

ADVERSE MATERNAL AND PERINATAL OUTCOMES IN GESTATIONAL DIABETES MELLITUS

Ambarisha Bhandiwad¹, Divyasree B², *Surakshith L Gowda³

ARTICLE INFO

Received: 5th Jun 2015

Revised: 24th Jul 2015

Accepted: 5th Sep 2015

Authors details: ¹Professor and Head, ^{2,3}Junior Resident Department of OBGY, JSS Medical College, JSS University, Mysore, India

Corresponding author: Surakshith L Gowda

Junior Resident Department of OBGY, JSS Medical College, JSS University, Mysore, India

Email: surakshithgowda@gmail.com

Keywords: *Gestational Diabetes Mellitus, Maternal and Fetal complications, Macrosomia, Preeclampsia*

ABSTRACT

Introduction: Women with Gestational Diabetes Mellitus (GDM) are at increased risk for many other health concerns with short and long-term implications for both mother and child. They are at higher risk for glucose-mediated macrosomia, hypertension, birth trauma, respiratory distress, hypoglycemia, hyperbilirubinemia with increased neonatal intensive care unit (NICU) admissions. Postpartum complications include obesity and impaired glucose tolerance in the offspring and diabetes and cardiovascular disease in the mothers. **Objectives:** To study the incidence of maternal and fetal co-morbidities associated with GDM. **Materials and Methods:** This is a retrospective observational study where cases with GDM were analyzed for maternal and fetal complications. **Results:** 189 cases were detected to be Gestational Diabetes Mellitus, out of which 63.49% cases developed co-morbidities with GDM. 11.11% cases developed preeclampsia, 9.52% had polyhydramnios, 5.8% patients went into preterm labour, 3 cases had Antepartum Haemorrhage and one case had Postpartum Haemorrhage. 19.57% cases developed macrosomia, hypoglycemia was seen in 7.40% babies and hyperbilirubinemia in 3.70% babies. 6 Intra Uterine Deaths and 2 still borns were documented. **Conclusion:** GDM is a condition which is worth monitoring and treating, since it has been demonstrated that good metabolic control maintained throughout gestation can reduce maternal and fetal complications.

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is commonly defined as carbohydrate intolerance that first becomes apparent during pregnancy. ^[1] Women with GDM are at increased risk for many other health concerns with short and long-term implications for both mother and child. Women with GDM are at higher risk for glucose-mediated macrosomia, hypertension, adverse pregnancy outcomes (stillbirth, birth trauma, cesarean section, pre-eclampsia, eclampsia, respiratory distress, hypoglycemia, hyperbilirubinemia, polycythemia, hypocalcemia, increased neonatal intensive care unit admissions) and neonatal adiposity with its long-term sequelae including childhood obesity and diabetes. ^[2, 3] Postpartum complications include obesity and impaired glucose tolerance in the offspring and diabetes and cardiovascular disease in the mothers. ^[3] Women who have GDM are at higher risk of developing T2DM in the future. This risk has been shown to be as high as 50% for future T2DM risk. ^[4] The ADA recommends that all women with GDM be screened at six to 12 weeks after delivery for persistent diabetes and then every three years thereafter ^[5] where as the DIPSI recommends to screen women with GDM at 6 weeks, 6 months and then yearly thereafter for persistent diabetes. This condition is worth monitoring and treating, since it has been demonstrated that good metabolic control maintained throughout gestation can reduce maternal and fetal complications. ^[1]

MATERIALS AND METHODS

Study design: This is a retrospective observational study

Study period and location: The study was done between January 2013 to December 2014, at JSS Hospital, Mysore

Ethics approval: The study was approved by the Institutional Ethics committee

Inclusion criteria: All antenatal patients who were diagnosed as GDM and who delivered during the study period available from the record section

Exclusion Criteria: Patients with oral glucose challenge test value of <140 mg/dl, incomplete data of the patient

