

Blood Glucose Levels in Neonates of Diabetic Mother: A Prospective Observational Study

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Abstract: **Background:** Diabetes during pregnancy is included in high-risk pregnancy condition; nevertheless, protocols regarding the care of these neonates of diabetic mother are unestablished. **Objectives:** To evaluate the instant complications in neonate of diabetic mother especially hypoglycemia and to assess the association between cord blood glucose and blood glucose levels in the neonates of diabetic mother. **Methods:** A prospective observational study was done in LNCT Medical College Indore, involving 39 consecutive live born in neonates of diabetic mothers. An antenatal document was the source of maternal data. Neonates was subjected to glucose estimation at preordained intervals and also screened for other morbidity sequence. **Results:** The commonest complications were hypoglycemia and jaundice both occurring in 49% and 27% respectively. Hypoglycemia was usually asymptomatic, occurred within first 3hrs of life and responded to oral feeds. Neonatal glucose levels correlated with cord blood glucose. ($r=0.511$; $p<0.001$). Congenital malformations detected in 21% of babies in which cardiac defects were most common. **Interpretation and conclusion:** Neonates of diabetic mother are high risk babies. They require close observation and checking of sugar levels but it may be limited to initial 3 hrs of life. Cord blood glucose estimation may be advised to forecast and prevent hypoglycemia.

Keywords: Hypoglycemia, Diabetes, Gestational, Neonates

1. Introduction

Diabetes affects about 1 to 5% of all pregnancies [1]. It may antedate pregnancy (progestational diabetes) or may be detected for the first time during pregnancy (gestational diabetes) [2]. With the rising incidence of diabetes in general population, especially in developing nations like India, a greater number of children is likely to be born to diabetic mothers in the future [3].

The IDMs are at an increased risk for peri-conceptional, fetal, neonatal and long-term morbidities. Short-term neonatal complications, such as hypoglycemia, RDS, hypocalcemia, hypomagnesemia, hyperbilirubinemia, polycythemia, are related mainly to fetal hyperinsulinemia and hypoxemia. Long-range complications include an increased rate of childhood and adolescent obesity, impaired glucose tolerance or diabetes mellitus, and subtle neuropsychological dysfunctions [4].

The present study was conducted in babies born to diabetic mothers at LNCT Medical College, Indore from April 2023 to September 2024. It focuses on the immediate neonatal complications of these infants with special reference to hypoglycemia and cord blood glucose levels.

2. Objectives

1. To evaluate immediate complications in IDMs especially hypoglycemia.

2. To correlate cord blood glucose and blood glucose levels in the neonate.

3. Methodology

All babies born to diabetic mothers in LNCT Medical College, Indore during the study period (April 2023 to September 2024) formed the study population. The study was approved by the hospital ethical committee.

Data of the diabetic status of the mother was obtained from antenatal records. Diabetic mothers were grouped into two categories: pregestational (diagnosed before pregnancy) and gestational DM.

Gestational diabetes was diagnosed based on Carpenter and Couston Criteria after an oral glucose tolerance test, i.e.; Fasting- 95mg/dl, 1 hour-180mg/dl, 2 hours-155mg/dl, 3 hours-140mg/dl. If two or more values were met or exceeded, the diagnosis of GDM was established.

Inclusion Criteria

All neonates born to mothers with Gestational Diabetes and Pregestational (Type 1 and Type 2) diabetes in LNCT Vidhyapeeth University during the study period.

Exclusion Criteria

Neonates where maternal history is not available and all out born neonate. Informed consent was obtained from all the mothers. Mothers' antenatal history and other associated medical problems were noted. Whenever a woman with diabetes went into established labour (or was posted for elective LSCS), the glucose level in the cord blood was measured immediately at the time of delivery.

All the deliveries were attended by pediatrician and the babies evaluated thoroughly. The baby blood glucose levels monitored at regular intervals (0, 1,2,3,6,12,24,36 and 48hrs) for first 48 hours of life by the standard heel prick using glucometric reagent strip method with the same glucometer.

At birth, weight was recorded using digital weighing scale (to nearest 10 gms). The babies grouped as SGA, AGA or LGA depending on the birth weight and gestational age according to growth charts [5].

