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Original Research Article

Morbidity profile of infants of mothers with gestational diabetes admitted to a tertiary care centre

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ABSTRACT

Background: Infants born to mothers with gestational diabetes are at increased risk of neonatal morbidities like birth trauma, hyperbilirubinemia, hypoglycemia, birth asphyxia etc., Maternal glycemic control has been one of the parameters that determines the occurrence of these problems.
Methods: A retrospective study done by analysing the case records of babies born to mothers with gestational diabetes and admitted to the NICU of Govt Kilpauk Medical college from January 2015 to December 2015. The morbidity profile of infants born to mothers with gestational diabetes was analysed and comparison was made between the two groups namely mothers who were managed by meal plan and those who were managed by insulin.
Results: About 198 babies were analysed majority were delivered by caesarean section (83%). Only 2 babies (1%) weighed more than 4000gms. The commonest morbidity observed was hyperbilirubinemia (24.2%) which was 27.7% in the insulin group as against 19% in the group on meal plan. The next common morbidity was sepsis (15.2%). This was also common in insulin group 18.5% as against 10.1% in the meal group. Others were hypoglycemia (4%), congenital heart disease (2.5 %) and respiratory distress syndrome (1.5 %).
Conclusions: Babies born to mothers with gestational diabetes were found to have morbidities like hyperbilirubinemia and sepsis. Less commonly found morbidities were hypoglycemia, birth asphyxia, respiratory distress syndrome etc., Though the morbidities were more common among insulin group as compared to the group on meal plan this difference was not statistically significant.

Keywords: Gestational diabetes, Morbidity, Hypoglycemia

INTRODUCTION

Infants of diabetic mothers are prone to a number of immediate neonatal complications when compared to the babies born to normal mothers. Gestational diabetes is a term used to denote high blood glucose levels in women who have never had diabetes in the past. Placental hormones that are secreted to facilitate fetal development block the action of the maternal insulin in her body, leading to insulin resistance.[1] Gestational diabetes increases the risk of preeclampsia, premature rupture of membranes, preterm labour and caesarean delivery. For the baby, it increases the risk of complications like macrosomia, birth trauma, hyperbilirubinemia, hypoglycemia etc.[2] With advances in obstetric management of mothers with diabetes the perinatal outcome of babies has improved. Mothers with good glycemic control can expect a normal outcome equivalent to mothers without risk factors. Good glycemic control during pregnancy minimises the perinatal complications associated with gestational diabetes. Diabetes during pregnancy can be associated with adverse fetal outcomes. The duration of diabetes and the degree of glycemic control have a strong influence on the outcome of pregnancy. Mothers who have poor glycemic control and

microvascular disease have an increased risk of poor perinatal outcome. The babies are at increased risk of premature delivery, RDS, polycythemia, hyperbilirubinemia, congenital anomalies, cardiac defects, poor feeding, macrosomia, metabolic complications like hypoglycemia, hypocalcemia, hypomagnesemia etc., By analysing the factors influencing the morbidity in babies born to mothers with diabetes we will be able to plan interventions to minimise immediate neonatal complications.

METHODS

The study was conducted at the Neonatal Intensive Care unit of Govt Kilpauk medical college hospital, Chennai. It was a retrospective study in which case records of all babies born to mothers with gestational diabetes, delivered at Kilpauk medical college hospital and admitted to the level III care during the period January 2015 to December 2015 were analysed and data collected in the prepared proforma. Extramural babies were not included in the study. Babies born to mothers who had other additional risk factors like PIH, anemia etc., were excluded from the study. During the study period, there were a total of 5878 deliveries and of these 198 babies were evaluated.

The babies were analysed in two groups based on the treatment plan for gestational diabetes. The maternal data that were analysed were age of the mother, parity, mode of delivery etc., Neonatal data that were analysed include the birth weight, gestational age, immediate complications like birth asphyxia, respiratory distress syndrome, neonatal hyperbilirubinemia, sepsis, hypoglycemia, seizures, shock, congenital anomalies etc. The relevant investigations like ultrasound abdomen/cranium, ECHO etc., were also noted. The management options that were needed in these babies were also documented and it included ventilator support, surfactant replacement therapy, inotropic support, phototherapy etc. The duration of stay of these babies was documented. The various morbidities in the neonate were compared between the two groups namely infants born to mothers with gestational diabetes managed by meal plan as against infants born to mothers with gestational diabetes who required insulin therapy.