How GDM was diagnosed ?: All pregnant women were screened and diagnosed with Diabetes In Pregnancy Study group India (DIPSI) criteria ^[6] i.e. irrespective of the timing of the last meal, as and when the pregnant women entered the antenatal clinic, she was given 75gm oral glucose. Then two hours later, plasma glucose was estimated by Glucose oxidase - peroxidase method. 2hr post plasma glucose value of 140 mg/dl was diagnostic of GDM and those patients were included in the study. All women were screened between 24-28 weeks of gestation and women with high risk factors such as age >30 yrs, obesity, family history of diabetes, previous bad obstetric history, history of GDM in previous pregnancy were screened earlier at 12 – 16 weeks of gestation and those diagnosed with GDM were included in the study,

but in a normally glucose tolerant women the test was repeated again at 32 – 34 weeks.

Methodology:

The incidence of maternal (i.e, Preeclampsia, Polyhydramnios, Preterm labour, Antepartum Haemorrhage, Postpartum Haemorrhage) and fetal complications (i.e., Macrosomia, ICU admissions, Hypoglycemia, Hyperbilirubinemia, Intra Uterine Death, Still born) which developed in those GDM patients were retrospectively analyzed from the medical records and the data was presented as percentage of complications.

RESULTS

A total of 2070 cases delivered during the study period in which 189 cases were detected to be Gestational Diabetes Mellitus, out of which 120 (63.49%) cases developed co-morbidities with GDM.

Maternal complications: 21 cases (11.11%) developed preeclampsia, 18 cases (9.52%) had polyhydramnios, 11 patients went into preterm labour i.e. 5.8%, 3 cases had APH (1.58%) and one case had PPH.

Fetal complications: 37 cases developed macrosomia, i.e. 19.57% (birth weight for Indian standards was taken as >3500 gms), 22 babies were admitted to NICU and 14 developed hypoglycemia (7.40%) and 7 babies had hyperbilirubinemia (3.70%). 6 Intra Uterine Deaths (3.17%) and 2 still borns (1.05%) were documented.

Table 1: Maternal & Fetal Complications with GDM

Maternal complications N (%)		Fetal complications	
Preeclampsia	21(11.1)	Macrosomia	37 (19.6)
Polyhydramnios	18 (9.5)	NICU admissions	22 (11.6)
Preterm labour	11 (5.8)	Hypoglycemia	14 (7.40)
Antepartum Haemorrhage	3 (1.58)	Hyperbilirubinemia	7 (3.70)
Postpartum Haemorrhage	1 (0.52)	IUD	6 (3.17)
-		Still borns	2 (1.5)

DISCUSSION

The incidence of GDM in the present study was found to be 9.13 %. In India the prevalence of GDM varied from 3.8 to 21% across the different regions [6] and 63.49% of GDM cases developed complications. Macrosomia in this study was found to be 19.57% which is similar to a study in which the incidence of macrosomia was 18%. [7] Currently, it is not known whether the overlap in GDM and hypertensive disorders reflects a common causal pathway. Both GDM and hypertensive disorders are associated with factors such as insulin resistance, inflammation, and maternal fat deposition patterns [8]. In a randomized MiG trial, which only included GDM women, about 5.0% of women had gestational hypertension and 6.3% had pre-eclampsia.[9] However, the randomized ACHOIS trial [10] reported that 15% of its GDM population had pre-eclampsia, and in the present study Pre eclampsia was associated with GDM in 11.11% of patients.

In 1987, Cousins reviewed the literature published in English from 1965 to 1985 on the impact of diabetes on the frequency and severity of obstetric complications. Hydramnios was found to be 5.3% [11] where as it was 9.52% in the present study

