

# Neonatal hypoglycemia in a tertiary care hospital

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## Abstract

**Introduction:** Neonatal Hypoglycemia (NH) is a common condition influenced in newborn by prematurity, macrosomia, intrauterine growth restriction, maternal diabetes mellitus, sepsis etc. NH is known to cause brain dysfunction and neuromotor developmental retardation in both symptomatic and asymptomatic cases. Hence a high risk neonate requires an aggressive blood sugar monitoring and management in order to reduce neonatal mortality and neurological sequelae in later life. **Aims and Objectives:** To find out incidence, risk factors (antenatal and postnatal), clinical features and outcome associated with NH in a tertiary care hospital. **Material and Methods:** This prospective study was conducted in pediatrics department in tertiary care centre from Jan 2012 to June 2013. All neonates born at tertiary hospital either by vaginal or LSCS delivery during study period were included and those born outside were excluded. Out of 8000 neonates delivered, 400 neonates were admitted and screened for hypoglycemia at 0,3,6,12,24,48 and 72 hr of life with operational threshold for hypoglycemia of blood glucose level < 40 mg/dl formed the study group. **Observation and Results:** Out of 8000 neonates delivered in our institute, 400 neonates were admitted in SCNU and Pediatrics wards, of which 106 neonates were detected to have hypoglycemia. The overall incidence of NH was found to be 13.25/ 1000 live birth. Among 106 with NH 74 (69.8%) neonates were preterm, 12 (11.32%) were full term, 20 (18.86%) were post term. Antenatal risk factors associated with hypoglycemia were diabetes in 18(36%), Toxemia of pregnancy in 12(24%) PROM in 8 (16%), fever in 6 (12%), dysuria in 4 (8%), APH in 2 (4%). Neonatal risk factors associated with hypoglycemia were birth asphyxia in 46 (43.39%), RDS in 31 (29.24%), Septicemia in 20 (18.8%), meningitis in 9(8.49%) neonates. **Conclusion:** NH was most commonly associated with prematurity and postmaturity, RDS and sepsis accommodate as most common neonatal risk factor and babies of diabetic mother and eclampsia formed most common antenatal risk factor for NH. Neonatal mortality was 17.9% in present study in neonates with hypoglycemia. Hence above categories of neonates (High risk neonate) requires an aggressive blood sugar monitoring and management in order to reduce neonatal mortality and neurological sequelae in later life.

**Keywords:** Neonatal hypoglycaemia.

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## INTRODUCTION

Neonatal hypoglycemia (NH) is common condition influenced in newborn by factors like birth weight, gestational age, perinatal complications, mode of delivery and feeding behaviour<sup>1,2,3</sup>. The stated incidence is estimated at 1 to 5 per 1000 births, but it is significantly higher in certain subgroups, 8% in LGA (large for

gestational age) infants and about 15% in SGA (small for gestational age) infants (i.e, those with intrauterine growth retardation)<sup>2</sup>. Hypoglycemia in neonates can be symptomatic or asymptomatic. The most common symptoms such as convulsion, apathy, hypotonia, coma, refusal to feeds, cyanosis, high pitched cry, and hypothermia are very nonspecific and especially in small sick neonates, these symptoms may be easily missed<sup>4,5,6</sup>. NH can be easily treated in most cases if it is recognized, but untreated hypoglycemia can have serious consequences for the infant as glucose is the major substrate for energy in all organs and almost exclusively used for cerebral metabolism<sup>7</sup>. Hypoglycemia is known to be associated with brain dysfunction and neuromotor developmental retardation in both symptomatic and asymptomatic cases<sup>8</sup>. Hence this study was planned to evaluate incidence, etiology, clinical features and outcome of NH.

