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Original Research Article

Hypoglycemia incidence and risk factors assessment in hospitalized neonates

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ABSTRACT

Background: Hypoglycemia is a major metabolic problem among neonates. Neonates are usually asymptomatic and hypoglycaemia can cause brain damage if not detected and treated early. This study was conducted to identify incidence as well as risk factors of hypoglycemia in neonates admitted to the NICU.
Methods: Blood sample for glucose testing was collected in neonates who were less than 72 hours old, at the time of admission to our NICU (Kempegowda institute of medical sciences, Bangalore, India).
Results: Total 250 neonates were admitted to the NICU for various reasons and all were screened for hypoglycaemia. Of the 250 babies 112 were hypoglycemic. 147 babies were males and 103 babies were females. 178 of the 250 babies enrolled were preterm and 72 babies were term. 44% babies were detected to have sepsis and 17.6% were detected to have respiratory distress syndrome. Only 7% (8 no. of) babies displayed symptoms like hypoglycemic convulsions, jitteriness.
Conclusions: Neonates with premature birth, low birth weight and perinatal asphyxia were susceptible to hypoglycemia. Active and continuous monitoring of blood glucose level should be performed in the early newborns, especially in high-risk children, and attention should be paid to timely feeding for the early diagnosis and treatment of neonatal hypoglycemia to reduce its impact on the newborns.

Keywords: Hypoglycemia, Low birth weight, Newborn, Preterm

INTRODUCTION

Hypoglycemia is an age old metabolic disorder seen among new born babies and is considered to be a common reason behind most of the NICU admissions. Most of the fetal glucose is derived from the mother through transplacental diffusion, therebycutting the umbilical cord poses as an interruption to the main source of glucose to the newborn in its primary hours of life. The neonate rapidly responds to this transient hypoglycemia by -

- Glycogenolysis
- Gluconeogenesis
- Utilisation of exogenous nutrients from feeding.

But some neonates may not be able to respond rapidly. This results in hypoglycaemia.[1] Hypoglycemia can cause brain dysfunction, cerebral injury and neuromotor developmental retardation.

The overall incidence of hypoglycemia in neonates is quoted to be 1.3-5/1000 live births.

The incidence in developing countries is more because of large proportion of low birth weight or intrauterine growth retarded (IUGR) babies and improper feeding/nursing practices.[2]

A newborn infant may or may not be symptomatic however his/her glucose levels in blood could also be lesser than the normal range. The most typical symptoms are jitteriness, convulsions, apathy, hypotonia, coma, refusal to feed, cyanosis, high pitched cry, hypothermia. Since these symptoms are non specific hypoglycaemia must be confirmed biochemically.[3] Since a newborn baby could be symptomatic or asymptomatic even with a low blood glucose levels it is clinically difficult to detect hypoglycaemia. Hence screening vigorously for hypoglycaemia turns out to be of utmost importance.

The neonates who are at high risk of developing hypoglycaemia include: Infants of diabetic mothers, Large for gestational age babies, IUGR babies, Sepsis, Preterm babies, Polycythemia, Beckwith-Weidemann syndrome, erythroblastosis, wrong-positioned umbilical artery catheter etc.[4] In our study neonates were assessed, on admission to NICU, for hypoglycaemia and were treated immediately if found hypoglycemic. The risk factors were assessed.

METHODS

Total 250 neonates were included in our study, conducted in NICU of Kempegowda Institute of Medical science, Bangalore, India between October to December 2019.

Inclusion criteria

Only babies less than 72 hours old were included in the study.

Written and informed consent was taken from parents of the 250 neonates who were included in the study. At the time of admission to NICU Venous blood sample was collected for testing glucose levels in the lab. Sample was collected in babies who were up to 72 hours old. Venous blood sample was sent to the central lab within half an hour of collection and was processed within 1 hour of collection. Laboratory hexokinase method was used to process the sample in the central laboratory. A value of less than 40mg/dl was taken as the cut-off for defining hypoglycaemia. Birth weight less than 2.5 kgs was taken as low birth weight.

