



NEONATAL OUTCOME IN INFANTS OF DIABETIC MOTHERS

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ABSTRACT

Introduction The prevalence of diabetes is increasing globally . 3 to 5 % of all pregnant women show glucose intolerance. Approximately 90% of these women have GDM. Infants born to diabetic mothers are prone to complications like congenital malformations and metabolic abnormalities. Most of these complications depend on maternal glycemic control which can be prevented by good periconceptional and prenatal care. **Aims and objectives** This study is taken up to evaluate complications occurring in infants of diabetic mothers and also to compare the outcome of infants of preGDM mothers and GDM mothers **Methodology** This is hospital based observational study done on infants of diabetic mothers admitted in NICU, KGH, Visakhapatnam Neonates of diabetic mothers who have other complications like heart disease, PIH, Pre eclampsia, twin gestation, etc. which may effect the baby adversely are excluded from study **Results** A total of 50 neonates are studied out of whom 37 neonates are born to mothers with gestational diabetes and 13 to mothers with overt diabetes . Mean birth weight of infants of GDM is 3.7kg. Hypoglycemia is more common in infants of GDM mothers than in overt DM. Congenital anomalies are seen in 14% of babies. Birth injuries including clavicle fracture , Erb's palsy are seen in 5 babies, all of them weighed >3.5kg and delivered by assisted vaginal delivery. **Conclusion** Macrosomia, birth injuries and metabolic complications are common in infants of GDM mothers than in infants of pre GDM mothers. This shows importance of timely screening of all pregnant women for GDM and counsel them regarding importance of glycemic control to prevent neonatal complications.

KEYWORDS : gestational diabetes mellitus, congenital anomalies

INTRODUCTION

Prevalence of diabetes is increasing globally and India is no exception. In 2021, Approximately 537 million adults (20-79 years) are living with diabetes. The total number of people living with diabetes is projected to rise to 643 million by 2030 and 783 million by 2045. These numbers also include GDM and should alert physicians to need to direct special attention to this population, especially in developing countries. Abnormalities of carbohydrate metabolism occur frequently during pregnancy and between 3 and 5 % of all pregnant women show glucose intolerance.¹ Approximately 90% of these women have gestational diabetes.²

Diabetic women are divided into Pregestational/overt type and those diagnosed during pregnancy as Gestational³. Diabetes is an important cause of maternal and perinatal morbidity and mortality.⁴ Infants of diabetic mothers are at significant risk for spontaneous abortion, stillbirth, congenital malformations, perinatal morbidity and mortality.⁵

Abnormal fetal metabolism during pregnancy complicated by maternal diabetes mellitus results in multiple neonatal sequelae, including abnormalities of growth, glucose and calcium metabolism, hematologic status, cardio respiratory function, bilirubin metabolism, and congenital anomalies.

Most of complications of the fetus depend on the maternal glycemic control which can be prevented by good

periconceptional and prenatal care.⁵ The present study is aimed to evaluate the metabolic complications in infants of diabetic mothers and to compare the complications in infants of Pre GDM mothers and GDM mothers.

METHODOLOGY

This is a hospital based observational study done on 50 singleton neonates of diabetic mothers admitted in NICU, King George Hospital, Visakhapatnam. Neonates of mothers with other comorbidities like Pregnancy induced hypertension, Eclampsia, Cardiac and Renal diseases were excluded. Ethical clearance was obtained from the institutional ethics committee. After taking the informed written consent from the parent or guardian, the relevant information from the history, physical examination and investigations were recorded in a predesigned proforma. Details like mode of delivery, birth weight, gestational age and weight for gestational age were recorded.

A detailed physical examination was performed to screen for birth injuries and congenital malformations. Investigations like blood glucose, serum calcium, haematocrit, serum bilirubin, echocardiogram and ultrasound abdomen were done. Babies were followed throughout their NICU stay for any complications.

RESULTS

A total of 50 neonates were studied out of whom 37 neonates

were born to mothers with GDM and 13 neonates were born to mothers with Pre GDM.