Preterm delivery is usually defined as delivery <37 weeks' gestation. While acknowledged as a risk of GDM, spontaneous preterm delivery is less common compared with other adverse outcomes.[3]. In the present study the incidence of preterm delivery was 5.3%. In the HAPO study, approximately 1608 of the 23,316 participants (6.9%) experienced preterm delivery (both induced and spontaneous), compared with 9.6% of infants who were LGA and 8.0% of infants who underwent intensive neonatal care admission.[12] The association between GDM and preterm delivery may be partially explained by the coexistence of other conditions with GDM that may lead to indicated or induced preterm delivery. Such conditions include pre-eclampsia and hypertensive-associated conditions, such as intrauterine growth restriction and placental abruption. However, spontaneous preterm birth, or birth in the absence of conditions prompting medical intervention, accounts for approximately three-quarters of preterm births and is not associated with GDM.[12, 13]. In the present study 3 cases had antepartum haemorrhage and one patient had post partum haemorrhage following a cesarean section where the neonatal birth weight was 3.9 kgs. In this study 22 babies had NICU admission and 14 babies were admitted for neonatal hypoglycemia. The reasons for neonatal hypoglycemia include physiologic fluctuations in glucose seen in GDM women, apart from treatment. Maternal hyperglycemia is thought to lead to excess fetal glucose exposure and fetal hyperinsulinemia. In turn, fetal hyperinsulinemia is thought to lead to hyperplasia of fat tissue, skeletal muscle, and subsequent neonatal hypoglycemia.[14] In ACHOIS, the prevalence of clinical hypoglycemia was 7% in GDM receiving intervention and 5% in GDM not receiving intervention, [10] which was similar to 7.4% in the present study.

Hyperbilirubinemia is more common among women with GDM than in women without GDM. Maternal hyperglycemia and the subsequent induction of fetal hyperinsulinemia and reduced oxygenation are hypothesized to lead to increased fetal oxygen uptake, fetal erythropoiesis, and subsequent hyperbilirubinemia.[15] In the HAPO study[12] 8.3% of the babies were affected with hyperbilirubinemia in comparison with 3.7% in this study. In more recent years and in industrialized nations, stillbirth is an uncommon outcome, even among women with glucose intolerance. Reduced stillbirth rates have been attributed to initiation of insulin therapy combined with closer monitoring and subsequent induction of labor as necessary.[16] In a study population consisting primarily of women with GDM, the stillbirth rate was approximately 1.4 per 1000 births.[17]. 3.17% fetal death an 1.05% neonatal death were documented in this study. In HAPO, only 130 women (0.56%) of the 23,316 deliveries experienced a perinatal death, 89 of which were fetal and 41 of which were neonatal.[12]

The effects of GDM upon fetal health may still be conceptualized through the framework of the Pederson hypothesis,^[18] which postulated that intrauterine exposure could lead to permanent changes in fetal metabolism. During the GDM pregnancy, the fetus may be imprinted or programmed, resulting in excess fetal growth, decreased insulin sensitivity, and impaired insulin secretion. In the short term, elevated infant birth weight confers perinatal risks, such as shoulder dystocia and infant hypoglycemia. In the longer term, altered fetal metabolism may be associated with impaired glucose tolerance during early youth and adolescence.^[19] The reduced beta-cell reserve in GDM women can manifest in the decade after delivery.^[20] Even among women who have a normal postpartum glucose tolerance test, the risk of future diabetes may be up to seven-fold higher than in women without histories of GDM.^[21] As many as one-third of women with diabetes may have been affected by prior GDM.^[22] In turn, the increased risk of diabetes is associated with future maternal cardiovascular disease.^[23]

CONCLUSION

The prevalence of GDM will continue to increase as obesity rates rises. There are sufficient evidences to show the association between hyperglycemia and adverse maternal and perinatal outcomes in the mother and offspring. A close attention to the fetal growth along with maternal glucose and weight monitoring during pregnancy and also in the postpartum period will minimize adverse outcomes. GDM is a condition which is worth monitoring and treating, since it has been demonstrated that good metabolic control maintained throughout gestation can reduce maternal and fetal complications.

