



RESEARCH ARTICLE

CLINICAL STUDY OF HYPOGLYCEMIA IN BREASTFED LATE PRETERM NEONATES

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Abstract

Aim: To evaluate the usefulness of regular monitoring of blood glucose in early diagnosis of hypoglycemia in breastfed late preterm neonate. **Method:** A total of 100 consecutively born breastfed late preterm neonates were studied and assessed for development of hypoglycemia against age of onset, symptomatology, gestational age and sex of the baby, parity and age of mother, and mode of delivery. Serial blood glucose was done at 0, 1, 3, 6, 12, 24, 48 and 72 hours of life to identify hypoglycemia. Blood glucose was estimated from heel prick capillary samples using glucometer. Association of both maternal and neonatal risk factors was studied in relation to hypoglycemia.

Results: The overall incidence of hypoglycemia was 15%. Out of 15 hypoglycemic babies 12(80%) developed symptoms and only 3(20%) were asymptomatic. Most (90%) of the hypoglycemia occurred on the first day of life. Babies born to primi mothers were more prone for hypoglycemia (25%). Highest incidence was seen in babies weighing less than 2 kg (50%). Symptoms of hypoglycemia included poor feeding (66%), lethargy(58%), jitteriness (41%), and weak cry (25%). **Conclusions:** There is a significant incidence of hypoglycemia in late preterm babies in spite of being on breast feeds. Babies born to primiparous mothers are more prone for hypoglycemia. Also hypoglycemia was very high in babies having birth weight below 2 kg. Therefore it is very important to regularly monitor the blood glucose levels in all late preterm babies even if they are on exclusive breast feeding.

Key words: Late Preterm, Neonate, Hypoglycemia, Breast feeding.

INTRODUCTION

Gestational age is one of the most important parameter to assess risks for morbidity and mortality in neonates. Also it is proposed that "late preterm" be defined as births between 34⁰/₇ weeks and 36⁶/₇ weeks of gestation calculated from the first day of the mother's last menstrual period[1,2]. Until recently these newborns were called "Near Term" and parents, caregivers and health professionals have treated these preterm infants on par with term infants, but they are physiologically and metabolically immature and have a higher risk of morbidity and mortality [2,3,4]

While preterm birth rates continue to rise globally as well as in India, reasons attributed for this rise include demographic changes, infertility treatments, increases in maternal age, more multiple



gestations, or increased rate of labor induction. Late preterm newborns are the fastest growing subset of preterm neonates, accounting for approximately 70% of all preterm births and about 8% of total births [5]. Infants who are late preterm may appear mature, but they are physiologically, metabolically and neurologically immature. These infants are at higher risk for a number of problems including poor feeding, hypoglycemia, hypocalcemia, jaundice, infections, respiratory distress, failure to thrive and hospital re-admission [2,3]. These infants present a number of feeding challenges including fewer and shorter awake periods and excessive sleepiness. They tire easily during feeding; they have a weak suck and poor muscle tone, and may exhibit an inability to sustain sucking, and fatiguing easily before finishing a feed. Their tone may be adequate at the start of a feeding session but rapidly decreases during the feeding, indicating decreased endurance [6]. There is a significant incidence of hypoglycemia in preterm and low birth weight babies in spite of being on breast feeds [7].

Glucose concentration is the most frequently measured laboratory value in neonatal medicine, presumably to diagnose and treat low glucose concentrations, or “hypoglycemia”. Consequently regular assessment of blood glucose has become an integral part of basic neonatal care in most centers. Therapeutic interventions, with fairly elaborate protocols for “low blood sugar”, are meticulously adhered to in neonatal units.

Unfortunately, there is still no research basis or consensus regarding the definition of neonatal hypoglycemia, or who is at risk and under what circumstances, or when screening should be performed [8,9]. But severe glucose deficiency can potentially lead to cerebral energy failure and impaired cardiac performance [10,11,12]. Thus, maintenance of glucose delivery to all organs is an essential physiological function. Normal term infants have sufficient alternate energy stores and capacity for glucose production from glycogenolysis and gluconeogenesis to ensure normal glucose metabolism during the transition to extrauterine life and early neonatal period. But this does not hold good for late preterm babies.