Data were entered in MS Office Excel and were analysed using Statistical Package for Social Sciences (SPSS) version 24.0. Descriptions of categorical variables like gender of babies, term status, etc were done in frequency and percentage. All tests were two tailed and p value <0.05 was considered statistically significant.

RESULTS

The incidence of hypoglycaemia

There were 112 hypoglycemic neonates detected out of 250 hospitalized neonates, the incidence being 44.8%.

Clinical data

Total 147 babies were males and 103 babies were females (Table 1).

Table 1: Gender distribution.

Gender	n	%
Male	147	58.8
Female	103	41.2

Table 2: Number of preterm and term babies.

Status	n	%
Term	72	28.8
Preterm	178	71.2

Data wise 178 of the 250 babies enrolled were preterm and 72 babies were term (Table 2). Total 250 neonates were admitted to the NICU for various reasons and all were screened for hypoglycaemia. Of the 250 babies 112 were hypoglycemic (Table 3).

Table 3: Incidence of hypoglycaemia.

Blood glucose	n	%
Hypoglycaemia	112	44.8
Normoglycaemia	138	55.2

Statistically 44% babies were detected to have sepsis and 17.6% were detected to have respiratory distress syndrome. Other reasons for NICU admissions was infants of diabetic mother, IUGR, Birth Asphyxia, MSAF, TTNB, Rh incompatibility, dehydration fever, AKI, DIC, Low birth weight. Most of the babies did not display any symptoms of hypoglycaemia. Only 7% (8 no. of) babies displayed symptoms like hypoglycemic convulsions, jitteriness.

High-risk factors assessment (Figure 1)

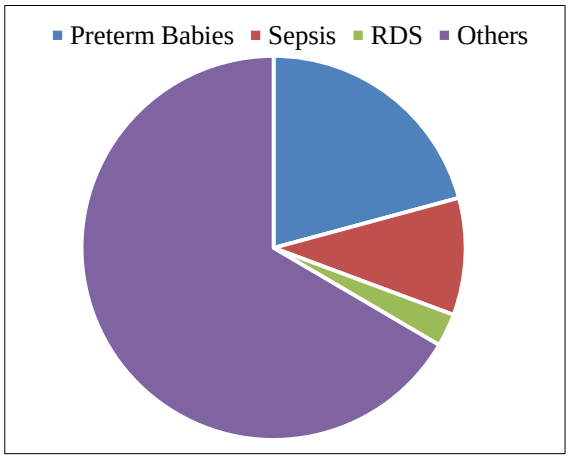

Figure 1: Incidence of hypoglycaemia for different risk factors.

Hypoglycemia and gestational age

The incidence of hypoglycemia in preterm children and full-term children were 37.5% and 62.5% respectively. There was a significant statistical difference in the incidence of hypoglycemia among the groups. The incidence of hypoglycemia in preterm children was significantly higher than full-term children which shows that in preterm children hypoglycemia was more common.

Hypoglycemia and birth weight

Only 8% babies with hypoglycaemia were detected to be of low birth weight. Statistical analysis showed a significant difference from normal weight babies.

Hypoglycemia and respiratory distress syndrome/sepsis

- 17.8% babies with hypoglycaemia were diagnosed with sepsis.
- 5% babies with hypoglycaemia were diagnosed with Respiratory Distress Syndrome.
- Babies with other diagnosis and hypoglycaemia were not.

So from the above results it can be concluded that preterm babies and low birth weight babies, babies with sepsis or respiratory distress syndrome are at higher risk of developing hypoglycaemia and its adverse effects

DISCUSSION

Hypoglycemia is a common metabolic disorder among neonates.