RESULTS

During the study period, there were 5878 deliveries. During this period, there were 2360 admissions to the Neonatal intensive care unit.

Table 1: Demographic profile of babies born to mothers with gestational diabetes.

Factors	GDM meal	%	GDM insulin	%	Total	%	P value
Gestational age							0.479
>42 weeks	1	1.3	0	0	1	0.5	
37-42 weeks	67	84.8	106	89.1	173	74.2	
34-37 weeks	9	11.4	9	7.6	18	9	
32-34 weeks	2	2.	4	3.4	6	3	
Birth weight							0.729
>4000 gm	1	1.3	1	0.8	2	1	
3500-4000 gm	6	7.6	12	10.1	18	9.1	
3000-3500 gm	21	26.6	31	26.1	52	26.3	
2500-3000 gm	29	36.7	47	39.5	76	38.4	
2000-2500 gm	15	19	24	20.2	39	19.7	
1500-2000 gm	5	6.3	2	1.7	7	3.5	
<1500 gm	2	2.5	2	1.7	4	2	
Sex							0.308
male	34	43	60	50.4	94	47.5	
female	45	57	59	49.6	104	52.5	
Age of mother							0.011
< 20 years	7	8.9	6	5	13	6.6	
21-25 years	30	38	31	26.1	61	30.8	
26-30 years	35	44.3	50	42	85	42.9	
>30 years	7	8.9	32	26.9	39	19.7	
Mode of delivery							0.557
LSCS	66	83.5	103	86.6	169	85.4	
Normal labour	13	16.5	16	13.4	29	14.6	
Obstetric score							0.001
Primi	43	54.4	42	35.3	85	42.9	
G2	17	21.5	56	47.1	73	36.9	
G3	15	19	20	16.8	35	17.7	
G4	4	5.1	1	0.8	5	2.5	

Table 2: Morbidity profile of babies born to mothers with gestational diabetes.

Morbidity	GDM meal	%	GDM insulin	%	Total	%	P value
Birth injury							0.769
Yes	1	1.3	1	0.8	2	1	
No	78	98.	118	99.2	196	99	
Birth asphyxia							0.38
Yes	2	2.5	6	5	8	4	
No	77	97.5	113	95	190	96	
Congenital anomalies							0.769
Yes	1	1.3	1	0.8	2	1	
No	78	98.7	118	99.2	196	99	
Congenital heart disease							0.357
Yes	1	1.3	4	3.4	5	2.5	
No	78	98.7	115	96.6	193	97.5	
Hyperbilirubinemia							0.16
Yes	15	19	33	27.7	48	24.2	
No	64	81	86	72.3	150	75.8	
Hypoglycemia							0.38
Yes	2	2.5	6	5	8	4	
No	77	97.5	113	95	190	96	
Sepsis							0.108
Yes	8	10.1	22	18.5	30	15.2	
No	71	89.9	97	81.5	168	84.8	
RDS							0.34
Yes	2	2.5	1	0.8	3	1.5	
No	77	97.5	118	99.2	195	98.5	
Shock							0.38
Yes	2	2.5	6		8	4	
No	77	97.5	113	95	190	96	
Seizures							0.871
Yes	3	3.8	4	3.4	7	3.5	
No	76	96.2	115	96.6	191	96.5	
Mechanical ventilation							0.769
Yes	1	1.3	1	0.8	2	1	
No	78	98.7	118	99.2	196	99	
Inotropic support							0.38
Yes	2	2.5	6	5	8	4	
No	77	97.5	113	95	190	96	
Phototherapy							0.168
Yes	15	19	33	27.7	48	24.2	
No	64	81	86	72.3	150	75.8	

About 250 babies born to mothers with gestational diabetes were admitted to the NICU. Of these 198 babies were included for analysis after excluding babies whose mothers had additional risk factors.