## MATERIAL AND METHODS

This prospective study was conducted in pediatrics department in tertiary care centre from Jan 2012 to June 2013. All neonates born at this hospital either by vaginal or LSCS delivery during study period were included and those born outside were excluded. Out of 8000 neonates delivered, 400 neonates were admitted and screened for hypoglycemia at 0,3,6,12,24,48 and 72 hr of life irrespective of gestational age with operational threshold for hypoglycemia of blood glucose level < 40 mg/dl formed the study group. A detailed antenatal, natal and postnatal history of all cases was taken. The risk factors like consanguinity, unregistered/ unbooked pregnancies, diabetes, toxemia, premature rupture of membrane, maternal fever, dysuria, antepartum hemorrhage (APH), mode of delivery, type of delivery, meconium stained liquor were recorded. The details of cases were recorded in a predesigned and pretested proforma. Glucometer was used for measuring the blood glucose levels. Glucometer was Accu-Chek Performa made by Roche diagnostics, Mannheim, Germany.

## OBSERVATION AND RESULTS

Out of 8000 neonates delivered in our institute, 400 neonates were admitted in SCNU and pediatrics wards, out of which 106 neonates were detected to have hypoglycemia. The overall incidence of NH in present study was 13.25/1000 live births.

**Table 1:** Relationship of NH with respect to birth weight

Birth weight(gm)	No of cases(n=106)	Percentage (%)
<1500	42	39.62
1501-2500	24	22.64
2501-3500	10	9.43
>3500	30	28.30

Table 1 shows, out of 106 neonates, 66 (62.26%) low birth weight (<2500 gm) neonates had hypoglycemia and 40 (37.73%) neonates with hypoglycemia were weighing > 2500 grams. Thus the hypoglycemia was common in low birth weight neonates (<2500gm) compared to neonates weighing >2500gm.

**Table 2:** Relationship of NH with respect to gestational age

Gestational age	No of cases(n= 106)	Percentage (%)
<32 Weeks	42	39.62
32-37Weeks	32	30.18
37-42 Weeks	12	11.32
>42 Weeks	20	18.86

Table 2 shows, out of 106 neonates, 74 (69.8%) neonates were preterm, 12 neonates (11.32%) were term and 20 (18.86%) neonates were post term. Thus hypoglycemia was more common in preterm neonates followed by post term and term neonates.

**Table 3:** NH with respect to Antenatal risk factors

Antenatal Risk Factors	No of cases(n=50)	Percentage (%)
Diabetes	18	36
Toxemia	12	24
PROM	8	16
Fever	6	12
Dysuria	4	8
APH	2	4

Table 3 shows that the most common antenatal risk factors associated with neonatal hypoglycemia were diabetes in 18 (36%) mothers, toxemia in 12 (24%) mothers, PROM in 8 (16%) mothers, fever in 6 (12%) mothers, dysuria in 4 (8%) and APH in 2 (4%) mothers.

**Table 4:** Relationship of NH with respect to neonatal risk factors

Neonatal risk factors	No of cases(n=106)	Percentage (%)
Birth asphyxia	46	43.39
Respiratory Distress Syndrome	31	29.24
Septicemia	20	18.86
Meningitis	9	8.49

The most common neonatal risk factor associated with hypoglycemia was birth asphyxia in 46 (43.39%) neonates followed by RDS in 31(29.24%) neonates, septicemia in 20 (18.86%) neonates and meningitis in 9 (8.49%) neonates as shown in table 4.

**Table 5:** Relationship of NH with respect to presentation

Presentation	No of cases=(106)	Percentage (%)
Symptomatic	50	47.17
Asymptomatic	56	52.83

**Table 6:** Relationship of NH with respect to clinical features

Clinical Features	No of cases (n=50)	Percentage (%)
Lethargy	32	64
Jitteriness	24	48
Respiratory abnormalities	16	32
Seizure	15	30
Hypotonia	8	16

Table 5 and 6 shows, out of 106 neonates with hypoglycemia, 50 (47.17%) were symptomatic and 56 (52.83%) neonates were asymptomatic and the most common symptom associated with neonatal hypoglycemia was lethargy in 32 (64%) neonates followed by jitteriness in 24 (48%) neonates, respiratory abnormalities in 16 (32%) neonates, seizure in 15 (30%) neonates and hypotonia in 8 (16%) neonates.

