

Original Research Article

Incidence and risk factors associated with hypoglycemia in the first 48 hours of life in Small for Gestational Age Neonates

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ABSTRACT

Background: Hypoglycemia is one of the important problems encountered in small for gestational age (SGA) neonates. The incidence and risk factors associated with hypoglycemia in the first 48 hours of life in Small for Gestational Age (SGA) Neonates was investigated in this study.

Methods: Capillary Blood Glucose was screened by glucostix at 1, 2, 6, 12, 24, and 48 hours of age in 100 SGA neonates fulfilling the inclusion and exclusion criteria.

Results: The overall incidence of hypoglycemia in SGA neonates in the study was 24%. The incidence of hypoglycemia was significantly higher in preterm SGA neonates (37.50%) when compared to term SGA neonates (17.65%). The incidence of symptomatic hypoglycemia was 9%. Maximum incidence of hypoglycemia was noted at 2 hours of life. Of the 24 SGA neonates with hypoglycemia, 33.33% had one episode of hypoglycemia, 45.83% had two episodes of hypoglycemia, 12.50% had three episodes of hypoglycemia, 8.33% had four episodes of hypoglycemia. None of the SGA neonate had more than four episodes of hypoglycemia. Early initiation of enteral feeding was significantly associated with decreased incidence of hypoglycemia in SGA neonates. There was no significant correlation between incidence of hypoglycemia in SGA neonates and gender of the baby, parity of mother, mode of delivery and type of IUGR.

Conclusions: It is recommended to monitor all SGA neonates especially preterm SGA for hypoglycemia and ensure early initiation of enteral feeding in all SGA neonates.

Keywords: Neonatal Hypoglycemia, SGA neonates

INTRODUCTION

Small for Gestational Age (SGA) is defined as having a birth weight that is more than two standard deviations below the mean or less than the 10th percentile of a population-specific birth weight vs. gestational age plot. Hypoglycemia in SGA neonates occurs from depletion of glycogen stores and decreased capacity for gluconeogenesis. The other factors playing a role in development of hypoglycemia include the limitation of

alternate fuel sources due to reduced oxidation of free fatty acids and triglycerides, abnormalities of counter-regulatory hormone mechanisms and hyperinsulinism.¹ Hypothermia may also potentiate the problem of hypoglycemia.

The major long-term sequelae of severe, prolonged hypoglycemia are mental retardation, recurrent seizure activity or both. Subtle effects on personality are also possible.

The symptoms attributed to hypoglycemia are nonspecific. While jitteriness, tremors, irritability, seizures, coma, lethargy, apathy, limpness, poor feeding, vomiting, apnea, weak or high-pitched cry and cyanosis are the symptoms attributed to hypoglycemia, many neonates may have no symptoms.

It is recommended that serial blood glucose levels be routinely measured in neonates who have risk factors for hypoglycemia. Screening for neonatal hypoglycemia in SGA neonates will aid in early detection and treatment of hypoglycemia and will help in prevention of long-term sequelae of hypoglycemia.

METHODS

The study was a prospective longitudinal study conducted at Sree Balaji Medical College and Hospital, Chennai from April 2015 to March 2016. 100 SGA neonates born at Sree Balaji Medical College and Hospital were the subject of the study. The neonates were excluded from the study if they were Infant of diabetic mothers, neonates with Rh-hemolytic disease, neonates born to mothers receiving therapy with terbutaline/propranolol/lebatolol/oral hypoglycemic agents, sick neonates including those with perinatal asphyxia, polycythemia, sepsis and shock when they are in active phase of illness and neonates of mothers receiving intrapartum dextrose infusion.

After taking the informed written consent from the parent or guardian, detailed antenatal, natal and neonatal history were recorded in a predesigned proforma. Capillary Blood Glucose was screened by gluco-stix at 1, 2, 6, 12, 24, and 48 hours of age. In neonates found to be hypoglycemic, hypoglycemia was confirmed by plasma glucose levels using venous blood samples. They were clinically examined and were treated according to standard protocol. Blood glucose levels were monitored accordingly. Fenton's intrauterine growth charts (Figure 1 and Figure 2) were used to assess the weight for gestational age in preterm neonates. Lubchenco Growth chart (Figure 3) was used to assess the weight for gestational age in term neonates. Any neonate whose weight was less than the 10th percentile for the respective age and sex was defined as SGA. Preterm gestation was defined as gestational age less than 37 weeks of gestation. Term gestation was defined as gestational age between 37 weeks to 41 weeks 6 days of gestation.

Ponderal index was used to classify SGA neonates. Ponderal index was computed as, $PI = \text{Weight (GM)}/\text{Length (CM)}^3 \times 100$.

Asymmetric IUGR: Ponderal index < 2

Symmetric IUGR: Ponderal index > 2

For the purpose of study neonatal hypoglycemia was defined as Capillary Blood Glucose less than 40 mg/dl and Plasma Blood Glucose less than 45 mg/dl. Tremors,

Jitteriness, Irritability, seizures, lethargy, apathy, limpness, poor feeding, vomiting, apnea and weak or high-pitched cry were considered to be clinical signs of hypoglycemia. Neonates were considered asymptomatic if hypoglycemia was not associated with clinical signs.

