International Journal of Contemporary Pediatrics
Anjum SK et al. Int J Contemp Pediatr. 2018 Mar;5(2):489-492
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20180541

Original Research Article

A study of neonatal outcome in infants born to diabetic mothers at a tertiary care hospital

Syeda Kausar Anjum*, Yashodha H. T.

Department of Paediatrics, Kempegowda Institute of Medical Sciences and Research Center, Bangalore, Karnataka, India

Received: 04 January 2018
Accepted: 30 January 2018

***Correspondence:**
Dr. Syeda Kausar Anjum,
E-mail: kausar.anjum86@gmail.com

ABSTRACT

Background: Diabetes is the most common medical complication in pregnancy, affecting about 0.5-5% of all pregnancies. In developing countries, management of diabetes in pregnancy still poses a challenge. Infants of diabetic mother are at increased risk of periconceptional, fetal, neonatal and long-term complications.
Methods: It was a prospective hospital-based study conducted in tertiary care hospital, Bangalore during a period of one year to assess the outcome in infants of diabetic mother and association of various complications to maternal glycemic status.
Results: The incidence of diabetes in pregnant mothers in our hospital was 2.8%. Diabetic mothers with gestational diabetes mellitus (GDM) were 86 (86%) and with pre-gestational diabetes were 14 (14%). Various complications like hypoglycemia, hypocalcemia, polycythemia, hyperbilirubinemia, macrosomia, prematurity, respiratory distress syndrome, TTNB, congenital heart diseases were observed in infants of diabetic mothers. Among them hypoglycemia was the most commonly observed complication with frequency of 54%, followed by hypocalcemia which was seen in 43%, polycythemia in 35% and macrosomia in 15%. Significant association was found between various complications and glycemic control in mothers.
Conclusions: High frequency of complications is seen in infants born to diabetic mothers. Hence, these babies should be delivered at hospitals where special neonatal care is available for management of high risks babies. Screening for GDMs should be performed in all pregnant women. Strict glycemic control in mother, planned pregnancy, proper antenatal care and strict monitoring in babies is required to prevent morbidity and mortality in infants of diabetic mother.

Keywords: Glycemic control, Infant of diabetic mother, Macrosomia

INTRODUCTION

Diabetes Mellitus refers to a group of common metabolic disorders that share the common phenotype of hyperglycemia.[1] It is the most common medical complication during pregnancy which affects about 0.5% to 5% of all pregnancies.[2] It may be before pregnancy (pre-gestational or overt diabetes) or may be detected for the first time during pregnancy (gestational diabetes). Of these 80% are caused by gestational diabetes mellitus.[3] Gestational diabetes (GDM) is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.[4]

Infants born to diabetic mother (IDM) are at increased risk of complications which may be periconceptional, fetal, neonatal and even long term.[5] GDM increases the risk of complications via a myriad of biological

mechanisms. Overt maternal diabetes mellitus can adversely influence intrauterine development. Spontaneous abortions and congenital anomalies may be induced in the first trimester. Excessive foetal growth, neonatal hypoglycaemia, jaundice, polycythemia and stillbirth may be induced during the second and third trimesters.[6]

Infants of diabetic mother are at higher risk of complications and congenital anomalies like macrosomia, hypoglycemia, hypocalcemia, hypomagnesemia, polycythemia, hyperbilirubinemia, prematurity, transient tachypnea of newborn, respiratory distress syndrome, birth asphyxia, congenital heart diseases like interventricular septal hypertrophy, transient hypertrophic subaortic stenosis, cardiomyopathy, cleft lip, cleft palate, sacral agenesis, jitteriness, seizures, movement disorders.[7-9] A strong association between congenital anomalies and maternal glycemic control has been documented.[10]

Although in developed countries there has been significant improvement in the outcome of diabetic pregnancies due to better metabolic control before and during pregnancy and better neonatal care, the management in developing country still poses a major challenge. Due to increased perinatal morbidity and mortality, IDM babies should be closely monitored. Studies have shown that strict control of maternal glucose during pregnancy has a favorable perinatal outcome.[11] The present study aimed to know the perinatal outcome and its relation to maternal glycemic control.

