

Original research article

Fetomaternal outcome in patients suffering with diabetes in pregnancy

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Abstract

Introduction: Diabetes mellitus is a disorder of carbohydrate metabolism. It is most common medical complication of pregnancy. Women can be separated into those who were known to have diabetes before pregnancy-pregestational or overt, and those diagnosed before pregnancy- gestational diabetes. Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy¹. Pregnancy confers a state of insulin resistance and hyperinsulinemia that may predispose some women to develop diabetes. Gestational diabetes mellitus (GDM) occurs when a woman's pancreatic function is not sufficient to overcome the diabetogenic environment of pregnancy. Undiagnosed or inadequately treated GDM can lead to significant maternal & fetal complications².

Aims and Objectives

Feto-maternal outcome in patients of pregnancy with diabetes was studied with following aims

- To review different diagnostic criteria for GDM.
- To study proportion of diabetes in pregnancy, both gestational diabetes and overt diabetes.
- To study feto-maternal outcome and complication in pregnancy with diabetes.
- To plan management of pregnancy with diabetes and to decrease fetomaternal morbidity and mortality.

Materials and Methods

A prospective case study was conducted on 70 Diabetic Patients at a tertiary care centre ND Desai Institute of Medical science and research, Nadiad, to study the fetomaternal outcome during December 2020 to August 2021. All necessary investigations were carried out. The data collected was analyzed and tabulations were made.

Result and Discussion

Total 70 patients were analyzed. Out of them maximum patients had gestational diabetes rather than Overt diabetes. maximum patients belonged to age group 20-29 years. maximum patients had positive family history of diabetes and were multipara with polyhydroamnios. Maximum patients required insulin for treatment of diabetes mellitus during pregnancy along with medical nutrition therapy and exercise. Regular insulin was used in all patients. maximum patients were delivered by caesarean section.

Keywords: Gestational diabetes, insulin, polyhydroamnios

Introduction

Diabetes has become a global pandemic because of aging population, sedentary life style, urbanization, and increasing incidence of obesity. A high prevalence of gestational diabetes mellitus (GDM) of the order of 18% has been reported from India^[3].

Women with GDM are at high risk for developing diabetes later in life. Pregnancy is a diabetogenic state. In early pregnancy there is increased risk of hypoglycemia due to increased insulin sensitivity. The opposite occurs from the mid second and third trimester when the insulin resistance starts occurring to provide nutrition to growing fetus. This explains why gestational diabetes is common after 26 weeks of pregnancy.

Hence main objective of the present series is to diagnose GDM at early stage and manage it accordingly to decrease maternal mortality and morbidity.

Background

- Gestational Diabetes (GDM). (Whites classification) ^[4].
- There are 2 classes of gestational diabetes (diabetes which began during pregnancy):

Class	Onset	Fasting	2hr Postprandial	Therapy
A1	Gestational	<105 mg/dl	<120 Mg/dl	Diet
A2	Gestational	>105 mg/dl	>120 Mg/dl	Insulin
Class	Age of onset (Years)	Duration (Years)	Vascular disease	Therapy
B	>20	<10	None	Insulin
C	10-19	10-19	None	Insulin
D	Before 10	>20	Benign retinopathy	Insulin
F	Any	Any	Nephropathy	Insulin
R	Any	Any	Proliferative retinopathy	Insulin
H	Any	Any	Heart	Insulin

Gestational diabetes: The definition of gestational diabetes mellitus according to American College of Obstetrics and Gynecology (ACOG) is “any degree of glucose intolerance that either commences or is first diagnosed in pregnancy” Accordingly to this definition some women classified as GDM may have previously unrecognized overt diabetes.

