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ORIGINAL ARTICLE

Outcome of Gestational Diabetes during Pregnancy and at Delivery

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ABSTRACT

Gestational diabetes (GDM) is a state of intolerance to glucose that initiates or is first diagnosed during gestation. About 1-14% of all pregnancies are complicated by GDM. The pregnancy-related morbidity and mortality in gestational diabetes is lower than in overt diabetes; however, if left untreated, it is significantly higher than in nondiabetic women. Treating GDM is important because appropriate treatment reduces side effects on the mother and newborn. GDM during pregnancy has a number of adverse short- and long-term consequences for both the mother and the fetus.

Aim: To establish the relationship between gestational diabetes and complications related to pregnancy and childbirth.

Study Design: A prospective cohort study.

Place and Duration: The study was conducted at the Karachi Aga Khan University Hospital in the Department of Obstetrics and Gynecology from 22 November, 2018 to 22 May 2019, six months after the approval of the study.

Methods: 130 patients, 65 patients in the GDM group and 65 patients in the non-GDM group were enrolled in the study. Demographic data were presented as standard deviation and mean as well as simple descriptive statistics, while qualitative variables as percentage and frequency. Chi-square test was applied for comparison of the incidence of complications related to pregnancy and childbirth. P<0.05 was considered statistically significant. Relative risk was calculated.

Results: 130 total patients, including 65 patients in GDM group and 65 patients in non GDM group were included. Mean age in GDM and non GDM group was 29.27±2.79 years and 28.49±3.40 years. Outcome of pregnancy in GDM and non GDM group showed that 27 (41.5%) and 18 (27.7%) had pregnancy induced hypertension, 07 (10.8%) and 03 (4.6%) had pre-eclampsia, 29 (44.6%) and 07 (10.8%) had polyhydramnios, 04 (6.2%) and 02 (3.1%) had antepartum hemorrhage, 01 (1.5%) and 06 (9.2%) had premature rupture of membrane, 11 (16.9%) and 09 (13.8%) had preterm labour, 13 (20%) and 04 (6.2%) had urinary tract infection. Outcome of pregnancy in GDM and non GDM group showed 51 (78.5%) and 33 (50.8%) had induction of labour, 17 (26.2%) and 14 (21.5%) had low birth weight, 14 (51%) and 03 (4.6%) had macrosomia, 02 (3.1%) and 01 (1.5%) had birth injury and 10 (15.4%) and 11 (16.9%) had NICU admission.

Conclusion: Gestational diabetes (GDM) is the utmost communal medicinal complication of pregnancy. It has negative consequences for the mother and the newborn baby. Maintaining glycemia in GDM decreases the morbidity of both baby and mother.

Keywords: Gestational diabetes mellitus, delivery outcome, pregnancy outcome, maternal and fetal outcomes.

INTRODUCTION

In pregnancy, the human body cannot produce enough insulin to meet its extra needs. Moreover, the body also has decreased insulin sensitivity during this period resulting in high blood glucose levels and subsequent progression of gestational diabetes mellitus (GDM)in patient at risk[1-2]. GDM occurs in 3-10% of pregnancies and its prevalence is increasing worldwide. This also indirectly reflects the type 2 diabetes mellitus prevalence in overall population[3]. Different criteria have been formulated for the diagnosis of GDM[4]. At our institution, the World Health Organization (WHO)criterion is followed. This includes measuring baseline fasting serum glucose level followed by 1 hour and 2-hour blood glucose levels after oral administration of 75 grams of glucose solution[5-6].