The operational threshold for hypoglycemia is defined as “that concentration of plasma or whole blood glucose at which clinicians should consider intervention, based on the evidence currently available in literature”[8]. This threshold is currently believed to be a blood glucose value of less than 40 mg/dl in both term and preterm babies.

We therefore evaluated 100 late preterm breast fed neonates, and monitored their plasma glucose at 0, 1, 3, 6, 12, 24, 48 and 72 hours of life along with the symptoms at the onset of hypoglycemia with the aim of clarifying some of these issues.

MATERIAL AND METHODS

It is a longitudinal study of pattern of blood glucose in late preterm infants conducted at Yenepoya medical college, Mangalore.

“Late preterm” is defined as infants born at gestational age between 34 ⁰/₇ weeks and 36 ⁶/₇ weeks calculated from the first day of mothers last menstrual period. Hypoglycemia was defined as Gucometer blood sugar reading of less than 40mg/dl.

100 Late Preterm neonates born from October 2011 to September 2012 delivered by normal vaginal delivery or by cesarean section and who were on exclusive breast feed from birth form the subjects of our study. These neonates were taken up for collecting blood samples at



0,1,3,6,12,24,48 and 72 hours. Samples were collected by heel prick (capillary blood). The glucose level was measured using Accu-check active glucometer. Those who found hypoglycemic by glucometer method were confirmed by Glucose oxidase method. Neonates detected to have hypoglycemia during this study were transferred to Neonatal Intensive Care Unit (NICU) and managed according to the standard protocol.

Babies who were small for gestational age (SGA), large for gestational age (LGA), those admitted to NICU, multiple gestation babies, those started on formula feeds, those who have not given the consent and those who were discharged before 72 hours of birth were excluded from the study. The relationship of hypoglycemia against age of onset, symptomatology, gestational age, birth weight and sex of the baby, parity and age of mother, and mode of delivery were analysed.

The clinical and laboratory parameters of the study population were expressed in terms of mean and \pm standard deviation (SD). Nonparametric categorical data were compared with Chi-square test and parametric continuous data were compared with Student's t test. P values less than 0.05 were considered statistically significant. The statistical analyses were performed using SPSS version 10.0 for Microsoft Windows.

RESULTS

A total of 100 late preterm babies were assessed which included 51 boys and 49 girls. The overall incidence of hypoglycemia was 15%. Out of 15 hypoglycemic babies 12 (80%) developed symptoms, and 3 (20%) were asymptomatic. Hypoglycemia was slightly more in boys but the difference was not statistically significant (Table 1).

Majority of the hypoglycemia occurred on the first day (80%), and remaining 20% babies were hypoglycemic on 2nd day. No babies developed hypoglycemia on third day (Table 2). Considering the intervals in hours, there was no hypoglycemia developed at birth and after 48 hours. At 1 hour 3 babies, at 3 hours 4 babies, at 6 hours 3 babies, at 12 hours 2 babies, at 24 hours 2, and at 48 hours 1 baby developed hypoglycemia.

Considering the mode of delivery, out of 80 babies born by normal vaginal route, 11(14%) had hypoglycemia and in caesarian born babies, 4(20%), developed hypoglycemia. (Table 3). But this difference is statistically not significant.

Out of 60 babies born to multiparous mothers, 5 (8.3%) babies developed hypoglycemia and out of 40 babies born to primiparus mothers 10 (20%) developed hypoglycemia. (Table 4) and this is statistically significant. In the gestational age group the highest incidence was seen in 34 week age group. There were 3(37%) hypoglycemic babies in this group. In the age group 35 weeks, 7(17%) babies and in 36 week age group 5(10%) were hypoglycemic. The incidence in babies weighing less than 2 kg was very high. There was 3(50%) hypoglycemic babies out of 6 babies in this weight category, compared to 12(12.7%) out of 94 babies weighing more than 2 kg. (Table 5 and 6)

Majority of the hypoglycemic babies were symptomatic in our study. Out of 15 babies with hypoglycemia 12(80%) babies were symptomatic and out of symptomatic babies, 66% showed



poor feeding, 58% were lethargic, 41% had jitteriness, , and 25% had weak cry. None had seizures or apnoea.

