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Incidence of hypoglycaemia within 72 hours after birth in low birth weight babies who are appropriate for gestational age

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ABSTRACT

Background: Neonatal hypoglycemia is a very common metabolic disorder which is due to inability to maintain a normal glucose homeostasis. The most effective method of preventing hypoglycemia is early breast feeding which is preferred to formula feeding. Therefore, author conducted this study to document incidence of hypoglycemia both symptomatic and asymptomatic in exclusively fed with breast milk, low birth weight neonates who are appropriate for gestational age. Aims and objectives of this study was to determine incidence of hypoglycaemia in first 72 hrs of life in low birth weight neonates (1500-2499gm) who are appropriate for gestational age and who are exclusively fed with breast milk.

Methods: Prospective cohort study conducted in between December 2015 to November 2017 in which 150 consecutive neonates with a birth weight between 1500 to 2499 grams and appropriate for gestational age, being fed exclusively with breast milk were studied.

Results: Out of 150 neonates, 36 (24%) developed one episode of hypoglycemia, 14 (9.4%) newborns had recurrent episodes while 13 (8.66%), and 1 (0.7%) newborn had two and three episodes of hypoglycemia respectively. Applying a cut-off of blood glucose level of 40 mg/dl, the incidence of hypoglycemia was 24%. The less is the gestational age there is higher chance of occurrence of hypoglycemia. PIH is the most common maternal risk factor for neonatal hypoglycemia. Incidence of hypoglycemia is highest during the first 24hrs after birth and jitteriness is the most common symptom of neonatal hypoglycemia.

Conclusions: Healthy new-borns in postnatal wards can be exclusively breastfed, but there is needing to closely monitor their blood glucose levels at least in first 72 hrs and asymptomatic hypoglycaemia in new-borns can be managed with frequent breastfeeding without any formula feeds.

Keywords: AGA, Breastfeeding, Hypoglycaemia, LBW

INTRODUCTION

Neonatal hypoglycaemia is a very common metabolic disorder which is due to inability to maintain a normal glucose homeostasis. The fetus is entirely dependent on the mother for glucose. At the time of birth, the neonate must abruptly switch from state of continuous supply of glucose from maternal blood to maintaining its own supply of glucose both during periods of fasting and in

between feedings. The maintenance of normal glucose levels in new-borns depends upon adequate glycogen stores, maturation of glycogenolytic and gluconeogenic pathways and an adequate integrated endocrine response.² Metabolic and endocrine disturbances frequently occur in neonates, because of developmental immaturity. As there is lack of significant correlation between plasma glucose concentration, clinical symptoms and long-term sequelae, the definition of

hypoglycaemia in the neonates has remained controversial.³

The operational threshold for hypoglycaemia is currently believed to be a blood glucose value of <40 mg/dl (plasma glucose <45 mg/dl). Mothers are often in dilemma and apprehensive whether new-borns at risk for hypoglycaemia, like neonates of diabetic mothers, large for gestation age, low birth weight and late-preterm neonates, could be sustained on exclusive breast feeding. Hence, they often offer supplemental feeding, leading to low exclusive breastfeeding rates in the community, especially during first two to three days. Even though occurrence and incidence of hypoglycaemia in neonates is well documented, its occurrence in exclusively breastfed low birth weight new-borns remains undervalued.

These new-borns are recommended to be screened for hypoglycaemia, as it has been shown to be associated with poor neurological outcome and low IQ. The most effective method of preventing hypoglycaemia is early breast feeding which is preferred to formula feeding. Therefore, author conducted this study to document incidence of hypoglycaemia both symptomatic and asymptomatic in exclusively fed with breast milk, low birth weight neonates who are appropriate for gestational age.

Aims and objectives of this study was to determine incidence of hypoglycaemia in first 72 hrs of life in low birth weight neonates (1500-2499gm) who are appropriate for gestational age and who are exclusively fed with breast milk, to observe whether these neonates are able to remain euglycemic after initiation of exclusive breast feeding and to study the pattern of blood sugar levels in LBW babies who feed exclusively on breast milk.