Pakistani females have an augmented jeopardy of progression towards GDM. In previous studies conducted across Pakistan, the incidence of GDM has been reported to range from less than 1% to as high as 14%[7-8]. Studies conducted at Lahore (2011), Bahawalpur (2013) and Hyderabad (2014) reported incidences of GDM as < 1%, 14.51% and 14.8% respectively. GDM is also related with amplified risk of neonatal and maternal complications. These include premature rupture of membranes, pregnancy induced hypertension (PIH), increased Cesarean section rate, instrumental deliveries, preterm labor, antepartum hemorrhage and repeated infections during pregnancy[9]. In a study conducted in Peshawar, females with GDM were more predisposed to develop PIH (21.5%) and pre-eclampsia (17.6%) compared to those without (11%) and (6.2%), respectively[10]. The prevalence of other maternal complications of GDM compared to normal subjects in the same study have been: Antepartum hemorrhage (23.3% vs 15.5%), PROM (20.2% vs 6.24%), preterm labour (24.9% vs 7.39%) and UTIs (30.1% vs 38.1%). The prevalence of polyhydramnios has been reported to be 4.2% in GDM versus 3.3%[11].

Moreover, GDM also poses significant risks to the fetuses as high blood sugar levels results in excess fetal growth (macrosomia) which in turn can lead to shoulder dystocia. In addition to this, there is increased risk of congenital abnormalities and preterm birth resulting in increased Neonatal Intensive Care Unit (NICU) admissions secondary to neonatal respiratory distress. All this leads to significant increase in perinatal morbidity and mortality. Later in life, GDM also poses to hyperbilirubinemia and hypoglycemia[12]. In previously published study conducted at Peshawar in 2013, the risk of macrosomia and hyperbilirubinemia in women with GDM was 28.2% and 29.1% compared to 10.3%and 10.3%in control subjects[13]. The prevalence of birth trauma and shift to NICU has been (27.2% vs 6.2%) and (27.2% vs10.9%) in GDM versus normal pregnancies. [14]

The incidence of GDM and its associated complications have been increasing, despite several measures. Therefore, as a first step, it is important to assess the current magnitude of problem, so that later on strategies can be implemented for studying the causative factors responsible for its rise and how to mitigate these. The aim of my study, therefore, is to compare the incidence of pregnancy related complications and delivery in women with and without GDM.

Our study will generate up to date and local data regarding the complications and outcomes related to GDM. This can later be used to identify approaches on how to tackle this problem including better patient counseling and monitoring during pregnancy, etc. This, in turn may lead to reducing the morbidity and mortality associated with this condition.

METHODS

This Prospective cohort study was held in the Department of Gynecology and obstetrics, Aga Khan University Hospital, Karachi for 6-months duration from 22 November, 2018 to 22 May 2019. Total 130 patients were divided in 2 groups and selected by non-probability consecutive technique of sampling.

Inclusion Criteria:

- All pregnant ladies enrolled at Aga Khan University Hospital for the delivery of their child having age between 15 to 45 years will be included in the study.
- EXPOSED GROUP: pregnant ladies with gestational diabetes mellitus.
- NON-EXPOSED GROUP: pregnant ladies without gestational diabetes mellitus.

Exclusion Criteria:

- Non consenting patients.
- Known case of type I or II Diabetes mellitus
- Multiple pregnancies (more than 1 fetus on ultrasound scan)
- Known case of renal disease
- Known case of Cardiac diseases
- Diagnosed case of Chronic hypertension
- Other serious chronic disease like cancer, AIDS, etc

Data Collection Procedure: Study was commenced after formal approvals from the ethics review committee at Aga Khan University Hospital and REU department of CPSP. All pregnant ladies who fulfilled the inclusion/exclusion criteria were asked to participate in the study and formal informed consent was taken. All the included participants underwent initial OGTT and ultrasound examination between 24-28 weeks of gestation followed bimonthly till delivery as per standard departmental protocol. Moreover, during pregnancy and at the time of labor all the study participants were monitored for the development of complications such as preeclampsia, pregnancy induce hypertension, etc. All the relevant data was recorded on a structured proforma (attached).

