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Effect of Diabetes Mellitus without Vascular Changes on Maternal and Fetal Outcomes

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Abstract

Background: Diabetes Mellitus is a metabolic disorder characterized by the presence of hyperglycemia due to defective insulin secretion, defective insulin action or both. This study aimed to assess the effect of different types of diabetes mellitus without vascular changes on maternal and fetal outcomes. **Patients and methods:** A cross-sectional study was carried out in Zagazig University Maternity Hospital during the period from March until September 2019. Included 50 cases of gestational and pregestational diabetic pregnant women. Patients were randomly divided into two groups of 25 patients, group I: included 25 pregnant women with pregestational diabetes mellitus (Type 1and Type 2 DM) without vascular changes. Group II: included 25 pregnant women with gestational diabetes mellitus. Fasting 2h postprandial blood glucose level was done and HbA1c. Complete general and abdominal examination, Obstetric Ultrasonography was done for all patients with Umbilical and middle cerebral artery Doppler if needed. **Results:** There was no statistically significant difference in gestational age at delivery and mode of delivery in current pregnancy between the two groups. There was statistically significant difference in fasting blood glucose and HbA1C between the two groups. However, regarding postprandial blood glucose, there was no statistically significant difference. **Conclusion:** We concluded that either diabetes was gestational or pregestational there was no statistical difference between maternal and fetal outcomes.

Keywords: Pregestational diabetes; GDM; Fetal outcomes

INTRODUCTION

Gestational diabetes mellitus (GDM) is operationally defined as impaired glucose tolerance with onset or first recognition during pregnancy. Its diagnosis is based on single step procedure. In accordance to World Health Organization recommendations, the guideline endorses 2-h 75-g oral glucose tolerance test, irrespective of last meal timings with a cutoff value of ≥140 mg/dL using a plasma standardized glucometer[(1)].

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

The pre-existing diabetes in pregnancy refers to diabetes diagnosed before pregnancy. The prevalence of pre-existing diabetes has increased in the past decade primarily as a result of the increase in type 2 diabetes. Studies of women with preexisting diabetes show higher rates of complications compared to the general population[(2)]**.**

Glycemic Targets: (Fasting < 95 mg/dL, 1 hour PP (post prandial < 140 mg/dL, 2hr PP <120mg/dL). Fasting and postprandial self-monitoring of blood glucose are recommended in both GDM and preexisting diabetes in pregnancy to achieve glycemic control. Due to increased red blood cell turnover, HbA1C is slightly lower in normal pregnancy than in normal nonpregnant women. The HbA1C target in pregnancy is 6-6.5%; < 6% may be optimal if this can be achieved without significant hypoglycemia, but the target may be relaxed to <7% if necessary to prevent hypoglycemia[(3)]**.** This study aimed to assess the effect of different types of diabetes mellitus without vascular changes on maternal and fetal outcomes.

Patients and Methods

After obtaining approval of the ethics committee, cross-sectional study was carried out in Zagazig University Maternity Hospital during the period from March until September 2019. Included 50 pregnant diabetic women in third trimester of pregnancy (28wks to 40wks). Patients were randomly divided into two groups of 25 patients, group I: included 25 pregnant women with pregestational diabetes mellitus (Type 1and Type 2 DM) without vascular changes. Group II: included 25 pregnant women with gestational diabetes mellitus. Written informed consent was obtained from all participants and the study was approved by the Research Ethics Committee of the Faculty of Medicine, University of Zagazig. Studies have been performed on research with human subjects in accordance with the Code of Ethics of the World Medical Association (Declaration Helsinki).

Inclusion criteria: Pregnant women with pregestational diabetes mellitus (type 1 or type 2 diabetes) without vasculopathy. Pregnant women diagnosed with gestational diabetes mellitus (GDM) by using the 75 gm 2 hour oral glucose tolerance test (OGTT). Single tone pregnancy.

All patients were subjected to full history taking, general examinations and Maternal screening for diabetes for group II using 1 hour postprandial blood glucose level is done during period of hospital admission from (24-28weeks),if the patient had the high risk criteria so, screening at once, if the level is >140 mg/dl, so the screening is positive and 75gm 2 hour oral glucose tolerance test (OGTT) is performed as follow; A fasting blood glucose sample was obtained. It provides a baseline for comparing other glucose values, the patient was asked to drink a sweet liquid containing a measured amount of glucose. For the glucose tolerance test, she will drink 75 grams.