METHODS

This prospective hospital-based study was conducted at a tertiary care hospital, Bangalore, Karnataka during the period from July 2016 to June 2017. Informed and written consent was obtained from the parents of the newborn. Ethical clearance was obtained from the institutional ethical committee.

The mothers were grouped into pre-gestational diabetes and gestational diabetes mellitus. GDM was defined as any degree of glucose intolerance with onset or first recognition during pregnancy. GDM diagnosis was made according to IADPSG criteria, if plasma glucose values:

- Fasting: 92 mg/dl (5.1 mmol/l)
- 1 hour: 180 mg/dl (10 mmol/l)
- 2 hours: 153 mg/dl (8.5 mmol/l)

100 neonates were included in the study. Maternal history and details of glycemic control (blood glucose and HbA1c levels) was taken from maternal records. Neonatal history and detailed examination of these babies was done. Birth weight was measured by using digital electronic weighing scale before first feed after removing clothes of the baby. Laboratory investigations like blood glucose, serum calcium, serum bilirubin, haematocrit, 2D Echo, chest X-ray was done. The mothers with HbA1c levels less than 6.5% were labelled as having a satisfactory glycemic control whereas mothers with HbA1c levels more than 6.5% were grouped as having unsatisfactory glycemic control. Results were analyzed by analysing software SPSS 21.

RESULTS

A total of 100 neonates born to diabetic mothers were studied. 39 (39%) were primi and 61 (61%) were multiparous. Mean age of diabetic mothers was 28 years. Diabetic mothers with gestational diabetes mellitus (GDM) were 86 (86%) and with pre-gestational diabetes were 14 (14%) (Table 1).

Table 1: Distribution of neonates according to type of diabetes.

Group	No. of cases
Gestational diabetes	86
Pre-gestational diabetes	14

Among the GDM mothers 18(18%) were on diet and exercise, 8 (8%) were on oral drugs and 74 (74 %) were on insulin. 62 mothers with diabetes had HbA1c value < 6.5%, whereas 38 mothers had HbA1c value >6.5% (Figure 1).

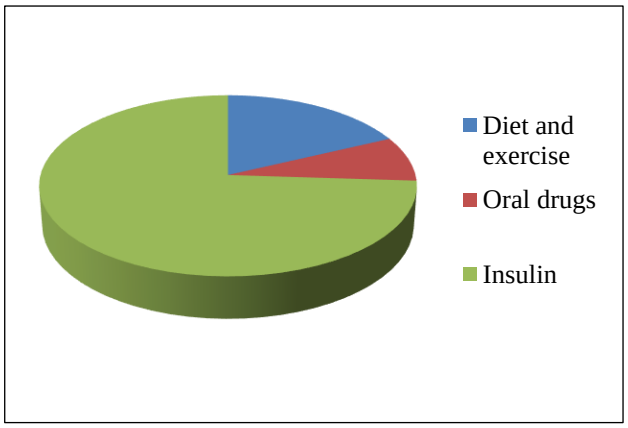

Figure 1: Based on treatment history.

Out of 100 IDMs, 55 were males and 45 were females.64 (64 %) were term and 36 (36%) were late preterm babies. 79 of GDM/Type 2 diabetic mothers delivered by caesarean section and 21 by normal vaginal delivery (Table 2). Mean birth weight was 3.28 kg. Macrosomia (birth weight >4 kg) was observed in 15% cases while 12% were having low birth weight (birth weight <2.5 kg) (Table 3).

Hypoglycemia was seen in 54% and hypocalcemia was seen in 43% neonates. Hypoglycemia at birth was seen more in babies with macrosomia and low birth weight. Polycythemia was seen in 35% neonates and hyperbilirubinemia was seen in 42% neonates

respectively (Table 4). 16% babies had respiratory distress syndrome, among them 5 babies required CPAP and 2 cases required mechanical ventilation. 3 cases of birth asphyxia were seen. 15 cases of TTNB were found. 1 case of hyperinsulinemic hypoglycaemia was seen. 1 birth injury i.e. shoulder dystocia was seen in the present study.

