



FREQUENCY OF VARIOUS COMPLICATIONS AMONG HOSPITALIZED INFANTS BORN TO DIABETIC MOTHERS

Pooja Bharti SMGS HOSPITAL GMC Jammu

Sanjana Sharma SMGS HOSPITAL GMC JAMMU

ABSTRACT

Objective : To determine the frequency of various complications in infants born to diabetic mothers.

Methodology : This was a hospital based, prospective, observational study, carried out in NICU of SMGS hospital, an associated hospital of GMC Jammu, over a period of 1 year from January 2016 to December 2016. Total of 64 neonates were recruited. Maternal history regarding diabetes was taken. Complete neonatal examination alongwith physical examination and anthropometric measurements were performed. CBC, serum calcium, serum magnesium, hematocrit, chest X-ray and echocardiography done.

Results : Out of 64 neonates, 19 (29.6%) were born to mothers with pre conceptual DM and 45(70.3%) were born to GDM mothers. 50(78.12%) were LSCS born and 14(21.8%) born by NVD. Among the clinical features hairy pinna was most common 62(96.8%) followed by Macrosomia 27(42.1%). Among metabolic complications hypoglycaemia was most common 47(73.4%) followed by hyperbilirubinemia 36(56.25%).

Conclusion : This study conforms high frequency of complications in infants of diabetic mothers. Most common were hairy pinna, macrosomia and hypoglycaemia.

KEYWORDS : Diabetes, Hypoglycaemia,

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder due to either insulin deficiency (relative or absolute) or due to peripheral tissue resistance to the action of insulin.¹ Women are separated into those who were known to have diabetes before pregnancy as pregestational (PGDM) and those diagnosed during pregnancy as gestational (GDM).²

Diabetes has long been associated with maternal and perinatal morbidity and mortality.³ Although perinatal mortality among this group has declined,^{4,5} excess neonatal morbidity remains a significant challenge. 6-8 Congenital malformations, macrosomia, respiratory distress syndrome (RDS), hypoglycemia, hyperbilirubinemia and hypocalcemia are some of the conditions most frequently diagnosed in the offspring of diabetic women.

All of the complications faced by this fragile group of infants are the direct result of maternal glycemic control both before and during pregnancy. In 1977, the hypothesis of "hyperinsulinism" in the IDM was proposed and recognized that maternal hyperglycemia causes fetal hyperglycemia that results in fetal islet cell hypertrophy and beta cell hyperplasia due to chronic fetal pancreas stimulation. Insulin, an anabolic hormone, hyperinsulinemic state lead to visceromegaly and macrosomia. At delivery, with the sudden loss of maternal glucose supplies, hypoglycemia quickly ensues. However, this hypothesis does not tell the whole story because birth weight is not always correlated with mean maternal plasma glucose concentration. It is likely that control of fetal growth and fetal glucose homeostasis are multifactorial. Even with strict glycemic control, fetal and infant complications persist.

Studies have shown higher mortality amongst infants of diabetic mothers compared to controls.^{3,9,10} In view of the high morbidity and mortality associated with this condition babies born to diabetic mothers delivered in the SMGS Hospital Jammu an associate hospital of GMC Jammu, who required NICU admission were studied to determine common morbidities, mortality and outcome.

Material and methods

This was a hospital based, prospective, observational study, carried out in NICU of SMGS hospital, an associated hospital of GMC Jammu, over a period of 1 year from January 2016 to December 2016. All infants of diabetic mothers (both pregestational and gestational diabetes), admitted into hospital were recruited in the study.

Total of 64 neonates were recruited. Detailed examination was performed at time of admission, then during hospital stay and finally at the time of discharge. Weight of each baby was recorded with electronic weighing scale, gestational assessment done using New

Ballard's scoring chart, subsequently they were grouped as Appropriate for gestational age (AGA), Large for gestational age (LGA) and Small for gestational age (SGA) by plotting their weight and gestational age on Lubchenco charts. Investigations done were, complete blood counts, X-ray chest, blood sugar, serum calcium, serum bilirubin, serum magnesium, hematocrit, ABG analysis. Blood sugar was done by glucostick method and any abnormal values if found were sent to laboratory for confirmation by Glucose oxidase method. Transthoracic Doppler Echocardiography was done in neonates suspected of having congenital heart disease on clinical grounds or chest X-ray abnormalities.

Hypoglycaemia was defined as a blood glucose level <40mg/dl in first 24 hours and <45mg/dl after first 24 hours of life. Hypocalcemia was defined as a total serum calcium <7 mg/dl or an ionized calcium <4md/dl. Hypomagnesemia was defined as serum magnesium <1.6mg/dl. Polycythemia was defined as a venous hematocrit of >65% and Hyperbilirubinemia was defined as indirect bilirubin >12mg/dl and/or any hyperbilirubinemia requiring treatment. Any neonatal complication was managed as per standard protocols outlined for these conditions.