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

Blood samples was collected at timed intervals of 1, 2, and sometimes 3 hours after drinking the glucose.

Pregnant diabetics was diagnosed with at least two values of plasma glucose levels exceeding the carpenter and constant criteria dosed by the American Diabetes Association.

All patients were followed up for every 2 weeks till 36 weeks, then every week till delivery for uncomplicated patients, in each visit. Maternal investigations (HB, AST, ALT, Urea, Creatinine, Urine analysis &coagulation profile, FBS, HbA1C, PPBS). Fetal investigations (ultrasound, CTG). Trans-abdominal ultrasound examination for fetal viability, estational age confirmation, measurement of fetal abdominal circumference (AC), and calculation of expected fetal birth weight (EFBW) before delivery. Doppler US to assess placental vascularization and calculate flow indices (was done to preeclamptic patients). Neonatal birth weight was measured in grams upon delivery.

Statistical analysis

Data collected throughout history, basic clinical examination, and ultrasound finding 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. P value was set at <0.05 for significant results & <0.001 for high significant result.

Results

the age of studied groups was (27.5±7.1) years in PGDM and (30.5±5.40) years in GDM with no statistically difference in maternal age between two **Figure** (1).

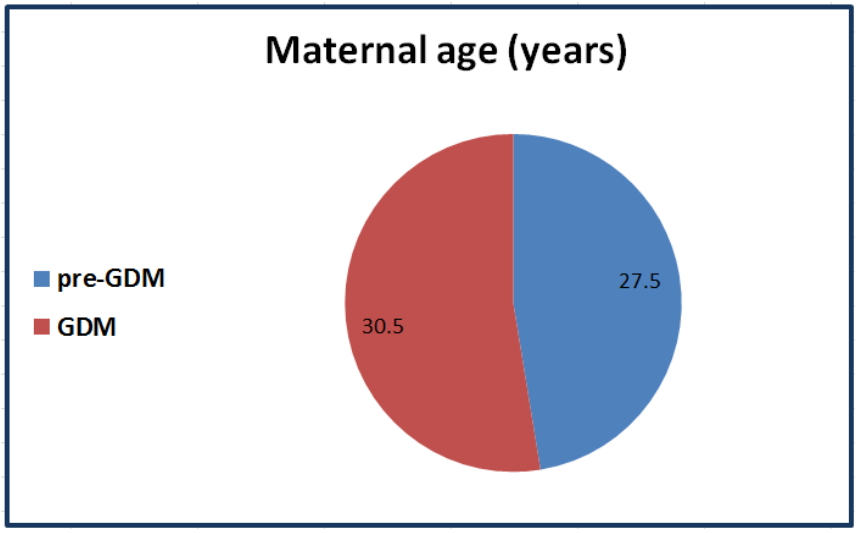

Figure (1): Pie chart of maternal age among studied groups

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

Table (1): Comparison between pregestational and gestational diabetic groups as regards gestational age at delivery and mode of delivery in current pregnancy.

Variable	Pre-GDM n=25	%	GDM n=25	%	χ^2	P
GA at delivery:						
<37weeks	2	8%	1	4%	**0.35**	**0.551**
≥37weeks	23	92%	24	96%		
Mode of delivery in current pregnancy						
CS	17	68%	15	60%	**0.34**	**0.555**
NVD	8	32%	10	40%		

χ^2 : chi-square test p -value > 0.05 is non-significant

Table (1), showed that there was no statistically significant difference in gestational age at delivery and mode of delivery in current pregnancy between two groups.

Table (2): Comparison between pregestational and gestational diabetic groups as regard of family history and past history of GDM, CFMF, IUFD, neonatal death.

Variable	Pre-GDM n=25	%	GDM n=25	%	χ^2	P
Positive Family history of DM	6	24%	2	8%	2.38	**0.12**
Previous history						
GDM					fisher's	**0.073**
CFMF*	0	0%	3	12%	fisher's	**0.314**
IUFD*	1	4%	0	0%	fisher's	**0.314**
Neonatal death**	1	4%	0	0%	fisher's	**1.000**
	1	4%	1	4%		

***CFMF: cardiac abnormality.** ****IUFD: unexplained IUFD.**

*****Neonatal death=due to cardiac abnormality and complication of prematurity**

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

Fisher's exact test ***P -value is non-significant***

Table 2; showed that there was no statistically significant difference in positive family history of diabetes and previous history of congenital fetal malformation, intra uterine fetal death and gestational diabetes mellitus between two groups.