Data Analysis Procedure: SPSS 20.0 was applied for analysis of data. The standard deviation and mean were determined for quantitative variables such as weight, age, BMI, parity, AFI, etc. The percentage and frequency were determined for categorical variables like complications developing during pregnancy and at delivery, mode of delivery and other adverse outcomes. Chi-square test was applied for comparison of the incidence of complications related to pregnancy and childbirth. P< 0.05 was taken as statistically significant. The effect of confounders in the data such as age, weight and parity were controlled through stratification of the data according to these parameters. Relative risk was calculated.

RESULTS

Out of 65 patients in GDM group; the patients minimum age was 21 while 37 years was the patients' maximum age. 29.27 years was the patients' mean age with S.D of ±2.79. Mean height ,weight and BMI in this analysis study was 161±6.78 cm, 85.2±8.54 kg and 30.54±2.88 kg/m2 respectively. Similarly, out of 65 patients in non GDM group; 21 years was the patients minimum age while 37 years was the patients' maximum age. Mean age in our study was 28.49 years with the standard deviation of ±3.40. Mean height, weight and BMI in our study was 158±7.28 cm, 88.7±9.87 kg and 29.77±3.94 kg/m2 respectively. As shown in Table 1.

Table-1: Descriptive Statistics n=130 (65 in GDM and Non GDM Group)

Variable	Mean ± sd	Standard Deviation	Min-max
Age gdm group (years)	29.27	±2.79	21-37
Age non-gdm group (years)	28.49	±3.40	21-37
Height Gdm group (m)	161	±6.78	148-168
Height non-Gdm group (m)	158	±7.28	148-168
Weight Gdm group (kg)	85.2	±8.54	68-115
Weight non-Gdm group (kg)	88.7	±9.87	68-115
Bmi Gdm group (kg/m^2)	30.54	±2.88	24-37
Bmi non-Gdm group (kg/m^2)	29.77	±3.94	24-37

Frequency distribution of pregnancy induced hypertension exhibited that from 65 subjects in GDM group, 27 (41.5%) and 38 (58.5%) had and did not have pregnancy induced hypertension. Similarly, out of 65 patients in non GDM group, 18 (27.7%) and 47 (72.3%) had and did not have pregnancy induced hypertension. As presented in Figure 1.

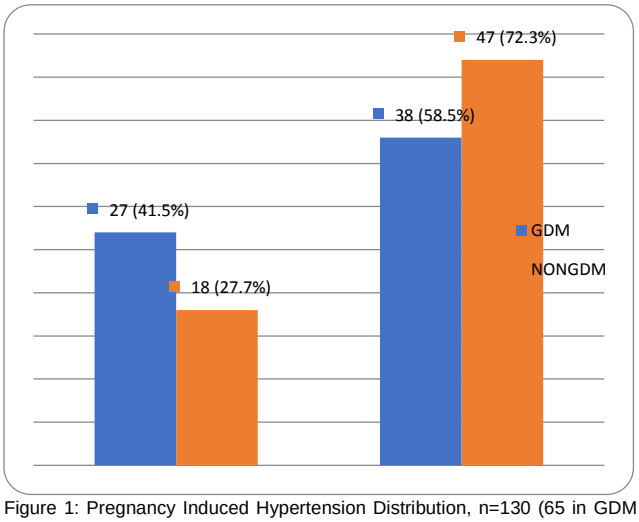

Figure 1: Pregnancy Induced Hypertension Distribution, n=130 (65 in GDM and Non GDM Group)

Frequency distribution of pre-eclampsia exhibited that from 65 patients in GDM group, 07 (10.8%) and 58 (89.2%) had and did not have pre-eclampsia. Similarly, out of 65 patients in non GDM group, 03 (4.6%) and 62 (95.4%) had and did not have pre-eclampsia. As presented in Figure 2.