Details of the study population are shown in table 1:

Table 1 :Characteristics of infants of diabetic mothers:

	GDM	Pre GDM	TOTAL
1. Mode of delivery			
Normal vaginal delivery	7 (18.9%)	7 (53.8%)	14
Assisted vaginal delivery	5 (13.5%)	3 (23.1%)	8
LSCS	25 (67.6%)	3 (23.1%)	28
2. Gestational age			
Preterm	2 (5%)	2 (15%)	4
Term	35 (95%)	11 (85%)	46
3. Gender			
Male	23 (62.1%)	10 (76.9%)	33
Female	14 (37.9%)	3 (23.1%)	17
4. Birth weight			
<2.5 kg	2 (5.4%)	6 (46.2%)	8
2.5-4 kg	29 (78.3%)	7 (53.8%)	36
>4 kg	6 (16.2%)	0	6
Mean birth weight	3.7 kg	2.6 kg	
5. Weight for Gestational Age			
SGA	2 (5.4%)	2 (15.4%)	4
AGA	29 (78.4%)	11 (84.6%)	40
LGA	6 (16.2%)	0	6

Most of the babies of GDM mothers were delivered by LSCS (67.6%), most of the infants of pre GDM mothers were delivered by normal vaginal delivery (53.8%).Most of the infants were born at term (92%).Majority of the neonates were males (66%).46.2% of the neonates born to pre GDM mothers weighed <2.5 kg and 16.2% of the neonates born to GDM mothers weighed >4kg . Mean birth weight of babies born to GDM mothers is 3.7 kg and to pre GDM mothers is 2.6 kg. The birth weight of majority of the neonates was 2.5-4 kg.Majority of the infants of diabetic mothers are appropriate for gestational age in both GDM and Pre GDM mothers.

Table 2: Distribution of metabolic complications in IDM's

Complication	GDM	Pre GDM	P value
Hypoglycemia	23(62%)	3(23.1%)	0.03
Hypocalcemia	17(45.9%)	4(36.7%)	0.53
Hyperbilirubinemia	19(51.3%)	2(15.3%)	0.05
Polycythemia	20(54.1%)	2(15.3%)	0.03

Hypoglycemia is more common in infants born to GDM mothers than in infants of pre GDM mothers which is statistically significant. Incidence of hypocalcemia, polycythemia, and hyperbilirubinemia were also higher in infants of GDM mothers.

Table 3: Congenital anomalies in neonates studied.

System	GDM	Pre GDM	Total
CVS-VSD	2(15.3%)	1(7.6%)	3
OS ASD	1(20%)	1(7.6%)	2
Assymetrical Septal Hypertrophy	1(2.1%)	0	1
CNS(MMC)	0	1(7.6%)	1
Renal(UHD)	1(2.7%)	0	1

8 IDM's had congenital malformations.6 had CVS malformations,1 had myelomeningocele and 1 had unilateral hydronephrosis.

5 babies had birth injuries.3 had erbs palsy,1 had shoulder dislocation and 1 had clavicle fracture.

DISCUSSION

In the present study, total number of IDM's was 50. Among them, 37(74%) neonates were born to GDM mothers. Among the pre GDM, 7(53.8%) were type 1 and 6(46.2%) were type 2.^{6,7}

In the present study, 56% of infants of diabetic mothers were delivered by LSCS. This is similar to several other previous studies. 67.6% of GDM mothers had LSCS where as 53.8% of mothers of pre GDM had normal vaginal delivery. This difference could be due to higher birth weight of babies of GDM. Mean birth weight of infants of GDM mothers was 3.7kgs whereas the mean birth weight of infants of pre GDM mothers was 2.6kgs.^{8,9,10,11}

In the present study 92% of IDM's were born term. Studies done by Deorari et al, Akhlaghi et al, Alam et al, Barkat et al,¹² and Mahmood CB et al¹³ also reported that most of the infants of diabetic mothers were born term .In the present study, birth weight of majority of babies of diabetic mothers was between 2.5 to 4kgs. 46.1% of babies of pre GDM were LBW.^{14,15} Macrosomia was seen in 6(16.2%) babies of GDM mothers. Majority of the IDMs were born appropriate for gestational age both in GDM and pre GDM group. Similar observation was made in study done by NilliFrouzeh et al. The incidence of LBW and SGA were higher in babies of pre GDM mothers (15.4%) compared to babies of GDM mothers (5.4%). This is probably related to the microvascular complications of advanced diabetes.¹⁵

In the present study, hypoglycaemia was the commonest metabolic complication observed in 52% of IDMs.⁹ The incidence of hypoglycaemia was higher in present study than in studies done by Deorari et al, Alam et al and Mangala et al. Higher incidence of hypoglycemia in present study may be because the cutoff level considered for diagnosis of hypoglycemia which was 40mg/dl irrespective of gestational age. In some studies, a lower cutoff level has been used to define hypoglycemia in preterm babies.^{6,7}

In the present study the occurrence of hypoglycemia was higher in infants of GDM mothers than in infants of pre GDM mothers.This difference is statistically significant (P value 0.03). This is in contrast to studies done by Mahmood CB et al¹³& Nili Frouzeh et al.¹⁵ They showed higher incidence of hypoglycemia in babies of pre GDM mothers.Hypoglycemia is associated with neonatal mortality and long term morbidity like brain dysfunction and retarded motor development which can be easily prevented.Majority of the infants in this study had hypoglycemia within first 6 hours of life and they were detected on routine screening and none of them were symptomatic and managed by gavage feeding.^{13,15} This shows the importance of routine screening of blood glucose in all high risk babies.In the present study the mean birth weight of babies who had hypoglycemia was 3.8kgs and that of babies who did not have hypoglycemia was 2.6kgs.This shows that there is co-relation between poor glycemic control in mother causing fetal hyper insulinism and macrosomia and the incidence of hypoglycemia in the new born.

