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RESEARCH ARTICLE

Maternal complications of gestational diabetes mellitus

Rajashree D[1], Vaishali M Paunikar[2]

[1]Department of Physiology, Malla Reddy Medical College for Women, Hyderabad, Telangana, India, [2]Department of Physiology, ESIC Medical College, Hyderabad, Telangana, India

Correspondence to: Vaishali M Paunikar, E-mail: dr.bvaishali@gmail.com

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) represents the most frequent endocrine disorder of pregnancy. Prevalence of GDM is increasing worldwide. Hence, impact of GDM on maternal and fetal health is a major concern and important from research point of view. **Aim and Objectives:** The aim of this study is to investigate risk factors associated with GDM and potential maternal complications of GDM. **Materials and Methods:** A total of 900 antenatal women of gestational age >24 weeks were screened for GDM using 50 g glucose challenge test followed by oral glucose tolerance test. Based on the American diabetes association criteria, 30 women were diagnosed with GDM cases and followed till their deliveries. Data regarding risk factors associated with GDM and percentage distribution of maternal complications associated with risk factors were recorded. **Results:** Complications of pre-eclampsia and polyhydramnios were found in 20% and 10% cases, respectively. **Conclusion:** High maternal age, increased parity, previous GDM history, and a family history of DM are the predisposing risk factors for the development of GDM. Information about the risks of GDM could potentially help to incorporate early intervention measures and prevent maternal morbidities.

KEY WORDS: Gestational Diabetes Mellitus; Oral Glucose Tolerance Test; Risk Factors; Pre-eclampsia; Polyhydramnios

INTRODUCTION

Pregnancy is potentially diabetogenic. Diabetes mellitus (DM) may be aggravated by pregnancy and clinical diabetes may appear in some women only during pregnancy termed as gestational DM (GDM). GDM is defined as glucose intolerance of variable severity that begins or is first detected during pregnancy.[1,2] GDM is one of the most common endocrine complications encountered during pregnancy. It has metabolic implications both on mother as well as the child. Pregnancy, in essence, serves as a metabolic stress test and uncovers underlying insulin resistance and β-cell dysfunction.[1] GDM is associated with obstetric problems and increased perinatal risks. Obstetric complications include preeclampsia, intrauterine deaths (IUD), stillbirths, polyhydramnios, birth injuries, and infections.[3] There is a great need for high-quality clinical evidence to determine optimal approaches for the management of GDM during and after pregnancy. Investigating risk factors implicated in the occurrence of GDM and the potential maternal comorbidities associated with it will give a clue to the level of intervention required to reduce this burden of antenatal as well as perinatal complications. Early detection and management can modify the course of the disease and decrease the incidence of complications in mother and child.

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MATERIALS AND METHODS

The present study was a hospital-based study conducted at Gandhi hospital, Secunderabad. Nine hundred antenatal women of gestational age 24 weeks and above attending the outpatient department of obstetrics and gynecology for

1 year were initially screened for the study. Participants were briefed about the study protocol and informed consent was obtained. All antenatal women were screened using two-step process which has been the most commonly used screening approach for diagnosing GDM.[4,5] Initially, these women were subjected to glucose challenge test with 50 g oral glucose without any preparation and plasma glucose levels were measured 1 h after ingesting glucose. Plasma levels ≥135 mg/dl were considered as positive. Women with positive test then underwent a 100 g, 3 h oral glucose tolerance test (OGTT), and plasma glucose levels were measured at 0 h, 1 h, 2 h, and 3 h. The threshold values used for the OGTT were as follows: Fasting ≥95 mg/dl, 1 h ≥180 mg/dl, 2 h ≥155 mg/dl, and 3 h ≥140 mg/dl, based on the American diabetes association criteria.[6] Those with two abnormal values were diagnosed with GDM.[6,7] Glucose estimation was done by glucose oxidase test. Multiphase sampling technique was used. Out of 900, 30 women were diagnosed with GDM and followed up until their deliveries. All women diagnosed with GDM were treated with insulin depending on their plasma glucose values. Subjects with previous history of medical illness such as DM, hypertension, renal, and cardiac disease were excluded from the study. A pre-designed, pretested, semi-structured questionnaire was administered to each patient. The questionnaire included information about age, weight, height, parity, obstetric history, and family history of diabetes. General physical examination and relevant laboratory investigations were also done. Participants were instructed to undergo self-monitoring of glucose, urine analysis of glucose, proteins and ketone bodies, daily blood pressure (BP) recording and report weekly to antenatal clinic. Non-stress test was done twice a week. Weekly ultrasound for biophysical profile of fetus and fundus examination was also done. Institutional Ethics Committee permission was taken for the study. Data were tabulated, and percentage distribution of maternal complications was recorded.

RESULTS

Table 1 shows percentage distribution of risk factors among pregnant women with GDM. Data reveals that increased maternal age >25 years, increased parity, positive family history of diabetes and a positive history of GDM in previous pregnancies accounts for increased risk for maternal GDM.

Table 2 shows percentage distribution of maternal complications of GDM. It reveals that maternal complications of pre-eclampsia were found in 20% and polyhydramnios was found in 10% population of mothers with GDM.

Table 3 reveals that approximately 87% mothers underwent caesarian section to minimize risks and injuries to both mother and child, whereas remaining 13% underwent a normal vaginal delivery.