METHODS

This prospective cohort study was conducted in Department of paediatrics at Konaseema Institute of Medical sciences and Research Foundation, Amalapuram, between December 2015 to November 2017 in which 150 consecutive neonates with a birth weight between 1500 to 2499 grams and appropriate for gestational age, being fed exclusively with breast milk were studied. All neonates were weighed at birth with an electronic weighing machine with an accuracy of $\pm 5 \, \mathrm{g}$. The birth weight percentiles were adopted from the Fenton growth charts. Gestational age assessment was done by the Modified New Ballard Score.

Inclusion criteria

 Neonates who were low birth weight (1500-2499gm) and appropriate for gestational age were included in the study. Neonates given exclusive breast feed within half an hour after normal delivery and within one hour after a caesarean delivery.

Exclusion criteria

- Babies born to diabetic mothers
- Neonates with asphyxia, respiratory distress, meconium aspiration, 5 minutes Apgar score less than 7 and any major congenital anomalies or polycythemia.
- IUGR, SGA, LGA Babies
- Any neonates who became ill during the study period (for reasons other than hypoglycemia) were excluded
- Babies whose mothers were not available due to various maternal problems were also excluded from the study

Data collection

Informed written consent was obtained from parents. All the details of the newborn and mother were noted in a proforma at the time of enrolment. Counselling as well as assistance for exclusive breastfeeding was done in all cases. Breastfeeding was ensured either direct breast feeding or with expressed breast milk depending on gestational maturity and feeding skills within 30 minutes of birth in vaginal delivery and no later than one hour after caesarean section and thereafter every 2 to 3 hrs, including at least two-night time feeds.

Blood glucose levels were monitored at 1 hr of life and later pre-prandial (preferred) at 3, 12, 24, 48 and 72 hrs of life or any time if symptomatic using glucometer strips (ALERE G1 Glucometer, measuring range (10-900mg/dL). Confirmation of blood glucose by sending the sample to the laboratory was done only if the level was less than 25 mg/dL, if baby was symptomatic or if three consecutive readings of BGL remained ≤40mg/dl. Hypoglycemia was defined as BGL ≤40mg/dl.

Recurrent hypoglycemia was defined as 2 or more episodes of hypoglycemia in first 72 hrs of life. Newborns developing asymptomatic hypoglycemia (25-40 mg/dL) were breastfed and repeat blood glucose level was determined after 1 hr; if still in range of 25-40mg/dl, neonate was breastfed again and advised increased frequency of feeding or increased volume if baby was given expressed breast milk (EBM).

Supplementation with neonates formula was done only if the level did not rise to >40mg/dl despite breastfeeding/EBM >2 times. Monitoring was discontinued if the blood glucose level was >40mg/dl on two consecutive measurements, and newborns were at least 72 hrs of age. Baby was admitted to the NICU and treated with intravenous dextrose as per standard protocols, if the level was <25mg/dl or symptomatic hypoglycemia occurred at any time.

Statistical analysis

The data was collected and analyzed. Mean, range, standard deviation, frequency and percentages were calculated.

RESULTS

Total number of cases enrolled in the study were 150 neonates. Out of 150 neonates, 36 (24%) developed one episode of hypoglycemia, 14 (9.4%) newborns had recurrent episodes while 13 (8.66%), and 1 (0.7%) newborn had two and three episodes of hypoglycemia, respectively. Applying a cut-off of blood glucose level of 40 mg/dl, the incidence of hypoglycemia was 24%.

Table 1: Incidence of hypoglycemia in relation to parity.

Parity	Total cases	Cases with hypoglycemia (n=36)	Incidence of hypoglycemia
<u>Primiparous</u>	82	22(61.11%)	26.82%
Multiparous	68	14 (38.88%)	20%

The overall incidence was 20% in multiparous and 26.82% in primiparous mothers respectively. When the hypoglycemic cases were analyzed the incidence was 61.11% in the primiparous group (Table 1).

Table 2: Incidence of hypoglycemia in neonates in relation to maternal age.

Maternal age (years)	Total cases	Cases with hypoglycemia (n=36)	Incidence of hypoglycemia
<u>< 20</u>	28	5(13.88%)	17.85%
21-24	52	16 (44.44%)	30.76%
25-30	48	12 (33.34%)	25%
>30	22	3 (8.33%)	13.63%

The incidence of hypoglycemia was 17.85% in the <20 years category, 30.7% in the 21-25 years category and 25% in the 25-30 years age category and 13.63% in more than 30 Years category. Considering the total number of hypoglycemic newborns, the incidence was higher in the age group of 21-25 years compared to an incidence of other three groups (Table 2).