Overt diabetes: Women who were known to have diabetes before pregnancy are included in pre-gestational or overt diabetes. Criteria for diagnosis include any one of the following:

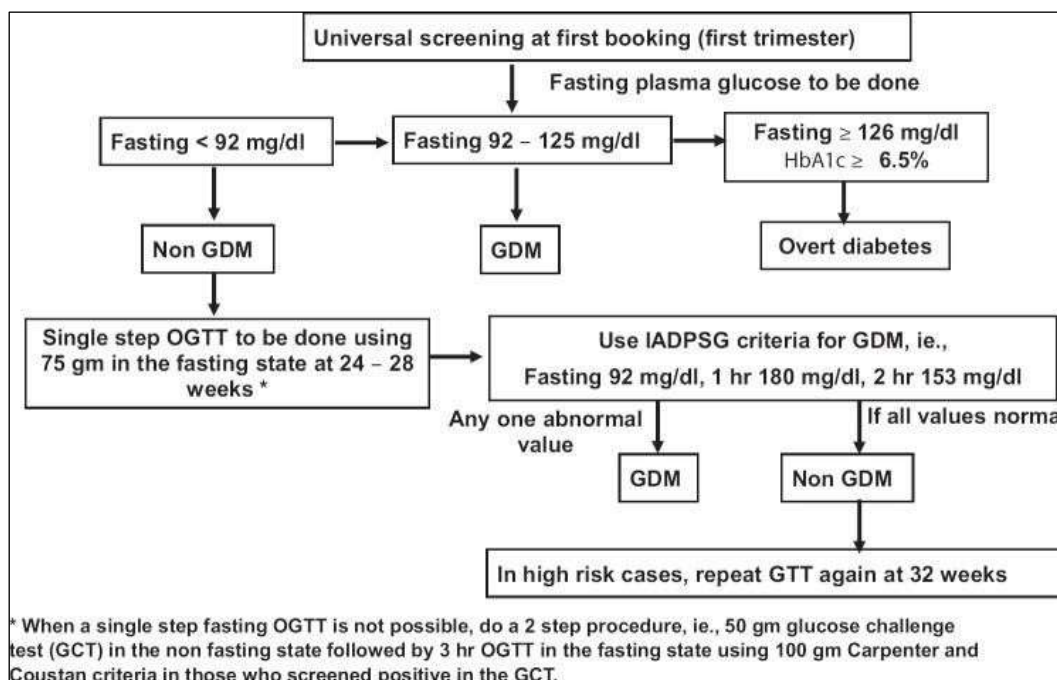
- Women with random plasma glucose level greater than 200 mg/dl along with confirmation by fasting glucose or glycosylated hemoglobin levels.
- Fasting plasma glucose (FPG) \geq 126mg/dl.
- HbA1c \geq 6.5% (on standardized assay).

1) Overt DM: HbA1c $>$ 6.5% or
 FPG \geq 126mg/dl or
 RPG $>$ 200mg/dl

2) GDM: HbA1c 5.7-6.4% or
 FPG \geq 92mg/dl but $<$ 126mg/dl

3) HbA1c $<$ 5.7% or
 FPG $<$ 92mg/dl
 ↓
 OGTT at 24-28 weeks
 ↓
 If abnormal-GDM

Screening for gestational diabetes



GDM diagnostic threshold values from various organization

Organization	OGTT Glucose load	Plasma glucose concentration thresholds(mg/dl)			
		Fasting	1-hours	2-hours	3-hours
ADA*	100g	95	180	155	140
ACOG*	100g	105	190	165	145
WHO^	75g	126	-	140	-
IADPSG^	75g	92	180	153	-

*Diagnosis of GDM if two or more glucose values equal to or exceeding the threshold values.

^Diagnosis of GDM if one or more glucose values equal to or exceeding the threshold values.

Maternal and Fetal effects

If gestational diabetes is not managed properly, or goes undetected/undiagnosed, it could cause a range of serious complications for both mother and fetus:

Fetal complication

Macrosomia
 Intrauterine fetal demise
 Malformations
 Rds

Hypoglycemia
 Hypothermia
 Hyperbilirubinemia

- Maternal complications:
- Antepartum:

Abortion
 Preeclampsia
 Polyhydroamnios
 Infection

- Intrapartum:
- Prolonged labour due to big baby.
- Shoulder dystocia:
- Increased incidence of cesarean section.

pph

- **POSTPARTUM:**
Puerperal sepsis
Increased maternal morbidity.
Diabetic retinopathy, nephopathy, neuropathy Dka
Infection
Death

Management

- **Prepregnancy (Overt diabetes)**

Women in the reproductive age group with diabetes should undergo a complete health check up and preconceptional counselling prior to planning pregnancy. Appropriate dietary measures, exercise, weight loss, drug therapy with oral hypoglycemic agents or insulin can help achieve optimal glyceemic control. We should target to achieve a pre-pregnancy HbA1c of less than 6.1% (NICE guidelines 2008). This would likely reduce the risk of congenital anomalies. Those with HbA1c >10% should be advised to avoid pregnancy.