Table (3): Ultrasound finding among the studied group (N=50):

Variables	Total		Pre-GDM		GDM	
	N	%	N=25	%	N=25	%
Normal	34	68%	14	56%	20	80%
IUFD	2	4%	1	4%	1	4%
Polyhydramnios*	9	18%	5	20%	4	16%
Oligohydramnios**	4	*8%*	3	12%	1	4%
Placenta previa	1	2%	1	4%	0	0%

One woman might have more than one finding.

****polyhydramonous AFI more than 25cm.***

*****oligohydraminous AFI less than 5cm.***

Table 3; showed that and (18%) of them had Polyhydramnios, Oligohydramnios was found in (8%) of them.

Figure (2), showed that there was no statistically significant difference in maternal complications between two groups.

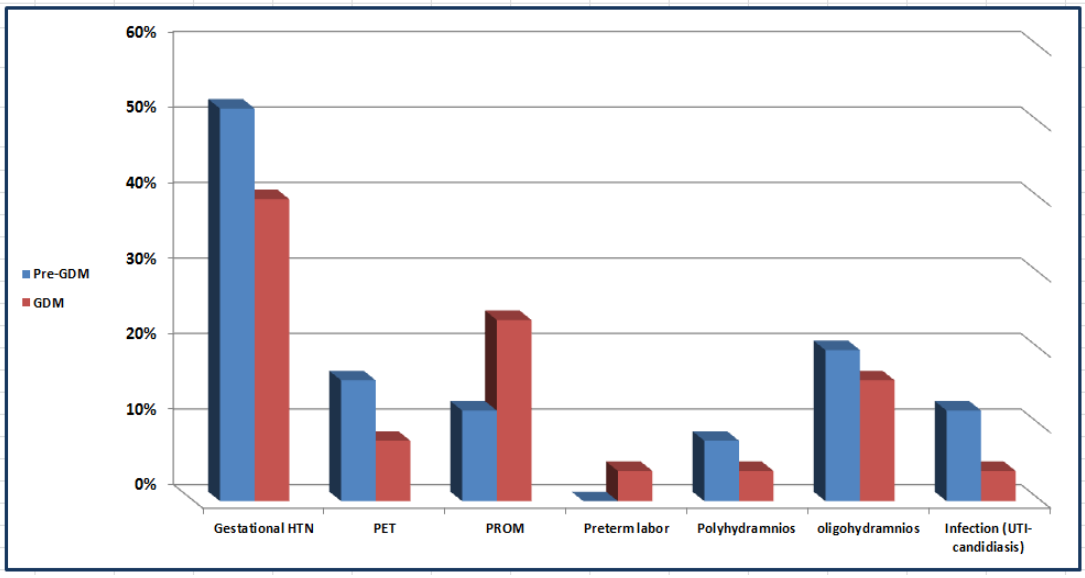

Figure (2): bar chart of maternal complication among studied groups.

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

There was a statistical significant difference in fasting blood glucose and HbA1C between two groups, but regarding postprandial blood glucose, there was no statistically significant difference **Figure (3,4)**.