The group with hypertensive disorders had an incidence of 24.48% and PROM had incidence of 15.38%. The groups with antepartum haemorrhage had incidence of 16.66%, polyhydraminos and Oligohydraminos had incidence of 14.2% and 12.5% respectively. The group without complications also had an incidence of 27.58% (Table 3).

The incidence was highest (27.27%) in the group of 30-32 weeks gestation and progressively reduced as the number of weeks increased, there by maintaining an

inverse relation between gestational age and the incidence of hypoglycemia (Table 4).

Table 3: Incidence of hypoglycemia in relation to maternal antepartum complications.

Maternal complications	Total cases	Cases with hypoglycemia (n=36)	Incidence of hypoglycemia
Hypertensive disorders	49	12 (33.34%)	24.48%
Antepartum haemorrhage	06	01 (2.77%)	16.66%
PROM	13	02 (5.56%)	15.38%
Polyhydraminos	07	01 (2.77%)	14.2%
Oligohydraminos	16	02 (5.56%)	12.5%
Twins	01	-	
none	58	16 (44.5%)	27.58%

Table 4: Incidence of hypoglycemia in relation to gestational age.

Gestational age (weeks)	Total cases	Cases with hypoglycemia (n=36)	Incidence of hypoglycemia
30-32	11	03(8.33%)	27.27%
32-34	106	26(72.22%)	24.5%
34-37	33	07(19.44%)	21.21%

Table 5: Incidence of hypoglycemia in relation to birth weight.

Birth weight (gm)	Total cases	Cases with hypoglycemia (n=36)	Incidence of hypoglycemia
1500-1779	11	03(8.33%)	27.27%
1800-2199	106	26(72.22%)	24.5%
2200-2499	33	07(19.44%)	21.21%

The incidence of hypoglycemia was 27.27% in the 1500-1799gm birth weight category, 24.5% in the 1800-2199gm category and 21.21% in the 2200-2499gm category. Considering the hypoglycemic cases alone, there was again a high incidence of 72.22% in the 1800-2199gm category, thereby showing an inverse relation between birth weight and incidence of hypoglycemia (Table 5).

Table 6: Incidence of hypoglycemia in relation to days of life.

Days of life	1st Day	2 nd Day	3 rd Day
Cases with hypoglycemia	31(86.11%)	4(11.12%)	2 (5.56%)

Incidence of hypoglycemia according to days of life was 86.11% on the first day, 11.12% on the second day, 5.56% on the third day of life (Table 6).

Distribution of cases according to symptoms of hypoglycemia. Out of total 36 number of babies with

Hypoglycemia 24 (66.67%) cases were asymptomatic and 12 (33.34%) cases were symptomatic. The major manifestations were jitteriness 58.4% followed by lethargy 25%, feeding intolerance 8.4% and Irritability 8.4%.

DISCUSSION

In this study the incidence of hypoglycaemia in LBW (1500 - 2499gm), appropriate for gestational age neonates was 24% and the blood glucose values increased as their hours of life increased. These findings are consistent with those of Lodhi et al, who reported hypoglycaemia in 29.1% neonates.⁵ In a study conducted by Osler et al, in Kenya, reported that 23% of neonates were hypoglycaemic, whereas Dashti et al, reported 15.1% prevalence of hypoglycaemia while Shams et al, reported the frequency of hypoglycaemia as 3.5%.⁶⁻⁸ There is wide variation in the incidence of hypoglycaemia in neonates as well as in method of glucose estimation, cut-off of blood glucose level for defining hypoglycaemia and population enrolled.⁹

In 1993 Anderson et al, conducted a cross sectional study of 226 full term, uncomplicated new-borns. 10 In this study, the incidence of hypoglycaemia using maternal age as a variable was 16.6% in $\leq\!\!20$ years category, 23.2% in 21-25 years category and 10% in >25 years category. In a study, Duvanel et al, found no significant difference between hypoglycaemic and euglycemic groups when maternal age was used as a risk factor, which compares well with the present study. In this study there was a slight high incidence in the group 21-25 years maternal age. 11

The incidence of hypoglycaemia was 20% in multiparous and 26.82% in primiparous mothers respectively. 61.11% of the total number of hypoglycaemic cases (n=150) were born to primiparous mothers. The incidence of hypoglycaemia was more in primiparous mothers compared to multiparous. This observation was correlating with other studies 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 hypoglycaemia.