Results

This study was conducted over a period of 1 year include 64 neonates born to diabetic mothers who were admitted in NICU and fulfilled inclusion criterion. Of the 64 neonates 36(56.2%) males and 28(43.7%) females. 19 (29.6%) were born to mothers with pre conceptual DM and 45(70.3%) were born to GDM mothers. 50(78.12%) were LSCS born and 14(21.8%) born by NVD. 36(56.25%) were AGA, 27 (42.1%) LGA and 1(1.5%) SGA.

Among metabolic complications Table 1, hypoglycaemia was most common followed by hyperbilirubinemia, amounting 47(73.4%) patients and 36(56.25%) patients respectively. Other metabolic complications noticed in this study were hypocalcemia 5(7.8%), hypomagnesemia 3(4.68%) and polycythemia 6(9.37%).

Among the clinical complications Table 2, hairy pinna was most common among 62(96.8%). Macrosomia was observed in 27(42.1%), Birth asphyxia in 8(12.5%), RDS in 8(12.5%), TTN in 7(10.9%), MAS in 13(20%). CHD was observed in 3 (4.68%) and they were VSD in 1 patient, TGA with VSD in 1 patient and 1 patient with hypoplastic left ventricle. Excluding CHD other major congenital malformations were noticed in 4(6.2%) with a split of 1 patient with TEF, 1 with myelomeningocele, 1 with hydrocephalus and 1 with cleft lip and cleft palate. Sepsis observed in 25(39.06%) patients.

Duration of NICU stay was ≤3 days in 16(25%) patients, 4-6 days in 28(43.75%) and ≥7 days in 20(31.25%) patients. Mortality observed in

this study was 1(1.5%) and it was due to hypoplastic left ventricle with sepsis with shock.

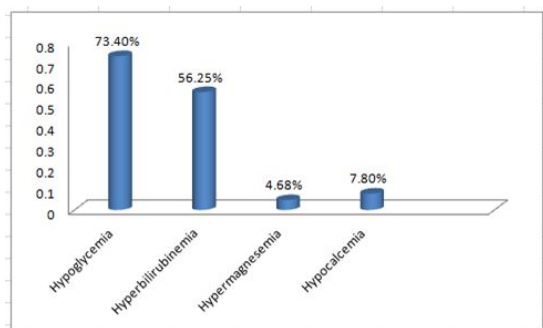


Table 1: Metabolic complications

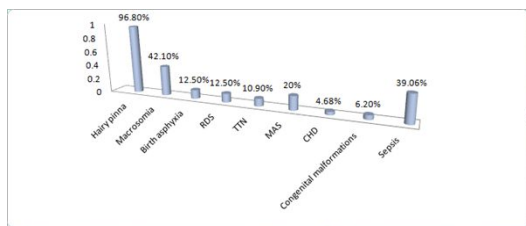


Table 2: Clinical complications

Discussion

Infants of diabetic mothers (IDMs) may have higher risks for complications during pregnancy, delivery and early neonatal period. Causes of fetal and neonatal sequelae which are seen in babies born to diabetic mothers are multifactorial. However, majority of the perinatal complications can be traced to the effect of maternal glycemic control on the fetus and can be prevented by appropriate periconceptual and prenatal care¹. Many of these complications can be minimized, but not eliminated with appropriate obstetric and pediatric intervention.

This hospital based study included 64 neonates born to diabetic mothers, admitted in NICU, to study frequency of different complications in these high risk neonates.

This study included 36(56.2%) males and 28(43.7%) females. Neonates born to GDM were more 45(70.3%) as compared to those with pre-gestational diabetes 19(29.6%). Studies done by Wasim et al¹² PGDM – 14.59% GDM – 85.41%, Deorari et al¹³ PGDM – 14%, GDM – 86%, Mangala et al¹⁴ PGDM – 31% GDM – 69% also found incidence of GDM more than PGDM.

Majority of neonates amounting 50 (78.12%) were LSCS born. The apparently high rate of LSCS in our study seem to be in accordance with similar trends noted all over world by different authors like Mangala et al¹⁴ 74%, Ranade et al¹⁵ 58%, Deorari et al¹³ 56.5%. We observed majority 56.25% were AGA, 42.1% LGA, and 1.5% SGA, similar to observation found by Ranade et al¹⁵ AGA 44%, LGA 40%, SGA 16%.