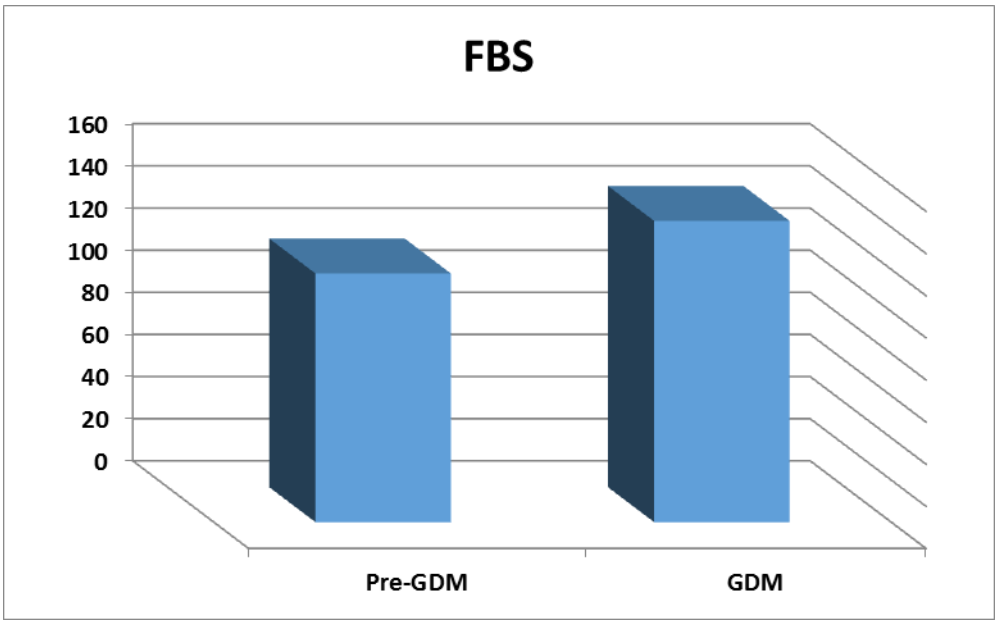

Figure (3); Bar chart for fasting blood glucose among the studied groups.

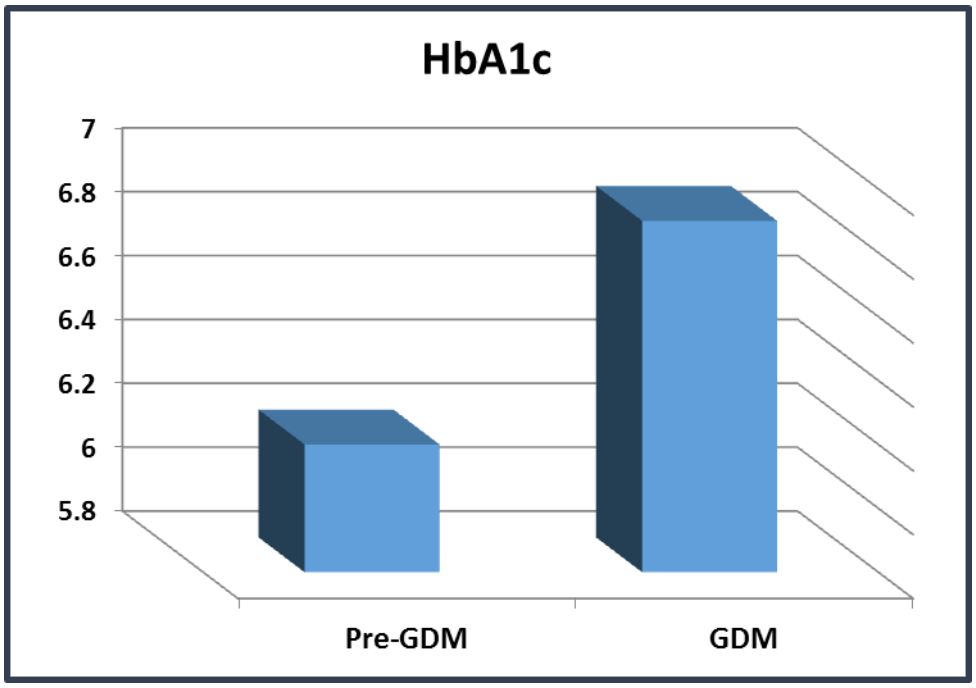

Figure (4); Bar chart for HbA1c among the studied group

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

There was no statistically significant difference in fetal complications between two groups **(Figure 5).**