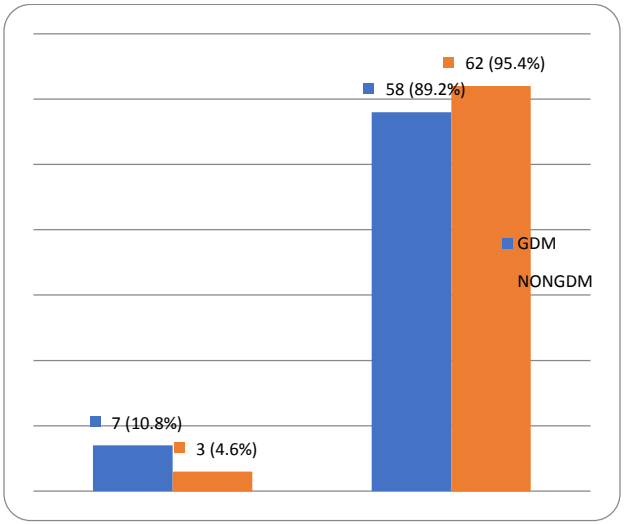

Figure 2: Pre-Eclampsia Distribution, n=130 (65 in GDM and Non GDM Group)

Frequency distribution of urinary tract infection exhibited that from 65 patients in GDM group, 13 (20%) and 52 (80%) had and did not have urinary tract infection. Similarly, out of 65 patients in non GDM group, 04 (6.2%) and 61 (93.8%) had and did not have urinary tract infection. As presented in Figure 3.

Frequency distribution of low birth weight exhibited that from 65 patients in GDM group, LBW was noticed in 17 (26.2%) and 48 (73.8%) did not have LBW. Similarly, out of 65 patients in non GDM group, 14 (21.5%) and 51 (78.5%) had and did not have LBW. As presented in Figure 04.

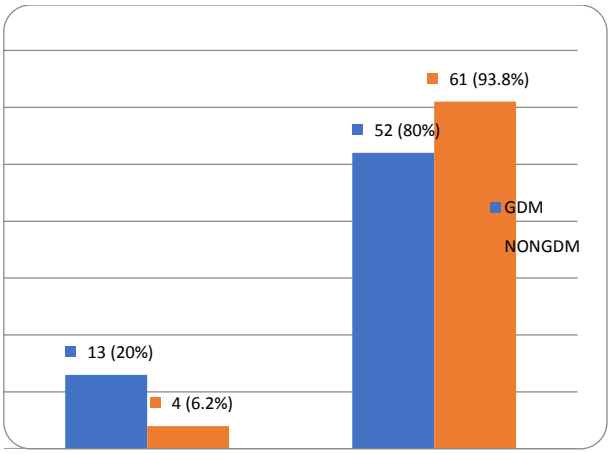

Figure 3: Urinary Tract Infection Distribution, n=130 (65 in GDM and Non GDM Group)

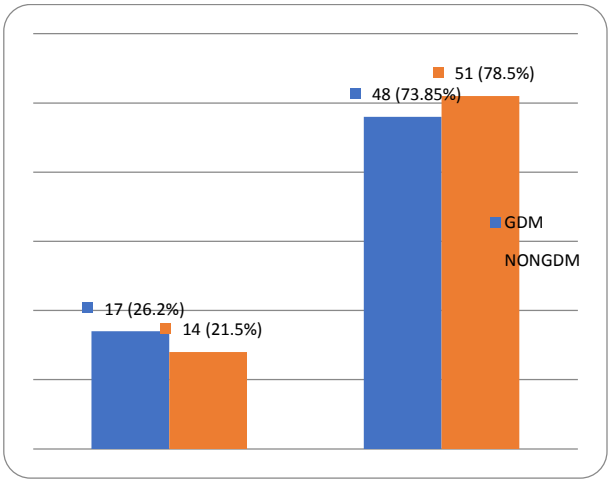

Figure 4: Low Birth Weight Distribution, n=130 (65 in GDM and Non GDM Group)

Frequency distribution of NICU admission exhibited that from 65 patients in GDM group, 10 (15.4%) and 55 (84.6%) had and did not have NICU admission. Similarly, out of 65 patients in non GDM group, 11 (16.9%) and 54 (83.1%) had and did not have NICU admission. As presented in Figure 05.