In our study hairy pinna was the most common observation found in 62(96.8%). **Macrosomia** was present in 27(42.1%) in our study. Wasim et al¹² found macrosomia in 39.58%, Ranade et al¹⁵ in 40%. Insulin is one of the important hormones affecting intrauterine growth of fetus so average weight of neonates born to diabetic mothers is more compared to otherwise healthy mothers. **Respiratory distress** at presentation was present in 28(43.7%). Causes of respiratory distress were RDS 8(12.5%), TTN 7(10.9%), MAS 13(20%) in our study MAS was more common and was due to delay in reaching tertiary care hospital as well as delay in cesarian section. Wasem et al¹² found RDS in 12.5% in their study, Matti P et al¹⁶ study has RDS occurrence of 13% and 11% in study done by Deorari AK et al¹³. **CHD** was present in 3 (4.68%) in our study and they were VSD in 1 patient, TGA with VSD in 1 patient and hypoplastic left ventricle in 1 patient. CHD was present in 3.12% in study done by Wasim et al¹², 3.37% by Leandro CM et al¹⁷. Besides CHD IDM are at higher risk for other **congenital malformations** which are attributed to hyperglycemia induced teratogenesis and indicate poor glycemic control in mother. In our study beside CHD other congenital malformations occurred in 4

(6.2%), and they were TEF in 1 patient, Meningocele in 1 patient, hydrocephalus in 1 patient and cleft lip with cleft palate in 1 patient. Congenital malformations found in other studies by Leandro CM et al¹⁷ 5%, Deorari AK et al¹³ 5.3% and Ranade AV et al¹⁵ 4%.

Hypoglycemia is the most common metabolic complication among IDM. And it requires prompt recognition and treatment to prevent long term brain damage. Maternal hyperglycemia leads to foetal hyperglycemia, stimulating fetal pancreas to synthesise excess insulin. After birth due to sudden interruption of glucose infusion without proportionate effect on hyperinsulinemia leads to neonatal hypoglycaemia. In our study hypoglycaemia was the most common metabolic complication among the metabolic complications accounting for 47(73.4%). Hypoglycaemia found by Girish et al¹⁸ in 42.02%, Wasim et al¹² 35.41%, Opare PI et al¹⁹ 63.8%. **Hyperbilirubinemia** is observed more frequently in IDM than normal neonates. Macrosomia, polycythemia and delayed clearance of bilirubin are responsible for hyperbilirubinemia. In our study after hypoglycaemia hyperbilirubinemia was most common found in 36(56.25%) neonates. Girish et al¹⁸ found hyperbilirubinemia in 57.97% and Opara PI et al¹⁹ in 57.4%. **Hypocalcemia** was observed in 5(7.8%) in our study and it was asymptomatic. Wasim et al¹² found hypocalcemia among 5.2%, Leandro Et al¹⁷ 4% and Yaseen HA et al²⁰ among 4%. **Hypomagnesemia** in our study occurred in 3(4.68%) which is similar to that observed by Lemon et al²¹ (4%) and Wasem et al¹² (4.16%). Fetal hypoxia in IDM is associated with preponderance for polycythemia. In our study **polycythemia** occurs in 6(9.37%) and all were asymptomatic. Wasim et al¹² found polycythemia in 9.37%, Deorari et al¹³ 11%. In our study 28 (43.75%) neonates have **NICU** stay of 4-6 days, 20(31.25%) having stay ≥ 7 days and 16(25%) with stay ≤ 3 days. Common cause for prolonged stay was sepsis and for shorter stay it was jaundice. Opara PI et al¹⁹ in his study has 46.8% with stay of 4-6 days 23.4% with stay ≤ 3 days and 29.8% with ≥ 7 days stay. In our study **mortality** was 1 (1.5%) and it was due to hypoplastic left ventricle with septicaemia with shock. Leandro et al¹⁷ found mortality of 0.75% and Wasim et al¹² found mortality of 1.04%.

Neonates born to diabetic mothers are at high risk with significant morbidity and less mortality, which could be avoided with proper awareness, good antenatal follow up, better compliance to therapy to achieve good glycemic control and good professional care of neonate right from delivery to early neonatal life.

Conclusion

This study was done to evaluate the infants of diabetic mothers who are traditionally consider to be a high risk population. They are prone to develop complications in utero to ex utero from delivery to NICU admission, but beauty of all these complications is that they are preventable upto some extent by good glycemic control in mothers and treatable without any significant long term sequelae. This study showed a high frequency of macrosomia, hypoglycaemia and hyperbilirubinemia which can be managed by prompt recognition and early therapy like early enteral feeding, if required intravenous dextrose and phototherapy. Intrapartum complications like Birth asphyxia, MAS can be reduced by opting for prompt LCSC with shrewd obstetrical judgement, if vaginal deliveries carry sufficient risk. CHD remains major contributor of all congenital malformations.

Key to optimal care of infant of diabetic mother is prevention, early recognition and/or treatment of neonatal morbidities. It begins right from conception and continues through the neonatal period and sometimes beyond, with the team work of obstetrician, paediatrician and endocrinologist.

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