In the present study the incidence of hypocalcemia was higher in babies of GDM than in infants of pre GDM,but the difference is statistically not significant.The incidence of hypocalcemia was lower in studies done by Mahmood CB et al & Nili Frouzeh et al and they showed higher incidence of hypocalcemia in infants of pre GDM.In the present study serum calcium levels were done as part of routine screening and hypocalcemia was picked up earlier before the clinical manifestations.^{13,15}

In the present study the occurrence of polycythemia was high in babies of GDM (54.1%) than in babies of pre GDM (15.3%).The difference is statistically significant with P value 0.03.This was similar to observation made by Mohsin F et al in his study but the overall incidence of polycythemia was less in his study.¹⁴

In the present study occurrence of hyperbilirubinemia was 51.3% in neonates born to GDM mothers and 15.3% in

neonates born to pre GDM mothers. The incidence of hyperbilirubinemia was similar in babies of GDM and pre GDM mothers in study done by Nili Frouzeh et al.¹⁵

In the present study 8(16%) babies of diabetic mothers had congenital malformations , 6 had congenital heart disease, 1 had myelomeningocele and 1 had unilateral hydronephrosis. There is no significant difference in the incidence of congenital malformation in the babies of pre GDM mothers and GDM mothers. The occurrence of congenital anomalies is more in the present study when compared to studies done by Farroq MU et al, Ranade et al and Deorari et al. This difference may be due to routine screening of all the infants by echocardiography and Ultrasound abdomen in the present study.^{6,16,17}

The most common congenital heart disease in the current study was VSD (50%) followed by ASD (33.3%) and Septal hypertrophy (16.6%). In the study done by basavaraj et al¹⁸ the commonest congenital heart disease was VSD followed by ASD and equal percentage of septal hypertrophy and TGA. In the study done by Ingale et al¹⁹ the commonest cardiac defect was ASD(55.2%) followed by PDA (39.4%) and in the study done by HaiderShirazi et al²⁰ Septal hypertrophy (71.1% was the commonest congenital heart disease followed by VSD and PDA.

In the present study birth injuries occurred in 5(10%) babies. Three had Erb's palsy , one had shoulder dislocation and one had clavicle fracture. All the infants who had birth injuries were born to GDM mothers, weighed more than 3.5kgs and were delivered by assisted vaginal delivery. The incidence of birth injuries was 17.5% in the study conducted by Alam et al and 2% in the study conducted by Ranade et al. Timely LSCS can prevent these birth injuries.^{9,17}

The pathophysiology underlying macrosomia, metabolic and hematological complications like hypoglycemia, hypocalcemia, polycythemia and hyperbilirubinemia is poor glycemic control in mother, pancreatic islet cell hyperplasia and hyperinsulinism in fetus which is common for both infants of GDM and Pre GDM. But some authors found higher incidence of these abnormalities in infants of GDM and some found higher incidence in infants of pre GDM.

In the present study the incidence of these complications was more in infants of GDM. This could be due to the fact that pre GDM mothers were diagnosed before pregnancy and were counselled regarding the importance of glycemic control in preventing neonatal complications but most of the mothers with GDM were diagnosed late in pregnancy, at the time of labor or retrospectively after birth of macrosomic babies. This could be the cause for higher incidence of metabolic complications in infants of GDM mothers. This emphasizes the importance of routine screening for gestational diabetes starting at 24 weeks of gestation which includes 2 step approach using non fasting 50grams glucose challenge screening test with plasma glucose measured 1 hour later, if the value is 140mg/dl - 200mg/dl, a 100gram, 3hour GTT should be performed.

CONCLUSION

The present study shows that macrosomia, metabolic complications like hypoglycemia, hypocalcemia, polycythemia, hyperbilirubinemia and birth injuries are more common in infants of GDM than in infants of pre GDM. This could be due to delay in diagnosis of GDM. This emphasizes the importance of routine screening of all pregnant women for GDM at 24 weeks of pregnancy.

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