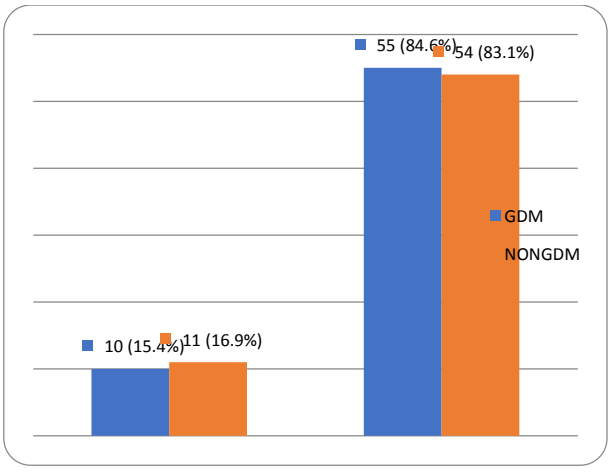

Figure 5: Nicu Admission Distribution, n=130 (65 in GDM and Non GDM Group)

Frequency distribution of age exhibited that from 65 patients in GDM group, 52 (80%) and 13 (20%) subjects were in 20-30 years and 31-40 years of age group correspondingly. Out of 65 patients in non GDM group, 48 (73.8%) and 17 (26.2%) patients were in the 20-30 years and 31-40 years of age group correspondingly. As presented in Figure 06.

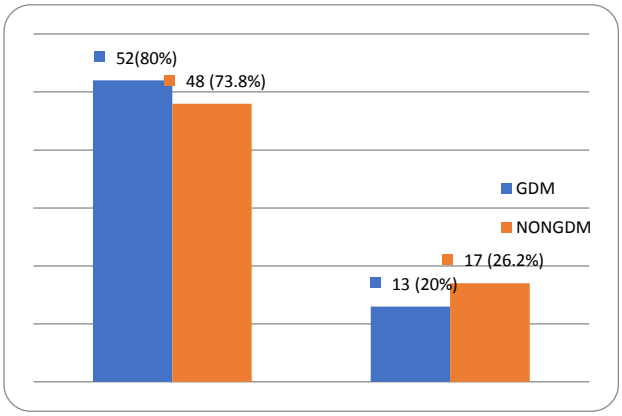

Figure 6: Age Distribution, n=130 (65 in GDM and Non GDM Group)

Stratification for pregnancy induced hypertension with reverence to GDM and non GDM group showed 27 (41.5%) and 18 (27.7%) had it. P-value was 0.09. RR was 1.51. (Table-II).

Table-2: Pregnancy Induced Hypertension According to GDM and Non GDM Group, n=130 (65 in GDM and Non GDM Group)

Group	Pregnancy induced Htn		P-value	RR
	YES	NO		
GDM group	27 (41.5%)	38 (58.5%)	0.09	1.51
Non GDM group	18 (27.7%)	47 (72.3%)		

Stratification for preterm labour with reference to GDM and non GDM group showed 11 (16.9%) and 09 (13.8%) had it. P-value was 0.62. RR was 1.22. As presented in Table 3.

Table-3: Preterm Labour According to GDM and Non GDM Group, n=130 (65 in GDM and Non GDM Group)

Group	Preterm labour		P-value	RR
	YES	NO		
GDM group	11 (16.9%)	54 (83.1%)	0.62	1.22
Non Gdm group	09 (13.8%)	56 (86.2%)		

Stratification for macrosomia with reference to GDM and non GDM group showed 14 (21.5%) and 03 (4.6%) had it. P-value was 0.01. RR was 4.67. Table 04.