Conflict of Interest: None

REFERENCES

- Metzger BE, Coustan DR (Eds.): Proceedings of the Fourth International Workshop- Conference on Gestational Diabetes Mellitus. *Diabetes Care* 1998;21(suppl. 2):B1-B167.
- Langer O. Management of gestational diabetes: pharmacologic treatment options and glycemic control. *Endocrinol Metab Clin North Am.* 2006;35(1):53-78.
- Gestational diabetes: risks, management, and treatment options, *Int J Womens Health.* 2010; 2: 339–351
- Metzger BE. Long-term outcomes in mothers diagnosed with gestational diabetes mellitus and their offspring. *Clin Obstet Gynecol.*2007;50:972-79.
- ADA Clinical Practice Guidelines 2011. *Diabetes Care.* 2011;34(suppl 1):S4-S5.
- Seshaiah V, Sahay BK, Das AK, Shah S, Banerjee S, Rao PV et al. Gestational diabetes mellitus-- Indian guidelines. *J Indian Med Assoc.* 2009 Nov;107(11):799-802, 804-806.
- Vedavathi KJ , Swamy Rm , Kanavi Roop Shekharappa , Venkatesh G , Veerananna HB Influence of Gestational Diabetes Mellitus on Fetal growth parameters. *Int J Biol Med Res.* 2011; 2(3): 832-834
- Seely E, Solomon C. Insulin resistance and its potential role in pregnancy-induced hypertension. *J Clin Endocrinol Metab.* 2003;88(6):2393–2398.
- Rowan J, Hague W, Gao W, Battin M, Moore M. MiG Trial Investigators. Metformin versus insulin for the treatment of gestational diabetes. *N Engl J Med.* 2008;358(19):2003–2015.
- Crowther C, Hiller J, Moss J, et al. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. *N Engl J Med.* 2005;352(24):2477–2486.
- Cousins L: Pregnancy complications among diabetic women: review 1965-1985. *Obstet Gynecol Surv* , 1987;42:140-49
- HAPO Study Cooperative Research Group. Hyperglycemia and adverse pregnancy outcomes. *N Engl J Med.* 2008;358(19):1991–2002.
- ACOG Committee on Practice Bulletins – Obstetrics. ACOG practice bulletin. Management of preterm labor. *Int J Gynaecol Obstet.* 2003;82(1):127–135.
- HAPO Study Cooperative Research Group. Hormonal and metabolic factors associated with variations in insulin sensitivity in human pregnancy. *Diabetes Care.* 2010;33(2):356–360.
- Ferrara A, Weiss N, Hedderson M, et al. Pregnancy plasma glucose levels exceeding the American Diabetes Association thresholds, but below the National Diabetes Data Group thresholds for gestational diabetes mellitus, are related to the risk of neonatal macrosomia, hypoglycaemia, and hyperbilirubinaemia. *Diabetologia.* 2007;50(2):298–306.
- ACOG Practice Bulletin. Clinical management guidelines for obstetrician-gynecologists. *Obstet Gynecol.* 2001;98(3):525–538.
- Girz B, Divon M, Merkatz I. Sudden fetal death in women with well-controlled intensively monitored gestational diabetes. *J Perinatol.* 1992;12(3):229–33
- Pedersen J. Weight and length at birth in infants of diabetic mothers. *Acta Endocrinol.* 1954;16(4):330–42
- Catalano P, Kirwan J, Haugel-de Mouzon S, King J. Gestational diabetes and insulin resistance: Role in short- and long-term implications for mother and fetus. *J Nutr.* 2003;133(5 Suppl 2):S1674–S1683.
- Kim C, Newton K, Knopp R. Gestational diabetes and incidence of Type 2 diabetes mellitus: A systematic review. *Diabetes Care.* 2002;25(10):1862–68.
- Bellamy L, Casas J, Hingorani A, Williams D. Type 2 diabetes mellitus after gestational diabetes: A systematic review and meta-analysis. *Lancet.* 2009;373(9677):1773–79.
- Cheung N, Byth K. Population health significance of gestational diabetes. *Diabetes Care.* 2003;26(7):2005–09.
- Carr D, Utzschneider K, Hull R. Gestational diabetes mellitus increases the risk of cardiovascular disease in women with a family history of Type 2 diabetes. *Diabetes Care.* 2006;29(9):2078–83.