All oral hypoglycemic agents except metformin should be stopped before pregnancy and substituted by insulin. Rapid (aspart and lispro) and intermediate acting insulin are safe in pregnancy.

Folate 400 microgram/day is given preconceptionally and during early pregnancy to decrease the risk of neural tube defects.

- **Self-Monitoring of Blood Glucose (SMBG)**

SMBG is required to identify those patients wherein intensification of treatment is needed. Usual practice is to perform fasting glucose and 2 hour after lunch and dinner or before meal on alternate days.

Medical Nutritional Therapy (MNT)

- First line therapy for women with GDM is dietary modification.
- The total calorie intake varies according to the BMI of the woman.
- BMI<25kg/sqm-3000cal/day.
- Overweight (BMI 25-30kg/sqm)-2500cal/day.
- Morbid obesity (BMI>40kg/sqm)-1250cal/day.
- The total calorie requirement should consist of <45% carbohydrate, 30% protein and 25% fat (mainly unsaturated) ^[5]. Calories must be met through three major and three minor meals at equal intervals. Studies have shown that a diet rich in fibre and low in glyceemic index is able to avoid insulin therapy. A watch on weight during each antenatal visit is very important.
- As per Indian ICMR guidelines for an average weight gain of 1012 g, an addition of 350 K.cal/day above the adult requirement is recommended during second and third trimester.

Exercise

- Around 30minutes of mild to moderate exercise daily helps in improving glyceemic control by improving insulin sensitivity at the skeletal muscle level(NICE guidelines). This reduces overall insulin requirement.
- Pharmacotherapy

Insulin:

- Insulin therapy is usually recommended when standard dietary management does not consistently maintain fasting plasma glucose at <95 mg/dL or 2-hour postprandial plasma glucose <120mg/dL as per ACOG.

The goals of glucose control recommended during pregnancy are shown in table below.

Specimen	Level (mg/dL)
Fasting	<95
Pre-meal	<100
1-hr post-parandial	<140
2-hr Post-prandial	<120
Mean (Average)	100
HbA1C	<6%

Oral Hypoglycemic Agents (OHA)

Two OHAs have been used in pregnancy-Metformin (biguanide group) and glyburide (sulphonylurea group). The Metformin in Gestational diabetes (MIG) trial showed that use of metformin in GDM patients reduced the required dose of insulin and also reduced the total weight gain.

Glyburide starting dose 2.5mg orally with morning meal.

Frequent antenatal visits, monitoring weight and fundal height, recording blood pressure forms an integral part of antenatal care.

Fetal Surveillance in Diabetes:

- **First trimester:** Early ultrasound for confirmation of viability and dating must be done. Nuchal translucency NT>3.5mm is associated with cardiac anomalies and it is commonly associated with diabetes.

Second Trimester: A detailed scan for anomalies must be done between 18 and 20 weeks. **Third Trimester:** The NICE guidelines suggest 4 weekly monitoring of fetal growth from 28-36 weeks.

This would help to detect macrosomia and polyhydramnios.

Timing and Mode of Delivery: Most associations recommend delivery after 38 completed weeks of gestation in a diabetic patient. The main concern with vaginal delivery is the risk of shoulder dystocia due to macrosomia.

Insulin Management During Labor and Delivery

- Usual dose of intermediate acting insulin is given at bedtime. Morning dose of insulin is withheld. Intravenous infusion of normal saline is begun. Aim is to keep glucose level between 72 and 126mg/dl. If blood glucose level is not maintained then dextrose insulin neutralizing drip is started. 50units of regular insulin in 50ml of normal saline is started. Dose is adjusted according to glucose level:
 <90mg/dl-0.5U/hr
 90-126mg/dl-1U/hr
 126-180mg/dl-2U/hr
 180-240mg/dl-3U/hr
 >240mg/dl-4U/hr

Once active labor begins or glucose levels decrease to <70mg/dl, the infusion is changed from saline to 5-percent dextrose and delivered at a rate of 100-150ml/hr to achieve a glucose level of approximately 100mg/dl.