Table 1:- Incidence of Hypoglycemia

| | | Asymptomatic Hypoglycemia | Symptomatic Hypoglycemia | Total Hypoglycemic Babies | |
|-------|-----|---------------------------|--------------------------|---------------------------|----------|
| Male | 51 | 2 (4%) | 6 (11.7%) | 8 (15.6%) | $p>0.05$ |
| Femal | 49 | 1(2%) | 6(12.2%) | 7(14.2%) | |
| Total | 100 | 3 (3%) | 12 (12%) | 15 (15%) | |

Table 2: Age of Onset of Hypoglycemia

| Time | hypoglycemia | |
|-------------|--------------|----------|
| <24 hours | 12(80%) | $P<0.01$ |
| 24-48 hours | 3(20%) | |
| >48 hours | 0 | |
| Total | 15(100%) | |

Table 3:- Incidence in Relation to Mode of Delivery

| Type of delivery | No. of cases | Incidence of hypoglycemia | |
|-------------------|--------------|---------------------------|----------|
| Normal vaginal | 80 (80%) | 11 (14.5%) | $P=0.79$ |
| Caesarian section | 20(20%) | 4 (16.5%) | |
| Total | 100(100%) | 15(15%) | |

Table 4:- Incidence of Hypoglycemia In Relation To Parity

| Factor | No. of cases | Incidence of hypoglycemia | |
|--------|--------------|---------------------------|--|
| | | | |



| | | | |
|-------------------|-----------|---------|------------------|
| Multiparus | 60 (60%) | 5(8.3%) | <i>P<0.05</i> |
| Primiparus | 40 (40%) | 10(25%) | |
| Total | 100(100%) | 15(15%) | |

Table 5:- Incidence of Hypoglycemia in Relation To Gestational Age

| Gestational age (weeks) | Total cases | Cases with hypoglycemia | |
|--------------------------------|--------------------|--------------------------------|----------|
| | | (n=15) | % |
| 34 | 8 | 3 | 37.5% |
| 35 | 40 | 7 | 17.5% |
| 36 | 52 | 5 | 9.6% |

Table 6:- Incidence in Relation to Birth Weight

| Birth weight | No.of cases (n=100) | Hypoglycemic babies (n=15) | |
|---------------------|----------------------------|-----------------------------------|------------------|
| < 2 kg | 6 | 3(50%) | <i>P<0.01</i> |
| > 2 kg | 94 | 12(12.7%) | |

Table 7: Incidence of Hypoglycemia in Relation to Maternal Age

| MATERNAL AGE GROUP | Number of cases (n=100) | Incidence (n=15) |
|---------------------------|--------------------------------|-------------------------|
| 18-25 | 53 (53%) | 7 (13.2%) |
| 25-35 | 38 (38%) | 6 (15.8%) |
| >35 | 9(9%) | 2 (22.2%) |

Table 8:- Symptomatology of Hypoglycemia

| | SYMPTOMS | |
|-------------------------------|---------------------|--------|
| Symptomatic N=12 (80%) | Poor feeding | 8(66%) |
| | Lethargy | 7(58%) |
| | Jitteriness | 5(41%) |
| | Weak cry | 3(25%) |



| | | |
|--------------------|-----------------|-------|
| | Sweating | 1(8%) |
| | Seizure | 0(0%) |
| | Apnoea | 0(0%) |
| Asymtomatic | 3 (20%) | |

DISCUSSION

In this study the incidence of hypoglycemia in late preterm newborns was 15%. The incidence of hypoglycemia shown by previous studies in preterm infants were 67% by Lubchenco and Bard [13], 4.3% by Chance & Brower [14], 15% by Fluge [15], 3-15% by Hawdon [16], 12.8% by Singhal et al [17]. Harris and Weston found 51% incident of hypoglycemia on study of high risk neonates [18]. Information on the incidence of neonatal hypoglycemia in developing countries is very limited. In 1993 Anderson et al conducted a cross sectional study of 226 full term, uncomplicated newborns in Kathmandu Low birth weight and hypothermia were associated with hypoglycemia, which was present in 55% of those weighing < 2200 gms [19].