The data was analysed using SPSS version 16. Descriptive statistics was done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Categorical variables were analysed with Fisher Exact Test. P Value < 0.05 was considered as significant.

RESULTS

In this study, 46% (n=46) of the neonates were males and 54% (n=54) females. Majority (68%) of the SGA neonates were term (n=68) and the rest (32%) were preterm (n=32). Among the 100 SGA neonates studied, 62% (n=62) were born to primigravida mother and 38% (n=38) were born to multigravida mother. Majority of the SGA neonates studied were delivered by LSCS (65%, n=65), followed by vaginal (26%, n=26) and assisted vaginal (9%, n=9). 74% (n=74) were asymmetric IUGR and 26% (n=26) were symmetric IUGR. Enteral feeding was initiated within one hour in 80% (n=80), between one to two hours in 13% (n=13), and beyond 2 hours in 7% (n=7).

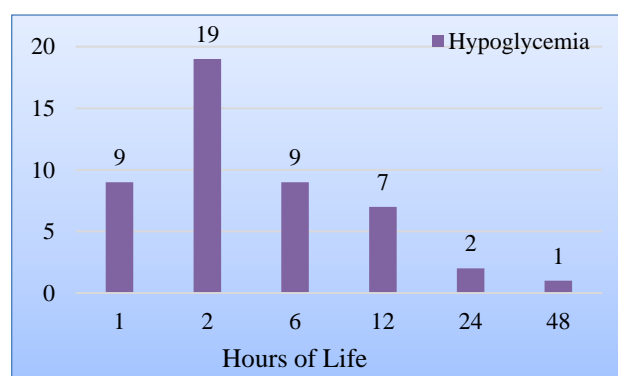


Figure 1: Incidence of hypoglycemia at different hours of life.

The overall incidence of hypoglycemia in SGA neonates in the study was 24%. The number of neonates developing symptomatic hypoglycemia were very few with an overall incidence of 9% (n=9). Of the 24 SGA neonates with hypoglycemia, 37.5% (n=9) were symptomatic and 62.5% (n=15) were asymptomatic. The incidence of hypoglycemia was maximum at 2 hours of life (19%). This is followed by an incidence of 9% at 1 and 6 hours of life, 7% at 12 hours of life and 2% at 24 hours of life. The incidence at 48 hours of life was the least. (1%) (Figure 1).

Of the 24 SGA neonates with hypoglycemia, 33.33% (n=8) had one episode of hypoglycemia, 45.83% (n=11) had two episodes of hypoglycemia, 12.50% (n=3) had

three episodes of hypoglycemia, 8.33% (n=2) had four episodes of hypoglycemia. None of the SGA neonates had more than four episodes of hypoglycemia (Figure 2).

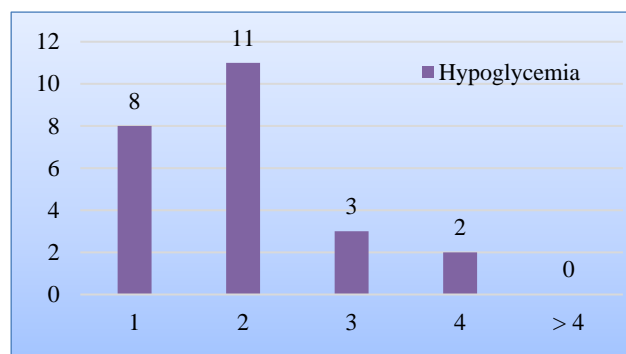


Figure 2: Number of episodes of hypoglycaemia.

Among the 46 male SGA neonates studied, 32.60% (n=15) developed hypoglycemia. Among the 54 female SGA neonates studied, 16.67% (n=9) developed hypoglycemia (P value > 0.05). Of the 68 term SGA neonates studied, 17.65% (n=12) had hypoglycemia. Of the 32 preterm SGA neonates studied, 37.50% (n=12) had hypoglycemia. The incidence of hypoglycemia was significantly higher in preterm SGA neonates when compared to term SGA neonates (P value < 0.05).

Table 1: Hypoglycemia and Time of Initiation of Enteral Feeding.

Time of initiation of enteral feeding	Hypoglycemia		Total
	Present	Absent	
< 1 hour	12(15.00%)	68(85.00%)	80
1 – 2 hours	8(61.54%)	5(38.46%)	13
>2 hours	4(57.14%)	3(42.86%)	7
Total	24	76	100
P Value (Fisher's exact test)	0.000171*		

Of the 62 SGA neonates born to primigravida mothers, 27.42% (n=17) had hypoglycemia. Of the 38 SGA neonates born to multigravida mothers, 18.42% (n=7) had hypoglycemia. (P Value > 0.05). Of the 26 SGA neonates born by vaginal delivery, 23.08% (n=6) had hypoglycemia. Of the 9 SGA neonates born by assisted vaginal delivery, 22.22% (n=2) had hypoglycemia. Of the 65 SGA neonates born by LSCS, 24.62% (n=16) had hypoglycemia (P value > 0.05).

