Original Research Article

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Morbidity and mortality of infant of diabetic mothers

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder due to either insulin deficiency (relative or absolute) or due to peripheral tissue resistance to the action of insulin. Women are classified into those who were known to have diabetes before pregnancy as Pregestational or overt, and those diagnosed during pregnancy as Gestational. The study was conducted in infants born to diabetic mothers focusing on the morbidity and mortality of the neonates.

Methods: This is a cross-sectional study which was carried out in the Neonatal Unit, Department of Pediatrics, Sree Balaji Medical College and Hospital from July 2014 to July 2015. The study population comprises of 65 Neonates of mothers diagnosed to have gestational diabetes mellitus or overt diabetes mellitus. Screening and appropriate investigations was done for the neonates.

Results: 65 neonates of Infants of Diabetic Mother were studied, 48(73.85%) were born to mothers with Gestational Diabetes Mellitus and 17 (26.15%) were born to mothers with Overt Diabetes Mellitus. The most common morbidity in neonate born to GDM mothers compared to overt DM mothers was hyperbilirubinemia (52.08%), hypoglycaemia (50%), polycythemia (43.75%). Ventricular septal defect (17.65%) was the most common cardiac finding in overt DM mothers. P values (0.05%) were significant for hyperbilirubinemia, hypoglycaemia and polycythemia when compared with infants of GDM mothers and overt DM mothers. There was no mortality in present study.

Conclusions: The occurrence of morbidities and mortality were more significant in the infants of GDM mothers when compared to overt DM mothers who had good glycemic control before and during the pregnancy.

Keywords: Haematological abnormality, IDM, Metabolic abnormality

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder due to either insulin deficiency (relative or absolute) or due to peripheral tissue resistance to the action of insulin. The prevalence of diabetes is increasing globally. In 2000 WHO estimates the prevalence of diabetes in adults showed an expected total rise from 171 million (2.8%) in 2000 to 366 million (4.4%) in 2030. These numbers also include GDM and should alert physicians to the need of 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. Approximately 90% of these women have gestational diabetes. Historically, infants born to mothers with diabetes have been at significantly greater risk for spontaneous abortion, stillbirth, congenital malformations, perinatal morbidity and mortality.^{4,5}

Women are classified into those who were known to have diabetes before pregnancy as Pregestational or overt, and those diagnosed during pregnancy as Gestational.^{6,7} 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, cardiorespiratory function, bilirubin metabolism, congenital anomalies and birth injuries.⁴ The neurocognitive sequalae of IDM is also well recognized ^{8,9}. The causes of the fetal and neonatal sequelae of maternal diabetes are multifactorial. However, many of the perinatal complications can be traced to the effect of maternal glycemic control on the fetus and can be prevented by appropriate periconceptional and prenatal care.⁴

Advances in maternal and fetal care have improved the outlook of IDM. However, the current knowledge regarding the nature of immediate complications of IDM hypoglycemia, hypocalcemia, hyperbilirubinemia and polycythemia and nature of congenital anomalies in IDM remains inadequate. It is important to know if the occurrence of complications of IDM can be predicted by the diabetic status and glycemic control of the mother. This knowledge will not only help in categorization of these at-risk newborns but also may help in designing management protocols for resource limited setting. The present study was conducted in infants born to diabetic mothers focusing on the incidence of immediate metabolic and hematological complications and the incidence of congenital anomalies with respect to the diabetic status of the mother.

METHODS

This is a cross-sectional study which was carried out in the Neonatal Unit, Department of Pediatrics, Sree Balaji Medical College and Hospital from July 2014 to July 2015. The study population comprises of 65 Neonates of mothers diagnosed to have gestational diabetes mellitus or overt diabetes mellitus with inclusion Criteria Singleton neonates of diabetic mothers and exclusion criteria were Neonates of diabetic mothers with medical complications such as heart disease, renal disease, pregnancy induced hypertension and eclampsia and twin neonates of diabetic mothers. After taking the informed written consent from the parent or guardian, the relevant history, physical examination and investigation findings were recorded in a predesigned proforma. Maternal characteristics recorded include age, parity, gestational age, h/o previous abortions, stillbirths and mode of delivery. Diabetic status and treatment details were abstracted from the antenatal records. For the purpose of present study, Diabetic mothers who had blood glucose levels in the range of 70 to 110 mg/dl throughout the day were considered to have good glycemic control and above this were considered to have poor glycemic control.

After the neonate was born, assessment was made on the basis of APGAR scores to determine the need for any resuscitative efforts. Baby was weighed, and the gestation was assessed. A screening physical examination for the presence of major congenital anomalies was performed. Blood glucose levels were checked at 1, 2, 3, 6, 12, 24,

36, and 48 hours by glucostix. Serum calcium levels were measured routinely at 24 hours of age and later if the baby remains hypocalcaemic or symptomatic. Complete hemogram was done at 24 hours using auto analyzer. Echocardiography and ultrasound abdomen was done routinely for all the infants. Chest X ray when it is necessary. Hypoglycemia is defined as blood glucose levels less than 40 mg/dl, hypocalcemia as serum calcium level less than 7 mg/dl and Polycythemia as hematocrit higher than 65%. Large for gestational age (LGA) is defined as weight more than 90th percentile and Small for gestational age (SGA) as birth weight less than the 10th percentile as per Fenton preterm growth chart.

Statistical analysis

Suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t test. Categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. P Value <0.05 was considered significant. The data was analysed using SPSS version 16.