The wide variations in the incidence of hypoglycemia seen in the above studies can be attributed to variations in definitions of hypoglycemia, the frequency of blood glucose monitoring, birth weight and gestational age of the neonates as well as the feeding regimes advocated, which have evolved over the years.

The incidence of hypoglycemia was highest (66%) on the first day of life. According to Hawdon et al in a study on preterm infants the mean blood glucose concentration was significantly lower on the first day than on subsequent days [16]. Likewise, in a study by MA. Bhat et al on SGA babies, almost all the episodes of hypoglycemia occurred within 24 hours [20].

In our study hypoglycemia was seen only on day 1 or day 2 with no episodes afterwards, suggesting the need for constant monitoring of blood glucose values in the first 48 hours.

The incidence of hypoglycemia was more in primiparous mothers compared to multiparous. This observation was correlating with other studies⁽¹⁷⁾ and this may be probably because primiparous mothers are the ones who face more difficulties related to breast feeding. Hence babies born to this group of mothers should be monitored more closely for hypoglycemia.

There is no significant variation in the incidence of hypoglycemia as far as the mode of delivery is concerned. It was 14.5% in normal vaginal delivery and 16.5% in caesarean born babies. It is comparable with the study done by K K Divakar on neonates, where he found that the mode of delivery does not affect the blood glucose of the baby [21]. These results are also similar to a study by Hawdon et al [16] where they did not find significant difference in the incidence of hypoglycemia between infants born by normal vaginal delivery and caesarean section in the first week of life.

The incidence was almost similar when the newborn sex was considered as a variable with figures of 15.6% in males and 14.2% in females, which contrasts with the study by K. Inayathullah where he found, hypoglycemia was more common in male babies [22]. But study done by Duvanel et al on SGA infants showed no significant difference between these groups [11]. Whereas in a study by Bhalla et al, mean blood glucose values were higher in female preterms compared to males [23] and Pildes have mentioned that hypoglycemic infants are predominantly males [24].

In our study, the common symptoms in hypoglycemic babies were poor feeding, jitteriness, sweating, lethargy and weak cry. Out of which poor feeding, lethargy and jitteriness were the



most common symptoms. 20% of the babies did not show any symptoms. This is comparable with the study done by K.Inatathullah [22] where he found that poor feeding and jitteriness were the most common symptoms in hypoglycemic babies.

The incidence of hypoglycemia was highest (66%) in the 34 weeks gestational age babies category and reduced to 41.7% in the 35 weeks category and 11.7% in the 36 weeks. These results are comparable to a study by Bhalla M et al [23] where they found that the mean glucose values were directly related to the gestational age. In a study by Singhal et al [17] the incidence of hypoglycemia was 12.8% in preterm compared to 3.6% in term babies. It can be thus concluded that lower the gestational age, the greater will be the risk of hypoglycemia in babies who are appropriate for gestational age.

Nancy Wight[25] have found out that the clinical manifestations of hypoglycemia are nonspecific, occurring with a variety of other neonatal problems. Even in the presence of an arbitrary low glucose level, the physician must assess the general status of the infant by observation and physical examination to rule out other disease entities and processes that may need additional laboratory evaluation and treatment.

CONCLUSION

The present study has shown that significant percentage of late preterm babies who are on breast feed developed hypoglycaemia. Therefore it is very important to monitor regularly the blood glucose levels of late preterm babies who are on breast milk during the first 48 hours of life.

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