Table 2: Frequency of gestational age and mode of delivery.

Features	No. of cases
Gestational age	
Term	64
Late preterm	36
Mode of delivery	
Normal	79
Caesarean Section	21

Table 3: Distribution of IDMs according to birth weight.

Birth weight	No. of cases
1500-2500 kg	12
2500-3499 kg	73
>4 kg	15

Table 4: Frequency of neonatal complication.

Complications	percentage(n=100)
Hypoglycemia	54%
Hypocalcemia	43%
Macrosomia	15%
Hyperbilirubenemia	42%
Polycythemia	35%
RDS	16%
TTNB	15%
Cardiac Defects	34%
LBW<2.5kg	12%

Table 5: Incidence of neonatal complications in relation to maternal HbA1c levels.

Complications	HbA1c <6.5%	HbA1c >6.5%	P value
Hypoglycemia	18	36	<0.01
Macrosomia	5	10	<0.01
Polycythemia	10	25	<0.01

Congenital anomalies were seen in 40% neonates out of which cardiac anomalies were 85%. We had 1 case of cleft lip and cleft palate, 1 case of hydroureteronephrosis with imperforate anus, 1 case of hydronephrosis, 2 cases of medullary nephrocalcinosis, 1 case of B/L grade 1 nephropathy. Among the cardiac malformations, atrial septal defect was seen in 22, ventricular septal defect in 9 and PDA in 3 neonates.

Hypoglycemia, macrosomia, polycythemia was seen more in mothers with HbA1c more than 6.5 than mothers with HbA1c less than 6.5 (Table 5). Complications were associated with poor maternal glycemic control (p <0.01).

DISCUSSION

Diabetes mellitus is the commonest endocrine disorder during pregnancy. The duration and severity of maternal diabetes and quality of its control during pregnancy determine the outcome of the offspring.[12]

In our study, the diabetic mothers constituted 2.9 % of all deliveries whereas other studies Prabhavathi et al showed an incidence of 3.5%, Shirazi H et al showed an incidence of 1.25%.[13,14] In the present study, GDM was found in 86% and pregestational diabetes in 14% cases, which was similar to other studies like Shirazi H et al (84%), Prabhavathi et al (87.5%), Hussain M et al (71.4%).[15]

The most common complication seen in the present study was hypoglycemia which was seen in 54% which can be dangerous. Hypoglycemia is defined as blood glucose levels <40 mg/dl in any infant regardless of gestational age and whether or not symptoms are present. Infants of diabetic mothers have hyperinsulinism at birth due to increased placental transfer of glucose and other nutrients stimulating hyperplasia of islets of Langerhans in the fetus and increased insulin secretion, increased amount of C peptide and free insulin in cord blood. Once the maternal supply of glucose is stopped by clamping the cord, the excess insulin in the baby reduces glucose during the first few hours of life.

Macrosomia was found in 15%, other studies by Hussain M, Shirazi H et al have found macrosomia in 40% and 16% respectively. Incidence of late preterm deliveries in our study was 36% which is in comparison to other studies like Thomas N et al (35%), higher than studies like Prabhavathi et al where incidence was 15%, Shirazi H et al where the incidence was found to be 19%.[16] Hypocalcemia was seen in 43% neonates. Hypocalcemia is defined as total serum calcium levels <7 mg/dl. Abnormalities in calcium metabolism represent a delayed transition from fetal to neonatal parathyroid control. Perinatal asphyxia that occurs in IDMs is a result of multiple factors like maternal hypertension with reduction of placental blood flow, premature labour, fetal macrosomia and maternal hyperglycemia within 6 to 8 hours preceding delivery, which supposedly reduces placental blood flow.[17]

RDS was seen in 13% babies which is due to higher insulin levels which interfere with incorporation of choline into lecithin, producing deficiency in saturated phosphatidyl choline in lungs and amniotic fluid.