Table-4: Macrosomia According to GDM and Non GDM Group, n=130 (65 in GDM and Non GDM Group)

Group	Macrosomia		P-value	RR
	YES	NO		
Gdm group	14 (21.5%)	51 (78.5%)	0.01	4.67
Non gdm group	03 (4.6%)	62 (95.4%)		

Stratification for gravid with reference to pregnancy induced hypertension exhibited that patients who were in gravid < 3 group 17 (38.6%) and 16 (30.2%) had pregnancy induced hypertension in the GDM and non GDM group respectively. P-value was 1.26. Relative risk was 1.28. Stratification for gravid with respect to pregnancy induced hypertension presented that females who were in gravid > 3 group 10 (47.6%) and 02 (16.7%) had pregnancy

induced hypertension in the GDM and non GDM group respectively. P-value was 0.73. Relative risk was 2.93. As presented in Table 05.

Table-5: Pregnancy Induced HTN According to Gravida, n=130 (65 GDM Group and 65 Non-GDM Group)

Gravida	Pregnancy induced hypertension Gdm group		Total	Pregnancy induced hypertension Non-gdm group		Total	P value	RR
	YES	NO		YES	NO			
<3	17 (38.6%)	27 (61.4%)	44 (100%)	16 (30.2%)	37 (69.8%)	53 (100%)	0.38	1.26
>3	10 (47.6%)	11 (52.4%)	21 (100%)	02 (16.7%)	10 (83.3%)	12 (100%)	0.07	2.93

Table-6: Remature Rupture of Membrane According to Gravida, n=130 (65 GDM Group and 65 Non-GDM Group)

Gravida	Prom Gdm group		Total	Prom non-Gdm group		Total	P value	RR
	YES	NO		YES	NO			
<3	01 (2.3%)	43 (97.7%)	44 (100%)	05 (9.4%)	48 (90.6%)	53 (100%)	0.14	0.22
>3	00 (00%)	21 (100%)	21 (100%)	01 (8.3%)	11 (91.7%)	12 (100%)	0.01	1.0

Stratification for gravid with respect to premature rupture of membrane showed that patients who were in gravid < 3 group 01 (2.3%) and 05 (9.4%) had premature rupture of membrane in the GDM and non GDM group respectively. P-value was 0.22. Relative risk was 1.28. Stratification for gravid with respect to premature rupture of membrane showed that patients who were in gravid > 3 group 00 (00%) and 01 (8.3%) had premature rupture of membrane in the GDM and non GDM group respectively. P-value was 0.73. Relative risk was 1.0. As presented in Table 28.

DISCUSSION

About 5% of pregnancies complicate with Gestational diabetes but numbers vary widely dependent on the standards used and the demographics of the people. Incidence is probable to rise with the ongoing obesity epidemic[15]. GDM carries risks for both fetus and mother. Few risks continue throughout the life of the child and mother. The complications related with mother comprise hyperglycaemic crises, pre-eclampsia, pyelonephritis caused by urinary tract infections, the necessity for C-section, morbidity after surgical delivery, augmented risk of progression towards overt diabetes mellitus, and probably complications related with cardiovascular system which occurs in later life, counting hypertension and hyperlipidaemia[16-17]. GDM mothers have fifty percent chance of progression towards type-II diabetes (T2DM) within twenty years of being diagnosed with GDM. Maternal hyperglycaemia results in augmented distribution of glucose to the fetus, resultant in increased fetal growth and fetal hyperinsulinemia[18]. The fetal increased growth-related complications include increased number of cesarean deliveries, birth trauma and a longstanding risk of obesity and glucose intolerance. Additional instantaneous fetal complications comprise hyperbilirubinemia, hypoglycaemia, cardiomyopathy, hypocalcaemia and respiratory distress syndrome[19]. This abundance of risk highlights the significance of early risk stratification with proper diagnosis and screening and therapeutic interferences that provide optimum control of glycemia[20].