RESULTS

65 Infants of Diabetic Mother was studied, 48(73.85%) were born to mothers with Gestational Diabetes Mellitus and 17(26.15%) were born to mothers with Overt Diabetes Mellitus. Majority of the neonates were females (53.85%) and rest (46.15%) were males. Mothers with GDM had poor glycemic control (n=34, 70.83%) whereas mothers with overt DM had good glycemic control (n=14, 82.35%). The increased incidence of good glycemic control in mothers with overt DM compared to the mothers with GDM is statistically significant (P value <0.05) as shown in Table 1.

Table 1: Distribution according to glycemic control and diabetic status.

Glycemic control	GDM	%	Overt DM	%
Good	14	29.17	14	82.35
Poor	34	70.83	3	17.65
Total	48	100	17	100
P value Fishers Exact Test			0.0001	

The gestational age of majority of the neonates in both gestational and overt diabetic mothers was term which was not statistically significant as shown in Table 2.

Table 2: Distribution according to gestational age and diabetic status.

Gestational age	GDM	%	Overt DM	%
Term	43	89.58	16	94.12
Preterm	5	10.42	1	5.88
Total	48	100	17	100
P value Fishers Exact Test			0.5789	

The neonates were 2.6 to 3.0 kgs birth weight group (n=26, 40.00%) with a mean birth weight of 3.13 kgs. The most common morbidity in neonate born to GDM mothers compared to overt DM mothers was hyperbilirubinemia (52.08%), hypoglycaemia (50%),

polycythemia (43.75%) whereas 43(89.5%) neonates had normal cardiac findings. Ventricular septal defect (17.65%) was the most common cardiac finding in overt DM mothers.

GDM Overt DM P value Fishers Morbidity of infant of diabetic mothers % % (n = 48)(n=17)**Exact Test** Asymmetrical septal hypertrophy 2.08 0 0.00 0.4577 1 PDA 1 2.08 0 0.00 0.4577 **PPHN** 2.08 0 0.00 0.4577 **VSD** 2.08 1 3 17.65 0.0146 2.08 0 ASD 1 0.000.4577 Polycythemia 21 43.75 3 17.65 0.0377 Hyperbilirubinemia 25 52.08 6 35.29 0.0137

50.00

20.83

4

3

24

10

Table 3: Morbidity of infant of diabetic mothers.

P values (0.05%) were significant for hyperbilirubinemia, hypoglycaemia, polycythemia and ventricular septal defect when compared with infants of GDM mothers and overt DM mothers. There was no mortality in present study.

DISCUSSION

Hypoglycemia

Hypocalcemia

Diabetes has long been associated with maternal and perinatal morbidity and mortality. Inspite of recent advances in medicine, IDM continue to have higher risk for complications. This study was undertaken to study the incidence of various complications of IDM and its correlation with diabetic status of the mother. In the present study, good glycemic control was observed in 82.35% of overt DM mothers compared to 29.17% in GDM mothers.

This may be due to the fact that, mothers with overt DM were diagnosed before pregnancy and were advised regarding the complications during pregnancy. Hence strict glycemic control with regular follow up was maintained in them, while most of the mothers with GDM were diagnosed at the time of delivery or retrospectively after the delivery in few cases.

In present study, total number of IDMs was 65. Among them majority were born to GDM mothers (73.85%) and rest were born to mothers with overt diabetes (26.15%) Similar observation was made in Ranade et al in their study of Infants of diabetic mothers-an analysis of 50 cases in the year 1989, Firouzeh N et al in their study of 107 infants, born to diabetic mothers, to describe and compare the clinical outcome of infants born to mothers with gestational and pregestational diabetes mellitus, between January 2000 to January 2002 in Tehran and

study of Perinatal outcome in pregnancies complicated by diabetes in 1991 by Mangala et al as shown in Table 4.9-11

23.53

17.65

0.0414

0.7778

The occurrence of polycythemia was statistically significant in GDM, which was similar to the observation made by Mohsin F et al12 in their study. But the incidence of polycythemia was not significant in either group in the study undertaken by NiliFirouzeh et al10.

Table 4: Comparison of diabetic status.

Study	Diabetic status		
	GDM	Overt DM	
Present study (n=65)	48 (73.5)	17 (26.15)	
Nili Firouzeh et al (n=107)	74 (69)	33 (31)	
Ranade et al (n=50)	32 (64)	18 (36)	
Mangala et al (n=38)	26(69)	12(31)	

Hypoglycemia was statistically significant in infants of GDM. This was different from the studies done by Mahmood CB et al and Firouzeh N et al, where the incidence of hypoglycemia was statistically significant in overt DM. ^{10,13} This difference may be attributed to good glycemic control in overt DM and poor glycemic control in GDM mothers as, in most of the situations, the diabetes was detected during delivery and in few instances, diabetes was diagnosed retrospectively after the delivery in the present study.

Hyperbilirubinemia was statistically significant in infants born to GDM mothers. This was different from the study undertaken by Firouzeh N et al where the occurrence of hyperbilirubinemia was not significant in either of the groups. This difference may be attributed to the occurrence of polycythemia in the present study. The commonest cardiac anomaly noted in present study is

VSD. VSD was the commonest cardiac anomaly noted in the study done by Wren C et al 14 excluding minor cardiac disorders like PFO, ASD, and PDA in preterms. ¹⁴ The commonest cardiac anomaly noted in the study by Sulaiman A et al was PDA. ¹⁵ The study done by Cordero et al showed an equal incidence of ASD, TOF and TGA. There was no mortality in present study, which may be due to less number of sample sizes. ¹⁶

CONCLUSION

The occurrence of morbidities and mortality were more significant in the infants of GDM mothers when compared to overt DM mothers who had good glycemic control before and during the pregnancy.

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Institutional Ethics Committee

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