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Original Research Article

BLOOD GLUCOSE LEVELS IN INFANTS OF DIABETIC MOTHER

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ABSTRACT

Background: Diabetes is the most common medical complication during pregnancy, yet guidelines regarding the care of these infants of diabetic mother are not well established.

Objectives: To assess the spectrum of immediate complications of Infants of diabetic mother especially hypoglycemia and to find out the association between cord blood glucose and blood glucose levels in the neonates.

Methods: A prospective observational study was done in LNCT Medical College, Indore involving 39 consecutive live born infants of diabetic mothers. Antenatal records were the source of maternal data. Neonates was subjected to glucose estimation at predetermined intervals and also screened for other morbidity patterns

Results: The commonest complications were hypoglycemia and hyperbilirubinemia both occurring in 27.02%. Hypoglycemia was usually asymptomatic, occurred within first 3 hrs of life and responded to enteral feeds. Congenital malformations detected in 21.62% of babies in which cardiac anomaly was most common. Neonatal glucose levels correlated with cord blood glucose. ($r=0.512$; $p<0.001$)

Interpretation and conclusion: Infants of diabetic mother are high risk neonates. They require intensive monitoring but their blood glucose measurements may be limited to initial 3 hrs of life. Routine measurement of cord blood glucose may be indicated to predict and prevent hypoglycemia.

Keywords: Hypoglycemia; Diabetes; Gestational; Infants

Study Design: Observational study

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INTRODUCTION

Diabetes during pregnancy is included in high risk pregnancy condition. It 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, more number of children are 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 focuses on the immediate neonatal complications of these infants with special reference to hypoglycemia and cord blood glucose levels.

OBJECTIVES

1. To determine immediate complications in IDMs especially hypoglycemia, and its clinical presentations.

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

MATERIAL AND METHODS

All consecutive infants born to diabetic mothers in LNCT Medical College, Indore during the study period (April 2022 to September 2023) 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 infants born to mothers with Gestational Diabetes and Pregestational (Type 1 and Type 2) diabetes in LNCTMC during the study period.

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

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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 heal prick using glucometric reagent strip method with the same glucometer for uniformity.

At admission, weight was recorded using digital weighing scale (to nearest 10gms).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 and supported by 2D-Echocardiography. 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 infant, regardless of gestational age and whether symptomatic or not [6]. Venous hematocrit and serum calcium levels were measured if clinically relevant, in the laboratory by automated analyser.. 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 by the pediatrician.

RESULT

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

Table 1 Sex wise distribution

Sex	**N**	**%**
Female	20	54.05%
Male	17	45.95%
Total	37	100%

Table 2 Birth weight with respect to gestational age

Type	**N**	**%**
SGA	1	2.70%
AGA	30	81.08%
LGA	6	16.22%
Total	37	100%

Table 3 Gestational age wise distribution

Gestational Age	**N**	**%**
Preterm	6	16.21%
Term	31	83.79%

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Table 4 Various complications wise distribution

Complication	N	%
Congenital Anomaly(CHD)	8	21.62%
Respiratory distress	6	16.22%
Icterus requiring phototherapy	10	27.02%

Table 5 Hypoglycemia incidence according to gestational Age

	Hypoglycemia/total no of baby according to gestational age	%
SGA	1/1	100%
AGA	6/30	20%
LGA	3/6	50%

In our study, it was observed that majority of the neonates were female (54.05%). 40.54 % were delivered by LSCS. Neonates were AGA 81.08%, LGA were 16.22% and SGA were 2.7%. Majority neonates were born at term (83.79%). 89.18% of the mothers in the study had GDM. At birth, babies having externally identifiable congenital anomalies were 21.62 %, out of this audible murmur were present in 7/8 of cases. The commonest cardiac anomaly taken 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 echocardiography. 16.22% of babies had respiratory distress. Transient tachypnea of newborn was diagnosed in 5 babies and 1 baby had RDS. 27.02 % neonates developed icterus requiring phototherapy. There was no case of perinatal asphyxia, birth trauma, mortality, or hypomagnesemia noted.

10 babies out of 37 babies diagnosed hypoglycemia (27.02%). Among neonates who were AGA, 20 % developed hypoglycemia whereas in SGA and LGA groups the incidence of hypoglycemia was higher at 100% and 50% respectively. Cord blood sugars of neonates show a large positive correlation ($r=0.512$) with blood sugar values of neonates at 0 hour with a strong statistical significance ($p<0.001$).

DISCUSSION

Our prospective observational study has shown that in spite of intensive management of maternal diabetes, the infants of diabetic mother continue to be a high-risk population. They are prone to develop problems both at the time of birth and after admission to the NICU. Hence, they should be delivered and managed at a tertiary care centre capable of providing intensive monitoring and therapy.
The major congenital anomalies were cardiac, occurring in as high as 21.62% of the subjects which suggests a necessity for a thorough cardiac examination supplemented by 2D-echo if required, in all these infants.

Hyperbilirubinemia requiring phototherapy is an often overlooked complication of IDMs seen in 27.02 % which may prolong the NICU stay in otherwise healthy newborns. It has to anticipate and treated promptly if present. Hypoglycemia continues to be a significant cause

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of morbidity in these babies. It was asymptomatic or with subtle signs and seen only in early postnatal life within 3 hrs. Most often it could be managed by enteral feeds but remains difficult to predict on the basis of birth weight. Repeated 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 predictor for hypoglycemic episodes when low. However, further large scale studies are needed to substantiate its role. IDMs may not require prolonged stay in NICU, especially if asymptomatic. Short term follow up showed no significant morbidity even in infants who developed hypoglycemia. However, long term follow up studies may be required to assess the future neurodevelopmental outcome in this group. Therefore, optimal care of infants of diabetic mothers is based on prevention, early recognition, and/or treatment of neonatal morbidities.

CONCLUSION

This study was done in a tertiary care centre to evaluate the infants of diabetic mother who are traditionally considered to be a high risk population. It assumes importance in view of the country experiencing an epidemic of diabetes and fast becoming the "diabetic capital of the world". Increased awareness, screening, and identification have led to a greater number of successful pregnancies among women with gestational diabetes mellitus (GDM) and pre-existing diabetes mellitus (PGDM). Our study mainly focused on hypoglycemia which is one of the most common and potentially the most dangerous complications.
Hypoglycemia, hyperbilirubinemia and minor congenital malformations constituted major morbidity patterns 27.02%, 27.02% followed by 21.62%. As described in few studies previously, hypoglycemia had a characteristic pattern of being asymptomatic, subtle, predominantly seen in early postnatal life, non-persistent and easily treated. It is less common in AGA infants. The association with cord blood glucose is suggested for future research. The short term follow up yielded promising results that no infant presented with abnormal neurological sequels. We conclude that IDMs could be managed better with very few clinical guided investigations. This study can be viewed a significant step forward in formulating appropriate protocols for the correct management of infants of diabetic mother without burdening the resources of our country.

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