Our study showed that out of a total of 130 patients, including 65 patients in GDM group and 65 patients in non GDM group. Mean age in GDM and non GDM group was 29.27±2.79 years and 28.49±3.40 years. Outcome of pregnancy in GDM and non GDM group showed that 27 (41.5%) and 18 (27.7%) had pregnancy induced hypertension, 07 (10.8%) and 03 (4.6%) had pre-eclampsia, 29 (44.6%) and 07 (10.8%) had polyhydramnios, 04 (6.2%) and 02 (3.1%) had antepartum hemorrhage, 01 (1.5%) and 06 (9.2%) had premature rupture of membrane, 11 (16.9%) and 09 (13.8%) had preterm labour, 13 (20%) and 04 (6.2%) had urinary tract infection. Outcome of pregnancy in GDM and non GDM group showed 51 (78.5%) and 33 (50.8%) had induction of labour, 17 (26.2%) and 14 (21.5%) had ow birth weight, 14 (51%) and 03 (4.6%) had macrosomia, 02 (3.1%) and 01 (1.5%) had birth injury and 10 (15.4%) and 11 (16.9%) had NICU admission.

Khan et al. Compared the outcomes in pregnant women with and without GDM. When it comes to maternal complications; pre-eclampsia (71.1% vs 6.5%, p = 0.03), PIH (21.8% vs 12.1%, p <0.05), premature rupture of membranes (18% vs 10.9%, p <0.05) in comparison to the control group 5.20%, p = 0.003, preterm delivery (24.5% vs 7.93%, p = 0.001) and caesarean section (22.6% vs 11.45%, p = 0.008). Regarding neonatal complications; birth trauma or shoulder dystocia (28.1% vs 6.5%, p <0.001), macrosomia (29.1% vs 11.9%) and jaundice (30.1 vs 11.2%, p = 0.001)[21-23]. Birth defects were not significantly greater in females with GDM.

- Uma et al. Assessed pregnant women assessed under the GDM Strategy for GDM (WINGS) and Women in India using the criteria of the International Diabetes Association and Pregnancy Working Group. As part of the MOC, 211 females with GDM during pregnancy were follow-up, of which 32 (15.4%) needed insulin and 180 (85.2%) were treated with PA and MNT[24-26]. The neonatal and maternal results of females with GDM were comparable to those of women without GDM: no significant variances were found in complications related to pregnancy like macrosomia, cesarean section, oligohydramnios / polyhydramnios, pre-eclampsia, neonatal death, preterm delivery, low birth weight and hyperbilirubinemia[27-30].

CONCLUSION

Globally, there has been a histrionic rise in the pervasiveness of obesity and overweight among females of childbearing age. The obesity and overweight females are at risk of progression towards GDM, results in complications during childbirth, the neonatal period and during pregnancy. Clinical treatment of obese pregnant females and females with GDM is challenging and places additional emphasis on the healthcare system.

Various fetal and maternal comorbidities are related with GDM. So, GDM can be regarded as a significant health problem. Though, a controversial issue still arises regarding the treatment and screening of GDM. This suggests that further research may be needed to determine the benefits of universal screening and treatment effects in decreasing the risk of short- and long-term complications.

Maintaining glycemia in GDM decreases the morbidity of both baby and mother. Other significant factor persuading the progression of GDM that has not yet been evidently clarified. In addition, GDM females are at risk of progression towards T2DM, CVD and metabolic syndrome and thus diagnosing females with GDM may initiate primary prevention approaches.

Moreover, it is becoming progressively clear that maternal metabolic characteristics are very vital determining factor of insulin resistance during gestation and in the offspring, and interferences such as healthy diet, weight loss and exercise are important determinants of insulin resistance before, during and afterwards pregnancy. It may be the key to preventing the vicious cycle that subsidises to insulin resistance, obesity and the T2DM epidemic.

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