Table 1: Risk factors-wise percentage distribution of cases of GDM

Risk factors	No. of cases with GDM	Percentage
Age		
<25 years	09	30
>25 years	21	70
Parity		
Primipara	08	26.7
Multipara	22	73.3
Family history of diabetes		
Positive	19	63.3
Negative	11	36.7
Previous history of GDM		
Positive	20	66.7
Negative	10	33.3

GDM: Gestational diabetes mellitus

Table 2: Percentage distribution of maternal complications of gestational diabetes mellitus

Complications	No. of cases	Percentage
Pre-eclampsia	06	20
Polyhydramnios	03	10

Table 3: Percentage distribution of mode of delivery in gestational diabetes mellitus cases

Mode of delivery	No. of cases	Percentage
Cesarean section	26	86.6
Normal vaginal delivery	04	13.3

DISCUSSION

This study reveals that increased maternal age >25 years, increased parity, positive family history of diabetes, and a positive history of GDM in previous pregnancies are independent risk factors for development of GDM. The study documents a higher risk for gestational hypertensive disorder, i. e., pre-eclampsia and polyhydramnios in women with GDM. It aims at identifying the magnitude of comorbidities associated with GDM stressing the importance of detecting the disease at an early stage and providing multi-disciplinary approach to all women with GDM.

The study is in accordance with findings of Khan *et al.* who had reported that maternal age, parity, previous history of GDM and family history of DM are high-risk factors for GDM.[8]

During a normal pregnancy, glucose intolerance occurs because of insulin resistance, but it is compensated by secreting more insulin leading to hyperinsulinemia. Those who are unable to compensate due to presumably underlying genetic factors develop GDM.[9] Among the possible causes of GDM are physiological insulin resistance due to increased secretion

of hormones with anti-insulin effect like human placental lactogen, estrogen, progesterone, cortisol and newer factors such as tumor necrosis factor-alpha and leptin. They cause increased gluconeogenesis and impaired post-receptor signal transduction that change specific metabolic pathways for glucose disposal. Other possible explanations include increased insulin degradation, reduced insulin secretion, reduced tissue susceptibility to insulin, decreased number of receptors or a combination of two or more of these mechanisms.[10]

The present study reveals that as the no. of pregnancies increase, likelihood of GDM increases with each pregnancy as the pancreas is burdened to produce more insulin.

Among 22 cases of multiparous women, 20 cases gave the previous history of GDM indicating once GDM is diagnosed in a woman, it tends to repeat in following pregnancy. Pregnancy is a stressful condition wherein genetically predisposed persons to DM, pancreatic reserve of beta cells is not capable of producing insulin needed to counter the insulin resistance of pregnancy, as such GDM is manifested. Once baby is delivered, insulin resistance is reduced and the need for excessive secretion of insulin is lessened. The abnormal requirement and blood glucose levels return to normal and remain subclinical until another beta cell stress occurs, i.e. another pregnancy.

The most common problem found in pregnant females with GDM is an increased incidence of pre-eclampsia (20%) due to poor glycemic control even in the absence of demonstrated pre-existing vascular or renal disease. It is proposed that hyperinsulinemia and insulin resistance is recognized as a stimulus for atherogenesis which leads to increase in peripheral vascular resistance and hypertension. Proposed mechanisms include increased BP sensitivity to dietary salt intake, augmentation of pressor and aldosterone response to angiotensin II, stimulation of sympathetic activity and reduced synthesis of vasodilatory prostaglandins.[11] Hypertensive disorders of pregnancy are associated with an increased rate of maternal complications and are a major contributor to preterm delivery among women with GDM. However, overall rate of pre-eclampsia was substantially lower in our study owing to timely intervention. This is consistent with findings of Landon *et al*.[12] who found a significant reduction in the rates of preeclampsia among women who received treatment for GDM compared to those who did not receive proper treatment.

Polyhydramnios affects about 10% of pregnancies with GDM which may result from poor maternal glycemic control with an abnormal maternal or fetal osmotic balance leading to excess fluid. Other theories include increased fetal urination from fetal insulin effects on renal sodium balance.[13]

Incidence of cesarean section was high as compared to normal vaginal delivery in GDM cases [Table 3].[12] Elective cesarean section was done to prevent birth canal injuries to mother and to avoid instances of sudden IUD and stillbirths. Emergency cesarean section was done in fetal distress to avoid fetal hypoxia related to uterine contractions in vaginal delivery.

Thus, women with GDM have increased risk for potential morbidity and for impaired glucose tolerance and it identifies a population of women who are at high risk of developing Type 2 diabetes in the years following pregnancy, with a conversion rate of up to 3% per year.[14]

The postpartum management of women with GDM is critical because of their markedly increased risk of Type 2 DM in future. The limitation of this study is that postpartum follow-up of these women was not done to know the exact conversion rate of these women vulnerable to develop Type 2 DM.

CONCLUSION

High maternal age, increased parity, previous GDM history, and a family history of DM are the predisposing risk factors for the development of GDM. Although complications such as pre-eclampsia and polyhydramnios occurred, they were less severe and seen in less proportion. Thus, with early diagnosis, nutritional therapy, close monitoring of glucose levels and insulin therapy to achieve glucose levels above goal, maternal morbidities such as birth injuries, infections, and IUDs could be avoided. Hence, for the prevention of postpartum diabetes, it is essential to recognize the risk factors and focus on modifiable targets.

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