**Table 7:** Mortality pattern in neonates with hypoglycemia

Cause of death	No of cases(n=19)	Percentage (%)
Birth asphyxia	9	47.37
Respiratory Distress syndrome	4	21.05
Septicemia	3	15.79
Meningitis	3	15.79

Table 7 shows that the most common causes of neonatal deaths were birth asphyxia in 9 (47.37%) neonates, RDS in 4 (21.05%) neonates, septicemia in 3 (15.79%) neonates and meningitis in 3 (15.79%) neonates. Neonatal mortality was 17.9% in present study in neonates with hypoglycemia.

## DISCUSSION

The exact incidence of NH is difficult to determine. The overall incidence of NH in present study was found to be 13.25/ 1000 live births. Incidence of NH reported by different authors in various studies is as below:

S.N.	Author of the study	Year	Incidence
1.	Holtrop <i>et al.</i>	1933	8.1% in LGA infants 14.7% in SGA infants
2.	Lubchenco <i>et al.</i>	1971	20.3% in Low birth weight infants.
3.	Singhal <i>et al.</i>	1992	4.8%
4.	Sashidaran C K <i>et al.</i>	2004	41/1000 live births
5.	Amy <i>et al.</i>	2009	24.7%
6.	Najati <i>et al.</i>	2010	6.1%
7.	Dhananjaya <i>et al.</i>	2011	4.2%
8.	Present study	2013	13.25/1000 live births

In present study, out of 106 neonates with hypoglycemia 66 (62.26%) neonates were low birth weight (<2.5kg) and 40 (37.73%) neonates were above 2.5 kg. Thus the incidence of NH was significantly higher in low birth weight neonates (<2.5 kg) than neonates weighing >2.5 kg which correlate with study done by singhal *et al* (1992)<sup>9</sup> and Dhananjaya *et al* (2011)<sup>10</sup> which state that prematurity and low birth weight increase the risk of hypoglycemia in neonates. Lubchenco *et al* (1971)<sup>11</sup> in his study reported 20.3% incidence of hypoglycemia in low birth weight or premature infants. In our study we observed that out of 106 neonates with hypoglycemia, 74 (69.81%) neonates were having gestational age <37 weeks, 71 (11.32%) neonates were having gestational age 37-42 weeks and 20 (18.86%) neonates were having gestational age >42 weeks. Kayiran *et al* (2010)<sup>12</sup> found that there was a significant decrease in blood glucose concentration for preterm, in the first few hours of life, suggesting that they were less able to adapt to the cessation of intrauterine nutrition compared to term neonates. Dhananjaya *et al* (2011)<sup>10</sup> in his study found that incidence of hypoglycemia was 11.9% in preterm, 2.9% in term and 30.7% in post term neonates. The small for gestational age (SGA) and pre-term neonates are at greater risk of neonatal hypoglycemia, as the fuels are directed towards growth due to inadequate production of glucose. High brain: body mass ratio, limited deposits of glycogen, reduced fat stores, delayed maturation of