Of these 79 mothers were managed with dietary modification (meal plan) and counselling and 119 needed insulin therapy in addition. There were 94 males (47.5%) and 104 females (52.5%). 174 babies (87.9%) were term and 24 (12.1%) were preterm. (Figure 1) There were 50 babies (25.3%) who were low birth weight and of these 4 babies (2%) were very low birth weight. (Figure 2) The mean birth weight in our study was 2932 gm in the babies born to mothers who were on insulin and 2818 gm in the babies born to mothers who were on meal plan.

Among the mothers analysed 7 (8.7%) were less than 20 years in the meal plan group as against 6 (5%) in the insulin group. Mothers more than 30 years were 7 (8.9%) in meal plan group while in insulin group there were 32 (26.9 %). This difference was statistically significant. (p value 0.011). About 29 babies (14.6%) were delivered by normal vaginal delivery while 169babies (85.4%) were delivered by LSCS. About 83.5% were delivered by caesarean section in the meal plan group while in the insulin group it was 86.6%.

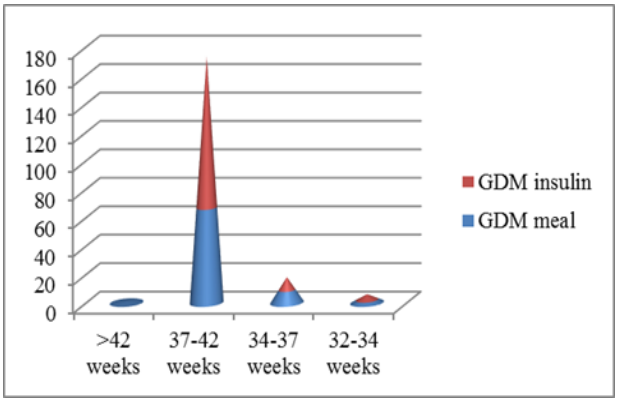

Figure 1: Gestational age distribution in GDM meal vs GDM insulin.

However, this was not statistically significant (p value 0.557). About 85 babies (42.9%)were delivered to primi mothers of which 54.4% were in the meal plan group and 35.3 % were in the insulin group.

73 babies (36.9%) were delivered to Gravida 2 mothers of which 21.5 % were in the group on meal plan and 47.1 % were in the insulin group. 35 babies (17.7%) were delivered to gravid 3 mothers and in those 19% were in the group on meal plan and 16.8% were in the insulin group. 5 babies (2.5%) were born to gravid 4 mothers and among these 5.1% were in the meal plan group and 0.8% were in the insulin group.

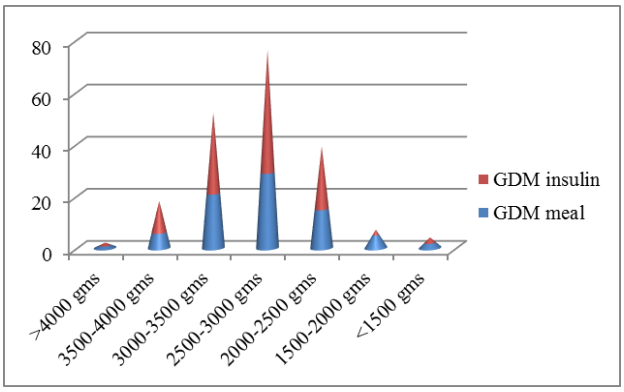

Figure 2: Birth weight distribution in GDM meal vs GDM insulin.

This difference was statistically significant (p value 0.001) (Table 1).

The common neonatal morbidities that we identified in our study were hyperbilirubinemia, (24.2%) and sepsis (15.2%). The less common morbidities were metabolic abnormalities like hypoglycemia, birth asphyxia, RDS, etc.

Birth asphyxia was observed in 8 babies (4%), RDS was seen in 3 babies (1.5%), Hypoglycemia was observed in 8 babies (4%), External congenital anomalies were noted in only 2 (1%)babies while 5 babies (4%) had ECHO evidence of congenital heart disease (Figure 3).