- It is important to monitor vitals and fluid intake and output, urinary ketones and blood glucose level 1-2 hourly. Fetal heart rate must be continuously monitored.
- Patient with DM in whom blood glucose level is well controlled on diet and exercise & there are no complications- should go for routine antenatal care.
- DM with good control of Blood glucose on insulin-If a patient with DM with well controlled plasma glucose on insulin has not already delivered spontaneously, induction of labour should be scheduled at or after 39 weeks pregnancy.
- DM with poor plasma glucose control -In Patient with DM with poor plasma glucose control, those with risk factors like hypertensive disorder of pregnancy, previous still birth & other complications should be delivered earlier.

Postpartum advice:

- OGTT 6-12 weeks postpartum and every 3 yearly thereafter if there is normal postpartum glucose screening. Wound care is important as there are high chances of infection in diabetes.

Discussion

Table 1: Registered or Emergency patients

Patients	No (70)	Percentage%
Registered	51	72.8
Emergency	19	27.1

Table 2: Age of patients

Age (Years)	No (70)	Percentage %
20-24	14	20
25-29	25	35.7
30-34	19	27.1
35-39	12	17.1

Table 3: Family history of Diabetes

Family History	No (70)	Present study %	Di Cianni <i>et al.</i> %
Present	22	31.4	14.5
Absent	48	68.5	-

Di Cianni *et al.* reported that GDM was more prevalent in women with a positive FHD (14.5% vs. 7.3%; $p < 0.0001$)^[6].

Table 4: Diabetes in pregnancy

Type of diabetes	No (70)	Percentage %	Wong T <i>et al.</i> 12%
Gestational	60	85.7	86.1
Overt	10	14.2	13.8

Table 5: Gravidity of Patients

Gravida		No. (70)	Percentage %	Rowaily <i>et al.</i> [7]	Binny Thomas <i>et al.</i> [8]
Primi		21	30	9.5	47.74
Multigravida	Second	21	30	18.2	50.34
	Three or more	28	40		

Table 6: HbA1C level of patients

HbA1C	No (70)	Percentage%
<6.5	15	21.4
6.5-8	46	65.7
>8	9	12.8

Table 7: Liquor of patients according to ultrasonography

Liquor	No (67)	Percentage %
Oligo	13	19.4
Adequate	29	43.2
Poly	22	32.8

Table 9: Pregnancy Outcome in Study Population

Mode of delivery	No. (70)	Percentage %	Priyanka Kalra <i>et al.</i> 9%
Abortion	3	4.2	-
Normal delivery	Preterm delivery	10	14.2
	Vaginal delivery	19	27.1
Cesarean section	38	54.2	79

Maternal complications

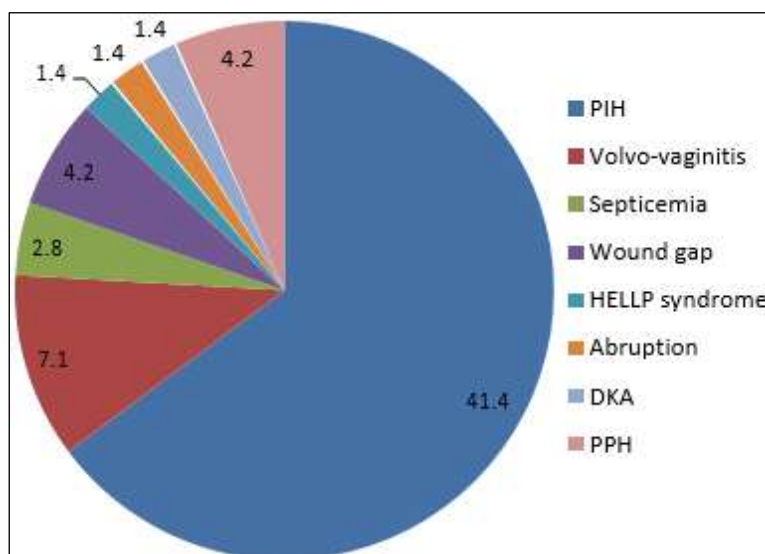


Table 10: Distribution of Birth Weight of Newborn in Study Population

Birth Weight (KGs)	No. (67)	Present study (%)	Binny Thomas <i>et al.</i> (%)
<2.5	12	17.1	40
2.6-3.9	45	64.2	45.2
≥4	10	14.2	8.1