The incidence of hypoglycaemia was highest (86.11%) on the first day of life. In a study by Arun Kumar De et al, found that overall incidence of hypoglycaemia in healthy breastfed new-borns was 32% and the blood glucose values increased as their hours of life increased. Maximum numbers of cases of hypoglycaemia were seen within the first 24 hr of age. 17 neonates had low glucose concentration at 1 hr, 33 neonates at 6 hr and 12 neonates at 12 hr and none of neonates had hypoglycaemia at 24 hr and 48 hr of age. A similar observation was made by Hoseth et al, in the breast-fed term AGA neonates. They found that blood glucose concentrations within the

first 24 hr of delivery were significantly lower than those after 24 hr.

There are various maternal risk factors for neonatal hypoglycaemia. In present study we found that PIH is the significant risk factor associated most hypoglycaemia, accounting for 24.48%. The group with PROM had incidence of 15.38%, the group with antepartum haemorrhage had incidence of 16.66%, polyhydramnios and Oligohydramnios had incidence of 14.2% and 12.5% respectively. The group without complications also had an incidence of 27.58%. In a study conducted by Sikandar Ali Bhand et al, maternal risk factors for neonatal hypoglycaemia were eclampsia, maternal diabetic mellitus, intrapartum administration of glucose, maternal drug uses as: (Beta blockers, Oral hypoglycaemic agents, Valproate), family history of metabolic disorder and without any factors with the percentage 22%, 13%, 09%,15%, 08%, 07%, 05% and 13% respectively.¹⁴

There is no significant variation in the incidence of hypoglycaemia as far as the mode of delivery is concerned. It was 27.58% in normal vaginal delivery and 24.32% in caesarean born babies. It is comparable with the study done by KK Divakar et al, on neonates, where he found that the mode of delivery does not affect the blood glucose of the baby. The incidence was slightly higher when the new born sex was considered as a variable with figures of 26.15% in males and 22.35% in females. Similar results have also been reported in a study conducted by Hamid H et al, also reported male predominance. The state of the support of the properties of 26.15% in males and 22.35% in females. Similar results have also been reported male predominance.

In this study, the common symptoms in hypoglycaemic babies were jitteriness (58.4%) followed by lethargy (25%), feeding intolerance (8.4%) and Irritability (8.4%). In this study, we found jitteriness as the most common clinical presentation. In another study by Dashti et al, reported refusal of feeding as the most frequent symptom (45%). In this study 67% of the babies did not show any symptoms.

The incidence of hypoglycaemia was 27.27% in the 1500-1799gm birth weight category, 24.5% in the 1800-2199gm category and 21.21% in the 2200-2499gm category. Considering the hypoglycaemic cases alone, there was again a high incidence of 72.22% in the 1800-2199gm category, thereby showing an inverse relation between birth weight and incidence of hypoglycaemia. The incidence of hypoglycaemia was highest (27.27%) in the group of 30-32 weeks gestation and progressively reduced as the number of weeks increased, there by maintaining an inverse relation between gestational age and the incidence of hypoglycaemia. These results are comparable to a study by Bhalla M et al, were they found that the mean glucose values were directly related to the gestational age.¹⁷ It can be thus concluded that lower the gestational age, the greater will be the risk of

hypoglycaemia in babies who are appropriate for gestational age.

CONCLUSION

There are different definitions used for hypoglycaemia and different policies of feeding in new born after birth. Current guidelines of some forums recommend formula or dextrose infusion in asymptomatic hypoglycaemia only after single unsuccessful trial of feeding over 1 hr. On the contrary, present study point out that most of such high-risk babies can be managed by supervised repeated exclusive breastfeeding or EBM rather than top feeding. We conclude that healthy newborns in postnatal wards can be exclusively breastfed, but there is needing to closely monitor their blood glucose levels at least in first 72 hrs and asymptomatic hypoglycaemia in new-borns can be managed with frequent breastfeeds. More studies with long-term follow up are required to evaluate impact of asymptomatic hypoglycaemia on the population.

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Institutional Ethics Committee

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