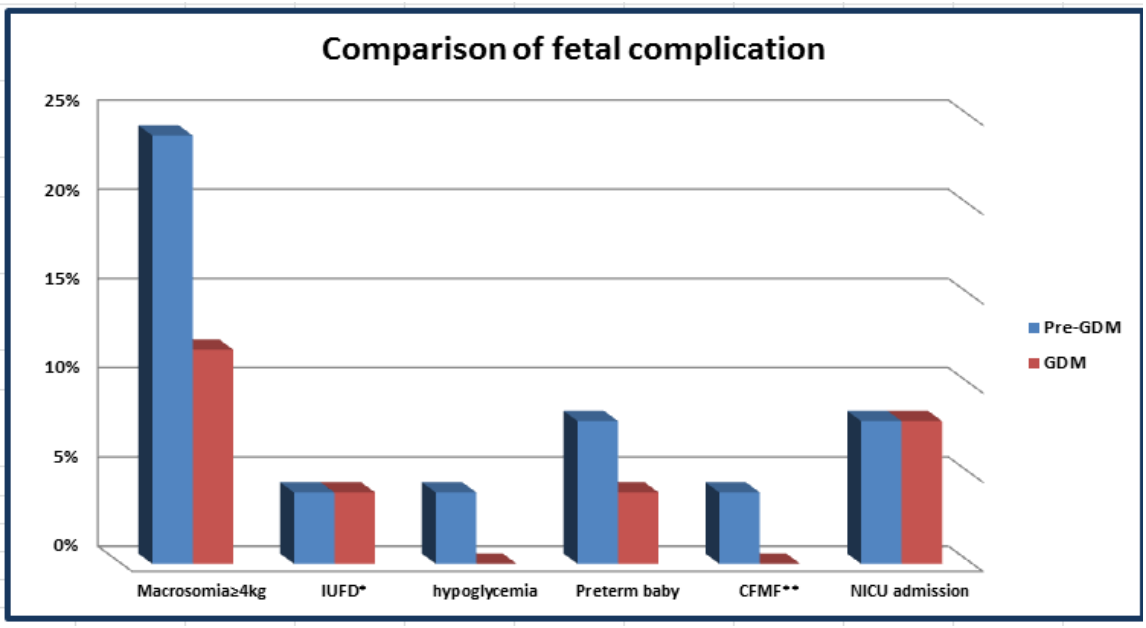

Figure (5): bar chart for fetal complication among studied groups.

There was no statistical significant difference between GDM and pre-GDM groups regarding neonatal weight, Apgar score at 1 & 5 minutes and neonatal RBS **(Figure 6).**

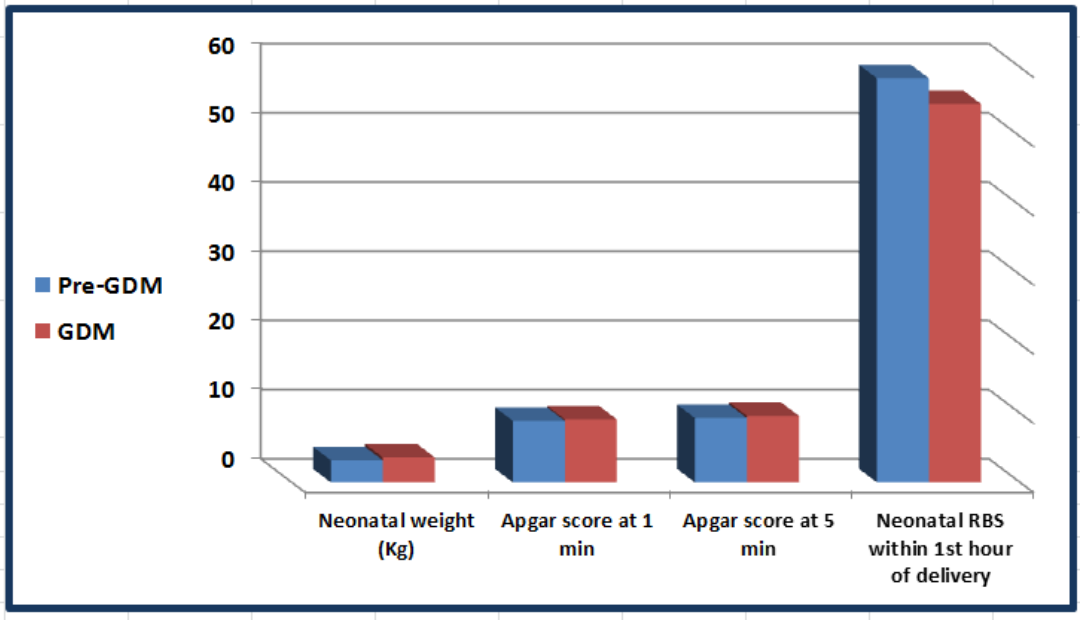

Figure (6):Bar chart for neonatal weight, Apgar scoring and neonatal RBS.

DISCUSSION

The current study revealed that the age of studied groups was (27.5±7.1) years in PGDM and (30.5±5.40) years in GDM with no statistically difference in maternal

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

age between two groups. While in **Salge et al.**[4] the mean age of the women studied was (28.5±5.71) years.

In current study that was, 96% of GDM group delivered at gestational age ≥37 weeks and 4% of them was preterm and as regard mode of delivery 68%, 60% of PGDM and GDM patients in respectively delivered by CS. The rate of CS was much higher due to high incidence of macrosomia and many patients had previous CS.