Of the 74 asymmetric IUGR neonates studied, 21.62% (n=16) developed hypoglycemia. Of the 26 symmetric IUGR neonates studied, 30.77% (n=8) developed hypoglycemia. (P value > 0.05). Of the 80 SGA neonates studied in whom enteral feeding was initiated within one hour, 15% (n=12) developed hypoglycemia. Of the 13 SGA neonates studied in whom enteral feeding was

initiated between one to two hours, 61.54% (n=8) developed hypoglycemia. Of the 7 SGA neonates studied in whom enteral feeding was initiated beyond two hours, 57.14% (n=4) developed hypoglycemia. The incidence of hypoglycemia was significantly lesser in SGA neonates who were initiated on enteral feeds within one hour of life (P value < 0.05) (Table 1). There was no significant correlation between incidence of hypoglycemia in SGA neonates and gender of the baby, parity of mother, mode of delivery and type of IUGR.

DISCUSSION

The overall incidence of hypoglycemia in SGA neonates in the present study was 24%.

Table 2: Incidence of Hypoglycemia in SGA neonates in various studies.

Study	Sample Size	Incidence
Present Study	100	24%
Narang A et al ²	127	25.2%
Behera et al ³	480	26.2%
Bhat, MA et al ⁴	127	25.2%
Xu J ⁵	126	25.7%

The overall incidence of hypoglycemia in SGA neonates in the present study is comparable to the studies done by Narang A et al, Behera et al, Bhat MA et al and Xu J.²⁻⁵

Neonatal hypoglycemia and immediate neurological complications were found to be significantly more frequent in term SGA males compared to females by Simchen MJ et al Holtrop and Tenovuo in their studies of SGA neonates also found out that hypoglycemia was more common in male neonates.⁶⁻⁸ But in this study no statistically significant correlation was found between the incidence of hypoglycemia and gender.

In the present study, of the 68 term SGA neonates studied, 17.65% developed hypoglycemia. Of the 32 preterm SGA neonates studied, 37.50% developed hypoglycemia. The higher incidence of hypoglycemia in preterm neonates was found to be statistically significant.

The incidence of hypoglycemia in term SGA neonates in the present study was 17.65%. Mejri A et al reported an incidence of hypoglycemia of 26% in term SGA neonates.⁹ Lubchenco and Bard reported an incidence of hypoglycemia of 25% in Term SGA group.¹⁰ Holtrop observed an incidence of 14.7% in small for gestational age term neonates. The incidence of hypoglycemia in term SGA neonates in the present study is lesser than that reported by Mejri et al and Lubchenco and Bard and is comparable to the study done by Holtrop.^{7,9}

The incidence of hypoglycemia in preterm SGA in the present study was 37.50%. Devanel CB et al in his study found that the incidence of hypoglycemia was 72.9% in

SGA preterm neonates.¹ Lubchenco and Bard reported an incidence of hypoglycemia of 67% in preterm SGA group.¹⁰ The lesser incidence of hypoglycemia in preterm SGA neonates in present study could be explained by the early initiation of enteral feeding in majority of the study subjects and by the fact that sick neonates in the active phase of illness such as those with perinatal depression, sepsis and shock were excluded in present study. Mejri A et al in their study noted that symmetrical growth restriction decreased the risk of neonatal hypoglycemia which was explained by the fact that more severe growth restriction is associated with relative insulin resistance. But no significant association was found between incidence of hypoglycemia and the type of IUGR in the present study.⁹

Narang A in his study noted that 98% episodes of hypoglycemia in SGA neonates occurred in first 24 hours of life.² Ninety four percent hypoglycemic episodes occurred within 24 h of life in the study of SGA neonates done by Behera et al. Mejri A et al in his study of hypoglycemia in term SGA neonates observed that only 15% of the neonates continued to present with hypoglycemic episodes beyond 36 hours of life.^{3,9} These findings are comparable to present study in which majority of the hypoglycemic episodes occurred within the first 24 hours of life. 9% of the SGA neonates in present study developed symptomatic hypoglycemia. This is comparable to the study done by Behera et al³ in which 10% of the SGA neonates developed symptomatic hypoglycemia.

Delay in initiating breastfeeding were considered risk factors for developing hypoglycemia in studies done by Anderson et al.,¹¹ and Sasidharan et al.¹² In the study by Bhat, M.A et al⁴ oral feeds had been initiated by one hour of life in only 37% of hypoglycemic neonates compared to 63% of non-hypoglycemic neonates. But in the study by Bragg JJ et al it was observed that early enteral feeding does not prevent the occurrence of hypoglycemia in SGA neonates.¹³ In present study, lesser incidence of hypoglycemia was noted in the SGA neonates in whom early enteral feeding was initiated as shown by the studies by Anderson et al, Sasidharan et al and Bhat, M.A et al.¹¹⁻¹³

CONCLUSION

It is recommended to monitor all SGA neonates especially preterm SGA for hypoglycemia. Since early initiation of enteral feeding was associated with significantly lesser incidence of hypoglycemia, it is advised ensure early initiation of enteral feeding in all SGA neonates.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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