In study by Yang *et al.*, incidence of preterm birth was 28% [10]. The incidence of hypoglycemia and hyperbilirubinemia in study done at Brazil were 16.3% and 6.1%, respectively [11].

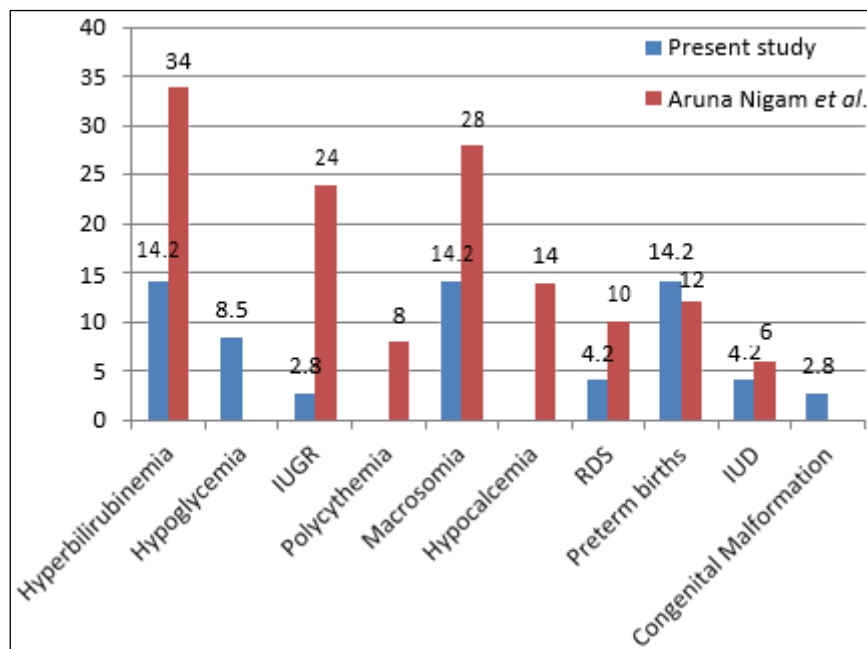


Table 11: Mode of Management in Study Population

Mode of Management	No (70)	Percentage %	Binny Thomas <i>et al.</i> %
Medical Nutrition Therapy	15	21.4	16.2
Insulin	55	78.5	83.78

Summary

- Total 70 patients were analyzed. Out of them 85.7% had gestational diabetes and 14.2% had Overt diabetes.
- 55.7% patients belonged to age group 20-29 years. 17.1% patients were above 35 years of age.
- 72.8% were registered patients
- 31.4% patients had positive family history of diabetes.
- 87% were multipara.
- 12.8% patients had HbA1C levels more than 8%
- 32.8% patients had polyhydroamnios.
- On admission, 4.2% patients had absent fetal cardiac activity suggestive of IUD
- 78.5% patients required insulin for treatment of diabetes mellitus during pregnancy along with medical nutrition therapy and exercise. Regular insulin was used in all patients.
- 54.2 % patients were delivered by caesarean section. Most common indications for caesarean section were CPD, PIH or previous one or more cesarean section, big baby, unstable lie, fetal distress, etc.
- Most common complication of pregnancy with diabetes was PIH, seen in 41.4 % patients. Vulvovaginitis and septicaemia was present in 7.1 % and 2.8% respectively. Wound gap and HELLP syndrome was present in 4.2% and 1.4% respectively. Most serious complication was diabetic ketoacidosis (DKA) seen in 1.4% patients.
- 14.2% patients had preterm delivery.
- Hypoglycemia was seen in 8.5% neonates.
- Congenital Malformations were seen in 2.8% of neonates

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