific types of diabetes [6].

Much evidence reported that pregnancies in women with preexisting diabetes, both type 1 and type 2, are affected by an increased risk of maternal and fetal adverse outcomes ,probably linked to poor glycemic control, especially in periconceptional period and in the first trimester of pregnancy[7].

GDM has a growing prevalence worldwide as the prevalence of obesity is growing. The unfavorable perinatal outcome associated with GDM results from the metabolic milieu projected to the fetus through the placenta[8].

The most common maternal complications reported were preeclampsia, spontaneous preterm labor, operative delivery and Cesarean section (Cs), while fetal and neonatal frequent complications resulted in miscarriages, congenital anomalies, macrosomia, small for gestational age (SGA) and stillbirth. Furthermore, women with preexisting diabetes could have an exacerbation of many diabetes-related complication such as retinopathy, nephropathy or chronic hypertension [9].

The present study aimed to detect the influence of diabetes on cesarean section rate and neonatal outcome in pregnant women with diabetes. The study recruited 51 pregnant diabetic women. In addition, there were other 51 non- diabetic women serving as control group. All participants were subjected to careful history taking, through clinical and obstetrical examination. The newborns were examined and their conditions were assessed by pediatrician.

In the present study, diabetic mothers had significantly greater BMI than non-diabetic mothers.

The current study found no statistically significant differences between the studied groups regarding the maternal complications during vaginal delivery, including cervical lacerations, perinatal tears and postpartum hemorrhage. Postpartum hemorrhage occurs at non diabetic due to patients suffering from anemia but at diabetic group to over-sized uterus and atony. This is in line with the recent study of Kong et al., [10], which revealed that there is no statistically significant relation between

diabetes and the presence of perineal laceration or tears and subsequent postpartum hemorrhage.

In this study diabetic mothers had significantly higher frequency of delivery by Cesarean section when compared with non-diabetic mothers. This is in agreement with the study performed by Heo et al., [11], where they reviewed the pregnancy outcome of diabetic patients. Fifty two hundred and twelve women who delivered live singleton infants at Korea University Medical Center from January 2009 to December 2013 were included. One hundred twenty-nine overt diabetes women and three hundreds twenty-two gestational diabetes women were categorized as diabetic women, and the others were categorized as non-diabetic women. They noted a significant increase in the risk of cesarean section in diabetic mothers.

In another study, Groen et al., [12] assessed the incidence of adverse pregnancy outcome in native and nonnative Dutch women with pregestational type2 diabetes (T2D) documenting a high rate of cesarean section in diabetic mothers.

Recently, Jovanović et al., [13] evaluated health outcomes, medical costs, risks and types of complications associated with diabetes in pregnancy for mothers and newborns. In their study, the incidence of diabetic patients was 7.86% (66041 among 839792), the relative risk of Caesarean section (Cs) was significantly greater with T2DM versus non- diabetics. Risk of Cs was also significantly greater for other diabetes types.

Considering the neonatal outcome in the studied groups, we found that diabetic mothers had a significantly higher frequency of macrosomia when compared with non-diabetic mothers. This is in harmony with results of Mitrović et al., [14], who analyzed the course and outcome of pregnancy in the patients with diabetes in relation to the group of healthy women regarding preterm delivery, perinatal morbidity and mortality. There was a higher incidence of fetal macrosomia in the women with diabetes compared to non-diabetic mothers.

In the present study, neonates of diabetic mothers had significantly higher frequency of neonatal hypoglycemia and hyperbilirubinemia, this is in agreement with the study of Knight et al. [15], who investigated if the outcomes in type 2 diabetic patient are related to the presence of diabetes or to maternal obesity. 213 pairs of type 2 and non-diabetic patients were compared. Diabetic patients had higher rates of preeclampsia, polyhydramnios, LGA infant, shoulder dystocia, cesarean delivery, fetal anomaly, neonatal hypoglycemia and hyperbilirubinemia, RDS and admission to the NICU, also Billionnet et al., [16] reported a results similar to our study.

In addition, the higher frequency of NICU admission in the current study is in agreement with Klemetti et al., [16], who analysed possible changes in the glycemic control, BP, markers of renal function, and perinatal outcomes of parturients with diabetic nephropathy during 1988-2011 and they found increase in neonatal intensive care unit admission (p=0.02).

CONCLUSIONS

Diabetic pregnant mothers are more exposed to complications during pregnancy and during delivery. Cesarean section rate is increased with diabetic patients. Neonates of diabetic pregnant mothers are at higher risk of macrosomia. They are also more exposed to hypoglycemia, hyperbilirubinemia, and NICU admission.

Conflicts of interest: None

Financial disclosure: None

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