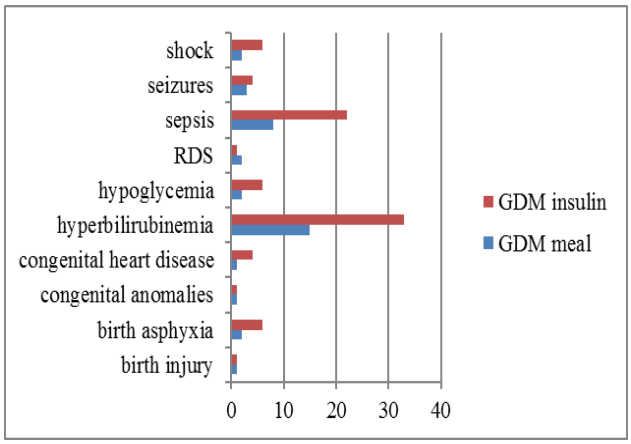

Figure 3: Neonatal morbidity profile in GDM meal vs GDM insulin.

Sepsis was observed in 30 babies (15.1%) and culture positive sepsis was seen in 4 babies. The organisms identified were Klebsiella and CONS.

Neonatal hyperbilirubinemia was observed in 49 (24.4%) and they were all treated with phototherapy.

Neonatal seizures were seen in 7 babies (3.5%), 8 babies developed shock (4%) and required inotropic support. (Table 2). The duration of hospital stay was calculated.

Table 3: Duration of stay of babies born to mothers with gestational diabetes.

Duration	GDM meal	%	GDM insulin	%	Total	%
< 3 days	14	17.7	14	11.8	28	14.1
3-7 days	36	45.6	63	52.9	99	50
7 to 10 days	20	25.3	27	22.7	47	23.7
10 to 14 days	5	6.3	7	5.9	12	6
>14 days	4	5	8	6.7	12	6

About 28 (14.1%) babies stayed for less than 3 days, 99 (50%) babies between 3 to 7 days, 47 (23.7%) babies between 7 to 10 days, 12 (6%) babies between 10 days to 14 days and 12 (6%) babies beyond 14 days (Table 3).

DISCUSSION

In our study the overall caesarean section rate was 83 %. Among mothers who were on meal plan the caesarean

section rate was 83.5% while in mothers who were on insulin it was 86.6%. In a study done by Girish Gopal et al it was observed that incidence of caesarean section was 73.91% while the study done by Mohammed Hussain et al showed a lower caesarean section rate of 45%.[3,4] Xiong X et al found high rates of caesarean section and preterm delivery.[5] CB Mahmood et al observed that a significant number (82.6%) of babies born to diabetic mothers were delivered by caesarean section.[6] Tala Anwar Al-Awqati et al in their study also had similar observations and they found about 80% of the diabetic mothers had caesarean section (p>0.14).[7]A 10-year review of neonatal morbidity in infants of diabetic mothers by Ogunwofora OB et al revealed that 58 % of babies were delivered by caesarean section. Peace I Opara et al reported a caesarean section rate as 74.3%.[8,9]

The mean birth weight in our study was 2824 gm among the GDM meal plan group while in the group on insulin therapy it was 2919 gm. In a study by Girish Gopal et al the mean birth weight observed was 3.06±0.82kgs. The mean birth weight of IDMs in a study done by CB Mahmood et al was significantly high (3212±563g) and it was found that around 21% of IDMs had birth weight >4000 g.[3,6] Tala Anwar Al-Awqati et al in their study found a mean birth weight of all macrosomic infants was 4363g (SD325g).[7]

We found that a total of 12.1% of babies were delivered preterm among which 13.9 % were in the GDM meal plan group while 10.9% were in the insulin group. Tala Anwar Al-Awqati et al in their study found.[7] The mean gestational age at delivery was 39.58 weeks (SD 1.11) in the diabetic mothers.[7] Deorari AK et al in their study found that 15% babies were preterm.[10]

In our study, male infants constituted about 48%. Prabhavathi R et al found that male infants constituted about 60 %. In a study by Mohammed Hussain it was observed that male Infants constituted about 69%.[4]