The incidence of congenital anomalies in our study was 40%. Congenital heart diseases accounted for 85% of all

congenital anomalies. A study by Shiraz H et al has shown incidence of 32% of all IDMs with 94% of all congenital anomalies, whereas study by Husain M et al showed lower incidence of 4.7% of all IDMs and 16.6% in Prabhavathi et al. In the present study we observed strong association between neonatal complications like hypoglycemia, polycythemia and macrosomia with poor maternal glycaemic control which was similar to other studies. Incidence of complications was more in mothers with HbA1c levels > 6.5%. Similar results were found by Haider Shiraz et al. and others. No deaths were seen in the present study.

CONCLUSION

Poor glycemic control in the pregnancy can lead to large for gestational age babies or small babies with higher frequency of other complications. Screening for GDMs should be performed in all pregnant women. Planned pregnancy, proper antenatal care, strict glycemic control in mother and prompt treatment of diabetic mother is essential to reduce perinatal and neonatal complications. Babies born to diabetic mothers should be monitored properly to reduce the morbidity and mortality.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kasper, Dennis L. Harrison's principles of internal medicine. 19th edition. New York: McGraw Hill Education; 2015;2:2399-2427.
2. Jansen C, Greenspoon SJ, Palmer MS. Diabetes mellitus and pregnancy. Current Obstet Gynaecol Diag Treatment 9th ed; 2003;18:317-21.
3. Chmait R, Moore TR. Endocrine disorders in pregnancy: Avery's diseases of the new-born, 8th ed; 2005:71-86.
4. American Diabetes Association. Clinical Practice recommendations. Diabetes Care. 2011;34(1).
5. Joan L, Nold MD, Michael K, Georgieff MD. Pediatr Clin N Am. 2004;51:619-37.
6. Murthy EK. Diabetes and pregnancy. Diabetologia Croatica. 2002:131-46.
7. HAPO Study Cooperative Research Group. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med. 2008;358:2061.
8. Kliegman, Stanton. Infants of Diabetic mothers. Nelson textbook of pediatrics. 20th edition; 2015;107(1):897-989.
9. John P Cloharty, Eichenwald;Manual of Neonatal care; Diabetes Mellitus; chapter 2; 7th edition;p 11-23.
10. Kalhan SC, Parimi PS, Linsu CA. Pregnancy complicated by diabete mellitus. In: Fanaroff AA, Mortin RJ, editors. Neonatal perinatal medicine: diseases of foetus and infant. Philadelphia: Mosby; 2002:1357-61.
11. Case J, Willoughby D, Haley-Zitlin V, Maybee P. Preventing type 2 diabetes after gestational diabetes. Diabetes Educ. 2006;32:877-86.
12. Singh M. Care of Newborn. 8th edition. CBS Publishers and Distributors Pvt Ltd. 2016;4:83-4.
13. Prabhavathi R, Basavaraj, Pushpalatha K, Udaykumar S. A study of perinatal and neonatal outcome in infants born to diabetic mothers. Int J Adv Med. 2015;2:246-9.
14. Shirazi H, Raiz S. Neonatal outcome of diabetic pregnancy. Ann Pak Inst Med Sci. 2010;6(2):107-12.
15. Hussain M, Irshad M. Frequency of various neonatal complications in infants born to diabetic mothers: a hospital-based study. JPMI. 2001;25(3):227-32.
16. Thomas N, Chinta AJ. Perinatal outcome of infants born to diabetic mothers in a developing country-comparison of insulin and oral hypoglycaemic agents. Indian Paediatr. 2013;50:289-93.
17. Mimouni F, Miodovnik M, Siddiqi TA, Khoury J, Tsang RC. Perinatal asphyxia in infants of insulin-dependent diabetic mothers. J Pediatr. 1988;113(2):345-53.

Cite this article as: Anjum SK, Yashodha HT. A study of neonatal outcome in infants born to diabetic mothers at a tertiary care hospital. Int J Contemp Pediatr 2018;5:489-92.