gluconeogenesis and hyperinsulinism will further aggravate hypoglycemia<sup>13,14</sup>. Post-term infants are also at risk for hypoglycemia because of relative placental insufficiency<sup>7</sup>. In present study the most common antenatal risk factor associated with NH were diabetes in 18 (36%), toxemia of pregnancy in 12 (24%), PROM in 8 (16%), fever in 6 (12%), dysuria in 4 (8%) and APH in 2 (4%) mothers. The most common neonatal risk factor associated with hypoglycemia were birth asphyxia in 46 (43.39%), RDS in 31(29.24%), septicemia in 20 (18.86%) and meningitis in 9 (8.49%) neonates. Kitzmiller *et al* (1978)<sup>15</sup> in his study reported 30-40% of IDMs babies were hypoglycemic. Singhal *et al* (1992)<sup>9</sup> in his study reported 23.8% of IDMs babies were having hypoglycemia. Dhananjaya *et al* (2011)<sup>10</sup> state that incidence of hypoglycemia was 40% in IDMs babies and 40% in babies with toxemia as antenatal risk factor which is comparable with our study. Singhal *et al* (1992)<sup>9</sup> reported 24.2% neonates with birth asphyxia, 13.9% neonates with RDS, and 11.6% neonates with septicemia had hypoglycemia. Dhananjaya *et al* (2011)<sup>10</sup> in his study showed 26.86% neonates with birth asphyxia, 15.2% neonates with septicemia, and 15.38% neonates with RDS had hypoglycemia which correlates with our study. IDMs babies have increased secretion of pancreatic insulin because of exposure to increase maternal glucose concentrations in utero. Placental glucose transport is increased, leading to fetal hyperglycemia, which in turn stimulates secretion of insulin by the fetal pancreas. After delivery, increased blood concentrations no longer are present, but the hyperinsulinemia persists, thus maintaining high insulin: glucagon ratio postnatally. In utero, hypoxia, acidosis and alteration in fetal blood flow mobilizes hepatic glycogen stores and increases the rate of anaerobic glycolysis, there by accelerating glucose use, hence depleting fetal glycogen stores. An increase rate of anaerobic glycolysis in combination with an increase rate of glycogenolysis probably predispose to hypoglycemia<sup>16</sup>. Septicemic neonates are predisposed to develop hypoglycemia due to inadequate calorie intake, increased metabolic rate of gluconeogenesis and the possibility of increased peripheral utilization due to enhanced insulin sensitivity<sup>9,10,17</sup>. In present study out of 106 neonates with hypoglycemia, 50 (47.17%) were symptomatic and 56 (52.83%) neonates were asymptomatic. The most common symptom associated with NH was lethargy in 32 (64%) neonates followed by jitteriness in 24 (48%) neonates, respiratory abnormalities in 16 (32%) neonates, seizure in 15 (30%) neonates and hypotonia in 8 (16%) neonates. Singhal *et al* (1992) in his study reported 59.8% cases of NH were asymptomatic. The most common symptom observed was lethargy in 81.4% neonates, followed by jitteriness in 67.4% neonates, respiratory

abnormalities in 41.9% neonates and seizure in 30.2% neonates which correlate with our study<sup>9</sup>. Nasrin *et al* (2007) in his study found refusal of feeds in 45% neonates, irritability in 30% neonates, cyanosis in 28.4% neonates, tachypnoea in 24.5% neonates, seizures in 16.6% neonates, weak cry in 15.8% neonates, apnoeic spells in 9.8% neonates and cardiac arrest in 9.1% neonates as major signs of hypoglycemia<sup>18</sup>. J.C Haworth *et al* found apnoea, cyanosis, irritability, lethargy, muscular twitching, convulsions, poor sucking and disappearance of grasp and other reflexes as the major signs of hypoglycemia<sup>17</sup>. Neonatal mortality was 17.9% in present study in neonates with hypoglycemia. The most common causes of neonatal deaths were birth asphyxia in 9 (47.37%) neonates, RDS in 4 (21.05%) neonates, septicemia in 3 (15.79%) neonates and meningitis in 3 (15.79%) neonates associated with NH.

## CONCLUSION

NH is a common problem which can be prevented if intervene early. NH was most commonly associated needed low birth weight, prematurity and postmaturity. RDS and sepsis accommodate as most common neonatal risk factor and babies of diabetic mother and eclampsia formed most common antenatal risk factor for NH. Neonatal mortality was 17.9% in present study in neonates with hypoglycemia. Hence above categories of neonates (High risk neonates) requires an aggressive blood sugar monitoring and management which can reduce neonatal mortality and neurological sequelae in later life. In present study, more than half of neonates with hypoglycemia were asymptomatic and the most common symptom in NH observed was lethargy, jitteriness, respiratory abnormalities, hypotonia, and seizure. Thus high risk neonates should be screened for hypoglycemia irrespective of symptoms within 72 hrs of life.

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