

Study of hypoglycemia in neonates with low birth weight

Ahmed Siddique A.¹, Saleem M.^{2*}


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¹ Abrar Ahmed Siddique, Assistant Professor, Department of Paediatrics, Niloufer Hospital, Hyderabad, Telangan, India.

^{2*} Mohammed Abdul Saleem, Assistant Professor, Department of Paediatrics, Gandhi Medical College, Secunderabad, Telangana, India.

Background: Glucose metabolism disorders are common in low birth weight (LBW) infants and are associated with high morbidity and mortality. Neonatal hypoglycemia, a common metabolic problem, often goes unnoticed owing to a lack of specific symptoms. Hypoglycemia both symptomatic and asymptomatic can lead to long term neurological sequelae. Therefore, it needs early management to prevent brain damage in a developing neonate. **Objective:** This study was conducted to evaluate the prevalence and risk factors associated with hypoglycemia in low birth weight infants. **Design:** A hospital-based prospective longitudinal study. **Duration:** One year (October 2017-October 2018). **Setting:** Niloufer Hospital, Hyderabad. **Participants:** 50 LBW neonates with birth weight less than 2500 grams. **Methods:** Blood glucose values were measured at the age of 1 h, 6 h, 12 h, 24 h, and 48 h after delivery which was independent of feeding time. Blood glucose value of less than 40 mg/dl (2.2 mmol/l) was defined as hypoglycemia. For statistical analysis, SPSS software version 20 was used. **Results:** Out of 50 neonates, 15 (30%) had one or more episodes of hypoglycemia. Overall 22 episodes were recorded. Out of 15 hypoglycemic neonates, 8 (53.3%) were small for gestational age (SGA) and 7 (46.7%) were AGA. Sepsis was significantly noticed after hypoglycemia. The pattern of blood glucose levels was significantly different among hypoglycemic babies and normoglycemic babies over the first 72 hours. **Conclusion:** Hypoglycemia was frequent among low birth weight babies more so in SGA babies in the first 24 hours.

Keywords: Hypoglycemia, Low birth weight newborns, Sepsis, Hypoglycemic episode

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Introduction

Low birth weight (LBW) has been defined by WHO as weight at birth of less than 2.5 kg. By international agreement, LBW has been defined as a birth weight of fewer than 2500 grams, with the measurement being taken preferably within the first hour of life before significant postnatal weight loss has occurred [1]. It contributes substantially to neonatal, infant, and childhood mortality and morbidity. Across the world, neonatal mortality is 20 times more likely for LBW babies compared to NBW babies (>2.5 kg) [2].

It is now a well-recognized fact that birth weight is not only a critical determinant of child survival, growth, and development, but also a valuable indicator of maternal health, nutrition, and quality of life. Neonatal hypoglycemia is a common metabolic disease due to the inability to maintain glucose homeostasis [3]. The overall prevalence depends on birth weight, gestational age, and intrauterine growth retardation.

Since quite a proportion of neonates do not manifest any symptoms despite the existence of hypoglycemia, the exact incidence is difficult to work out. In other words, symptomatic hypoglycemia is not as common as against chemical hypoglycemia. Undiagnosed hypoglycemia can have long term neurological consequences; thus, the emphasis is on prevention and early detection along with treatment of asymptomatic hypoglycemia [4]. The prognosis of these newborns with hypoglycemia depends on how promptly and efficiently hypoglycemia is managed [5,6].

The maintenance of normoglycemia in newborns depends upon the adequacy of glycogen stores, maturation of glycogenolytic and gluconeogenic pathways and integrated endocrine response. The current study, therefore, proposes to study the clinical profile of low birth weight babies with reference to the occurrence of hypoglycemia.

Materials and Methods

Place of Study: Niloufer Hospital, Hyderabad.

Type of Study: A hospital-based prospective longitudinal study.

Sample Collection: Capillary blood was collected by heel prick after proper aseptic measures and also venous blood was collected.

Sampling Methods: Capillary blood was screened by reagent strips method and the same time the venous blood sample was sent for laboratory confirmation by glucose oxidase method in an autoanalyzer.

Inclusion Criteria: Neonates with birth weight less than 2500 grams.

Exclusion Criteria: Infants of a diabetic mother, those with birth asphyxia, congenital malformations and endocrine deficiencies were excluded.

Statistical Methods: Data were presented in the form of statistical tables and charts. SPSS software version 20 was used.

Results

The age of mothers ranged from 23 years to 35 years. Mean with SD age of mothers was 26.9 ± 3.9 years. A total of 17 neonates had maternal morbidities out of which eight had leaking per vagina. Statistically, no significant maternal morbidity was associated with the occurrence of hypoglycemia. Apgar score at 1 min ranged from 2 to 7 with a mean of 7 ± 1 and at 5 min ranged from 8 to 9 with a mean of 9 ± 1 . Out of 50, 35 neonates (70%) were normoglycemic and 15 neonates (30%) had hypoglycemic episodes. Overall 22 episodes of hypoglycemia were recorded. There was no significant association between birth weight and episodes of hypoglycemia. The majority of hypoglycemic infants were male. There was no significant association between gender and episodes of hypoglycemia.