In contrast to us, the study of **Stogianni et al.** [5], among pregnant women with any diabetes type more delivered preterm (21% vs. 6%, $p = 0.0001$) and by CS (30% vs. 19%, $p = 0.05$) compared to those not complicated by diabetes.

The mean gestational age at delivery was 37 weeks (38.7 in the control group). Seventy-four (56%) mothers delivered vaginally (7 required forceps assistance) and 58 (44%) required cesarean section. In comparison, 22% of controls underwent cesarean section, twenty-four women underwent emergency cesarean section, and the most common indication was unsatisfactory progress of labor[6].

The study on the hand revealed that there was no statistically significant difference in positive family history of diabetes and previous history of congenital fetal malformation, Intra Uterine Fetal Death and gestational diabetes mellitus between the two groups.

Women with history of GDM are at an increased risk of adverse maternal and perinatal outcome and at increased risk of future diabetes predominantly Type II including their children and therefore there are two generations at risk[7].

The present study evaluated US findings among participants mothers and found that (68%) of the studied group had normal U/S, and 18% of them had Polyhydramnios, Oligohydramnios was found in only (8%) of them.

Poorly managed gestational diabetes is associated with fetal macrosomia and polyhydramnios but the pathogenesis has not been elucidated yet[8].

The present study revealed that there was no statistically significant difference in maternal complications between the two groups as gestational hypertension, PROM , preterm labor.

Any degree of glucose intolerance during pregnancy is associated with adverse maternal and fetal outcome. The adverse maternal complications include hypertension, preeclampsia, urinary tract infection, hydramnios, increased operative intervention and future DM[9].

Twenty-four women underwent emergency cesarean section, and the most common indication was unsatisfactory progress of labor. Thirty-four percent of the women had complications either during pregnancy or labor and all complications were significantly less in the control group. The maternal complications were more common in mothers with less than optimal control (41% vs. 30%), but this was not statistically significant ($P = 0.26$). GDM is associated with an increased risk of complications for both the mother and the child. The rate of preeclampsia and

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cesarean section is increased in the mother and the risk of macrosomia is increased in the newborn[7].

The current study revealed that there was no statistically significant difference in fetal complications between the two groups.

Studies of women with preexisting diabetes show higher rates of complications compared to the general population, including perinatal mortality, congenital malformations, hypertension, preterm delivery, large-for-gestationalage infants, caesarean delivery and other neonatal morbidities[10].

The present study revealed that there was no statistically significant difference between GDM and pre-GDM groups regarding neonatal weight, Apgar score at 1 & 5 minutes and neonatal RBS.

Of note, babies born to women with diabetes have significantly higher rates of being large for gestational age (LGA) (birth weight >90th percentile for gestational age and sex), macrosomia (birth weight >4,000 g or 8 lb 13 oz), and neonatal hypoglycemia[11].

In the study of **Prakash et al.**[6], the deaths occurred in neonates with birth weight which was less than average for gestational age.

Neonatal hypoglycemia occurred in six newborns (4%) in this study. All episodes occurred in newborns whose mothers had suboptimal blood sugar control before delivery[12].

Serious perinatal complications specifically attributable to gestational diabetes are in general rare[13].

The present study assessed Laboratory investigations of the studied group and found that the fasting blood glucose ranged from 80 to 235, HbA1C ranged from 5.3 to 9.5 and PPBS ranged from 95 to 300.

Women with PGDM had significantly higher fasting plasma glucose [$p<0.001$] levels compared to GDM[14].

In contrast to us, the study of **Macintosh et al** [10], most women (1606; 68%) had a recorded measurement of glycaemic control by 13 weeks of pregnancy. Good control, defined by (HbA1c) of less than 7%, was achieved by 596 (37%) women. The median HbA1c was 7.9% for the women whose pregnancies resulted in a congenital anomaly, 8.0% for those with a normally formed stillbirth or neonatal.

Diabetes during pregnancy is an increasingly common metabolic disorder, associated with significantly increased risks for both mother and child, Pregnancies complicated by diabetes are associated with significantly increased risks for both mother and child[5] .

Conclusion:

We concluded that either diabetes was gestational or pregestational there was no statistical difference between maternal and fetal outcomes.

ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 04, 2021

Starting glycemic control preconceptional is important to decrease the incidence of congenital malformation, birth injuries, macrosomia, fetal mortality, the need for NICU admission and neonatal jaundice.

We recommend for further studies on large geographical scale and larger sample size to emphasize our conclusion.

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