Glucose is the major source of energy to the body. It constitutes an important substance for supplying energy to the human body. Glucose is the only major source of energy for the brain. Hypoglycemia can cause brain damage in the form of cerebral injury and also neuro motor developmental retardation. Low blood sugar can cause disorders of energy in brain cells, impacting the metabolism and development of brain cells, resulting in temporary or even irreversible damage.[5,6] The Directory of the United States Neonatal Hypoglycemia suggested that "routine glucose screening should be performed in all high-risk newborns early at birth."[7]

The incidence of hypoglycemia in premature children, children with low birth weight and in children with sepsis and RDS was higher than that in full-term children and normal birth weight children.

Since the placenta is the major source of glucose to the neonate, after birth and the cutting of the umbilical cord, the baby has to convert to other ways of replenishing its glucose stores. The other ways include: Glycogenolysis, Gluconeogenesis and Utilisation of exogenous nutrients from feeding. If the baby is not able to immediately adapt by these methods, after birth, then the baby is bound to go into hypoglycaemia.

The causes of hypoglycaemia can be divided into 3:

- Hyperinsulinemia as seen in Infants of diabetic mothers
- Increased utilisation as seen in sepsis, asphyxia, exchange transfusion, post resuscitation, inborn errors of metabolism etc
- Decreased Production/Stores as seen in prematurity, IUGR, small for gestational age babies etc.

Neonatal asphyxia causing hypoxia and ischemia and the pathological process that ensues after hypoxic ischemic damage to the brain can causes hypoglycaemia.[8] There will be an increase in anaerobic glycolysis, a reduction in energy production and sugar consumption increases.

Stressors like infections or diseases can cause increased consumption of glucose for energythereby resulting hypoglycemia.

Also in caesarean sections oxytocin secretion is low thereby causing a significant reduction in milk secretions.[9]

There was also a report that in case of transient hypoglycemia, blood glucose levels can increase after eating, suggesting the importance of timely post-natal feeding.[10]

In a study conducted by Bromiker et al 4000 newborns were taken up for the study of which 3595 were analyzed (405 babies were excluded). 2 hypoglycemia cut offs were taken i.e. 40 and 47 mg/dl. 124 babies (3.4%) had blood glucose levels below 40 mg/dl and 435 (12.1%) below 47 mg/dl. Their study showed that gestational age, maternal diabetes, low birth weight (<2500 g), and twin delivery were factors that were linked with early neonatal hypoglycemia. Other risk factors like large or small for gestational age, birth weight >3800 g were not and gestational age showed the strongest association.[11]

In a study conducted by Yuliana Yunarto et al which was a case control study 123 newborns with blood glucose <47 mg/dL comprised the case group and 123 newborns without hypoglycemia comprised the control group. All factors from infant and maternal side was recorded to identify possible relationships with hypoglycemia. In multivariate regression analysis, prematurity and low birth weight were the significant factors associated with neonatal hypoglycemia.[12]

An observational study was conducted by Thinesh Kumar et al, in babies born with risk factors for hypoglycaemia i.e. infant of diabetic mother, LGA (birthweight >90th percentile), SGA (birth weight <10th percentile), low birth weight (>1800 to <2500 grams) and preterm (35 - 37 weeks). Babies on formula or pre-lacteal feed, major

congenital malformations and admitted in NICU for other reasons were excluded. Hypoglycemia screening was done at 2, 6, 12, 24 and 48 hours of life, prior to feeding. It was seen that the incidence of hypoglycemia in infants with risk factors was 33.3%. Out of 1883 Babies born with risk factors, 627 Babies developed at least one episode of hypoglycemia. Of these, 30.3% were asymptomatic hypoglycemia and only 3.0% were symptomatic. Hypoglycemia was seen in 42% of SGA, 33% of IDM, 19% of preterm and 10% of LGA babies.[13]

Finding out the babies at risk of developing hypoglycaemia would help to meticulously screen and monitor such babies for hypoglycaemia and thus would help to treat early and prevent its complications.

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