Table-1: Comparison of hypoglycemic and normoglycemic neonates with respect to birth weight

Birth Weight(Kg)	N	Infants				P-Value
		Hypoglycemic (n=15)	%	Normoglycemic (n=35)	%	
Extremely Low (≤ 1.000 kg)	2	1	6.6	1	2.8	*0.203
Very Low (1.001- 1.500 Kg)	10	4	26.6	6	17.1	
Low (1.501-2.500 Kg)	38	10	66.6	28	80.0	

The majority of hypoglycemic infants were born with low birth weight (1.501-2.500 kg). There was no significant association between birth weight and episodes of hypoglycemia.

Table-2: Comparison of hypoglycemic and normoglycemic neonates with respect to the gestational size

Gestational size	N	Infants				P-Value
		Hypoglycemic (n=15)	%	Normoglycemic (n=35)	%	
AGA	34	7	20.5%	27	79.5%	0.20
SGA	16	8	50%	8	50%	

AGA – Appropriate for Gestational Age

SGA- Small for Gestational Age

Out of fifteen hypoglycemic infants, eight were small for gestational age and seven were appropriate for gestational age. 50% of all the small for gestational age neonates were hypoglycemic and 20.5% of all the appropriate for gestational age were hypoglycemic. This was statistically significant (p-value = 0.020). Hypoglycemia was more common in small for gestational age infants.

Various co-morbidities which occurred after hypoglycemia were analyzed in the normoglycemic and hypoglycemic group. The significant difference was analyzed with sepsis occurring in hypoglycemic infants.

Discussion

The term "hypoglycemia" refers to a low blood glucose concentration. Neonatal hypoglycemia is not a medical condition in itself, but a feature of illness or of failure to adapt from the fetal state of continuous transplacental glucose consumption to the extrauterine pattern of intermittent nutrient supply.

There is controversy over the definition of a "safe" blood glucose concentration, that is, a value below which there is a risk of long-term neurodevelopmental impairment. Hypoglycemia associated with abnormal clinical signs (symptomatic hypoglycemia) has a poor short- and long-term outcome but evidence of risk in the absence of clinical signs (asymptomatic hypoglycemia) is inconclusive.

Hypoglycemia is not a disease but a symptom of other diseases or lack of metabolic adaptation postnatally. Manifestations of hypoglycemia are non-specific but unexplained by other diagnoses and corrected with the provision of glucose [7]. However, when low blood glucose levels are prolonged or recurrent, they may result in acute systemic effects and neurologic sequelae.

According to AAP guideline 2011, there has been no substantial evidence-based progress in defining what constitutes clinically important [neonatal hypoglycemia (NH)], particularly regarding how it relates to brain injury, and that monitoring for, preventing and treating NH remains largely empirical. The guidelines call for immediate intravenous glucose for an infant who is symptomatic and have glucose levels lower than 40 mg/dl.

For asymptomatic at-risk infants, the initial feed should be given within 1 h of birth, with glucose screening 30 min after the first feed. Because there is no point-of-care screening method reliable enough to be used as the sole method for screening for NH, the blood or plasma glucose concentration must be confirmed by laboratory testing done simultaneously. In the present study too, besides doing the reagent strip test, blood was sent for laboratory measurement of glucose immediately. However, the therapy required was initiated based on the reagent strip test itself.

The incidence of hypoglycemia in low birth weight neonates in the current study was 30%. Different studies in the literature have reported varying incidences. Dias E and Gada S[8] reported the incidence of hypoglycemia (Blood glucose <40mg/dl) to be 17% whereas Jonas D et al[9] reported 11.7% incidence of hypoglycemia. Yoon JY et al[10] reported a 20% incidence in which hypoglycemia was defined as a blood glucose level of less than 40mg/dl up to 24 hours and less than 50mg/dl thereafter.

Dashti N et al[11] reported hypoglycemia incidence to be 15.15% which was less as compared to the present study. The present study demonstrated a significantly greater incidence of hypoglycemia in LBW newborns. The mean blood glucose values in the LBW newborns were significantly lower at 1 h, 6 h, 12 h, 24 h, and 48 h after delivery, which is well correlated with the findings of Singhal et al.[12] and Anderson et al.[13].

In the present study, significantly lower mean blood glucose values and a higher incidence of hypoglycemia was found in SGA than the AGA babies [Table 2]. Holtrop PC [14] studied the incidence of hypoglycemia in SGA babies. The definition of hypoglycemia chosen was that suggested by Srinivasan et al.[15] Hypoglycemia was detected in 14.7% of SGA babies which was much lower than that of the present study.

Higher incidence in the present study may be due to a large number of the LBW infants present in the SGA group which is also a contributing factor of hypoglycemia. Bhat et al.[16], found hypoglycemia in 25.2% of SGA babies as compared to 32.8% reported by Lubchenco and Bard [17].

The variability in incidence could be partly due to different definitions used for hypoglycemia, SGA and different policies of feeding. Various co-morbidities were analyzed in normoglycemic and hypoglycemic infants of which sepsis was significantly noticed after hypoglycemia.

Conclusions

According to our observation, the incidence of hypoglycemia in low birth weight neonates in the present study is 24%. Small for gestational age is a significant determinant for hypoglycemia.

What does the study add to the existing knowledge?

Hypoglycemic episodes were significantly noticed in the first 24 hours as compared to another time interval. Various co-morbidities were analyzed in normoglycemic and hypoglycemic infants of which sepsis was significantly noticed after hypoglycemia.

Authors contribution

Dr. Abrar Ahmed Siddique: Concept, study design

Dr. Mohammed Abdul Saleem: Data analysis, manuscript preparation

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