Data regarding detailed examination of the new born was recorded in a predesigned proforma. Congenital anomalies were identified clinically. Respiratory rate is measured for identifying respiratory distress. Hypoglycemia was defined as a blood glucose level less than or equal 40 mg/dl in any neonate, regardless of gestational age and whether symptomatic or not [6]. Venous hematocrit and serum calcium levels were measured if clinically relevant. S.Bilirubin estimation was done in if the neonate had clinical jaundice. Chest x-ray and arterial blood gas analysis was done if baby had significant respiratory distress and 2D-echocardiography was done if clinically suspicious.

4. Result

Out of a total of 1243 deliveries during the study period at LNCT Medical College, Indore a total of 39 mothers with either progestational or gestational diabetes mellitus delivered 39 live neonates. Out of which 2 were excluded because of lack of proper data and remaining 37 were analysed.

In our study, it was observed that majority of the neonates were female (54%). 39% were delivered by LSCS. 80% of neonates were AGA, LGA were 17% and SGA were 3%. Majority neonates were born at term (82%). 90% of the mothers in the study had Gestational diabetes.

At birth, babies having externally identifiable congenital anomalies were 21%, out of these audible murmurs were present in 7/8 of cases. 17% of babies had respiratory difficulty. 27% neonates developed icterus requiring phototherapy. Transient tachypnea of newborn was diagnosed in 5 babies and 1 baby had RDS. The commonest cardiac anomaly was ASD seen in 4 infants, next was PDA found in 2 babies followed by VSD which was seen in 1 child. 1 baby had associated PPHN diagnosed on echo. However, cord blood sugars of neonates show a large positive correlation ($r = 0.511$) with blood sugar

values of neonates at 0 hour with a strong statistical significance.

There were no cases of perinatal asphyxia, birth trauma, mortality, or hypomagnesaemia noted. Amongst neonates who were AGA a total of 19% developed hypoglycemia whereas in SGA and LGA groups the incidence of hypoglycemia was higher at 52% and 44% respectively.

5. Discussion

Our prospective observational study has shown that the neonates of diabetic mother continue to be high-risk babies.

They are prone to develop problems after birth. Therefore, they should be delivered and managed at a tertiary care set up providing intensive monitoring and therapy.

The major congenital abnormalities were cardiac, occurring in as high as 19% of the babies which suggests a need for a detailed cardiac examination with 2D-echo if required, in all these neonates.

Jaundice requiring phototherapy is an often-ignored complication noticed in 27% of these babies which may require the NICU stay in healthy neonates. It has to be observed and treated with phototherapy if bilirubin level is near phototherapy range.

Hypoglycemia continues to be a significant cause of morbidity in these babies. It was asymptomatic or with sophisticated signs and seen only in early postnatal life within 3hrs. Frequently it could be managed by oral feeds. Periodic estimations of blood glucose may be unnecessary after 3 hrs. as recurrent or late episodes of hypoglycemia are unlikely. Cord blood glucose level measured immediately at birth correlates with early postnatal glucose measurements and may be a forecaster for hypoglycemic episodes when low. However, further many more studies are required to justify its role. Early monitoring showed no significant morbidity even in babies who had hypoglycemia. However, long term monitoring with research studies may be mandatory to assess the future neurodevelopmental outcome in this group.

Therefore, optimal care of neonates of diabetic mothers is based on early identification, and management of neonatal morbidities.

6. Conclusion

This study was done in a tertiary care set up to evaluate the neonates of diabetic mother who are customarily considered to be a high-risk pregnancy. It is important as in our country India experiencing an epidemic of diabetes and transforming to the "diabetic capital of the world". Our study mainly focused on hypoglycemia which is one of the most common and potentially the most dangerous complications.

We included 37 neonates, blood glucose levels and screened for other known immediate neonatal

complications. Other investigations were done based on clinical suspicion.

Hypoglycemia, hyperbilirubinemia and minor congenital.

Anomaly constituted major morbidity patterns 49%, 27% and (21%) respectively. Hypoglycemia was asymptomatic, predominantly seen in early postnatal life, temporary and easily manageable. It is less common in AGA infants. The association with cord blood glucose is suggested for future workup and studies. The short term follow up showed that no baby presented with abnormal neurological outcome.

So, it can be conferred that neonates of diabetic mother can be managed better with very few clinical led investigations. This study is a maiden effort for guiding management of neonates of diabetic mother in our country where resources are limited.

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