Our study showed that neonatal hyperbilirubinemia (24.4%), sepsis (15.2%) were the common morbidities followed by birth asphyxia (4%), hypoglycemia (4%), respiratory distress syndrome (1.5%), congenital anomalies (1%), etc., Our study also showed that congenital heart disease constituted the commonest anomaly in these babies. Comparing the morbidities among the two groups it was seen that hyperbilirubinemia and sepsis were more common among babies of mothers with gestational diabetes managed by insulin as against those on meal plan. In a study by Girish Gopal et al the commonest metabolic abnormality seen in 73.91% of neonates was hypoglycemia. Congenital malformations were seen in 17.40% of neonates, of which most of them had congenital heart disease.[3] Study by Prabavathi et al showed that the common neonatal complications were hypoglycemia, hypocalcaemia, hyperbilirubinemia, polycythemia, macrosomia, respiratory distress syndrome, prematurity, congenital heart diseases etc.[2] Of these hypoglycemia was most commonly observed complication (28%) followed by macrosomia (20%).[2]

In a study by Mohammed Hussain it was observed that there were 40.4% with macrosomia and 23.8 % with hypoglycemia.[4] R. Al-Khalifah et al in their study concluded that hypoglycemia and perinatal distress were the reasons for NICU admissions among infants of diabe tic mothers.[11] However, they found a lower rate of macrosomic babies in their study.[11] They also observed a lower rate of respiratory distress syndrome in their study.[11]

As ours was a retrospective study we were unable to get data on HbA1c levels as it was not done as a routine in all cases. Prabavathi et al found that there was significant correlation between maternal glycemic control and the occurrence of neonatal complications.[2] In a study by Mitali mahapatra it was found that HbA1c levels that reflect maternal glycemic control has been strongly and independently correlated with hypoglycemia in the newborn.[12]

In a study by Xiong X et al it was found there was a high risk of large for gestational age/ macrosomic babies among infants born to mothers with gestational diabetes.[5] In a study by CB Mahmood et al it was found that perinatal asphyxia, hypoglycemia, hypocalcaemia and polycythemia were the most common morbidities.[6] About 23% of the IDMs developed perinatal asphyxia. Hypoglycemia was symptomatic in 66 % of babies born to diabetic mothers.[6] About 5.7% of babies had congenital malformation which included polydactyly, cleft palate and preauricular skin tag.[6] Tala Anwar Al-Awqati et al in their study found that respiratory distress was one of the common problems among infants of diabetic mothers.[7]

Our study revealed a birth injury rate of only 1%. This was probably due to higher rate of caesarean section. Tala Anwar Al-Awqati et al in their study found that birth injury was seen in about 3.7 %. while Niranjan Thomas et al in their study found birth injuries in 2.5%.

Tala Anwar Al-Awqati et al in their study the duration of hospitalization of more than three days was significantly higher in the infant of diabetic mothers (p=0.05).[7] Niranjan Thomas et al in their study found that hypoglycemia occurred in 9.3%, congenital anomalies in 5.4%, birth injuries in 2.5%, polycythemia in 2.3%, hypocalcemia in 0.5% and probable sepsis in 2.5% babies.[13] A 10 year review of neonatal morbidity in infants of diabetic mothers by Ogunwofora OB et al and most common morbidities were hypoglycemia, jaundice and birth asphyxia etc.[8] The other less commonly identified morbidities were prematurity, transient tachypnoea of new born and birth injury. Congenital malformations constituted about 8.3%. Deorari AK et al in their study found hypoglycemia occurred in 16%, birth asphyxia in 9% and respiratory distress in 8%.[10] In a

study by Peace I Opara et al it was found that macrosomia, hypoglycemia, hyperbilirubinemia and respiratory disorders were the common morbidities among infants of diabetic mothers. There were no major congenital anomalies in their study.[9]

Deorari AK et al in their study found that 15% babies were preterm and 20% were low birth weight (less than 2500 g).[10] 17% were large-for-dates (LFD) and 6.2% were small-for-dates (SFD).

Our study showed a lower rate of congenital heart disease of 2.5%. N. Narchi observed that congenital heart disease occurs in 5% of IDM. The highest relative risk for major cardiovascular defects occurs if the mother has gestational diabetes and develops insulin resistance in the 3rd trimester.[14]

CONCLUSION

Babies born to mothers with gestational diabetes were commonly found to have morbidities like hyperbilirubinemia and sepsis. Less commonly found morbidities were hypoglycemia, birth asphyxia, respiratory distress syndrome etc., Though the morbidities of hyperbilirubinemia and sepsis were more common among infants born to mothers on insulin therapy as compared to mothers who were on meal plan this difference was not statistically significant.

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