

*Original Research Article*

# Diagnosis and treatment issues concerning neonatal hypoglycemia

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## Abstract

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Neonatal hypoglycemia is one of the most frequent metabolic disorders of the newborn. If it goes undiagnosed and it is inaccurately treated, it may lead to future neurologic sequelae. History taking and spotting the maternal and fetal risk factors of hypoglycemia right after birth are important. The objective was to spot the risk factors for hypoglycemia- quite a frequent issue. We carried out a retrospective study of babies with hypoglycemia; we included the infants born in Galati St. Andrew Department Emergency Hospital between 1.01.2010-31.12.2011. There were 402 babies with hypoglycemia out of 4070 infants born in our maternity between 1.01.2010-31.12.2011 – a 9% total incidence. The inborn babies were distributed according to their gestational age as follows: 482- preemies, 228- postmature infants and 3360 term newborns. Hypoglycemia occurs frequently in neonatal wards. It had a 9,8% incidence in our overall study group, a 65% incidence in the premature babies group, a 65,2% incidence in the large for gestational age babies group, a 50,9% incidence in the small for gestational age babies group and a 5,4% incidence in the appropriate for gestational age babies group. These results are in accordance with the literature data.

**Keywords:** Cure, Hypoglycemia, Metabolic disorders, Neurologic sequelae, Risk factors

## INTRODUCTION

Hypoglycemia is one of the most frequently encountered metabolic disorders of the newborn. There is a great deal of controversy regarding its definition; according to WHO data glycemia under 50 mg% (or 2,6 mmol/l) in term or premature newborn is considered hypoglycemia. According to the Romanian National Department of Health values of blood glucose under 40 mg% (< 2,2 mmol/l) mean hypoglycemia.

### **Risk factors**

According to literature data the rate of hypoglycemia in the first days of life varies – it occurs in around 70% of

the small for gestational age newborns, in 20-50% of large for gestational age babies, in over 50% of the infants of diabetic mothers and in about 2% of term infants of non-diabetic mothers (Auer, 2004).

Spotting the newborn at risk for hypoglycemia matters because hypoglycemia may hinder the child's cognitive development; glucose is the main fuel of the neonatal brain- it uses over 90% of the glucose turn-over (Turner et al., 2004).

The neonatal brain also uses lactate and beta-hydroxybutirate as energy sources. In hyperinsulinism based hypoglycemia glucose production by glycogenolysis or gluconeogenesis is decreased and glucose use and storage are increased; thus in hyperins-

ulism the brain is deprived of all fuels, hence the risk of convulsions, mental handicap, spasticity and developmental delay heightens (Kim et al., 2005; Kuwa et al., 2001; Nayak et al., 2009).

Persistent hypoglycemia of the premature or small for gestational age babies may lead to neurodevelopmental deficits (Duvanel et al., 1999). The earlier the onset of the hypoglycemia and the longer it lasts the greater the risk of long term deleterious impact upon the child's cognitive and neurologic development; same goes for the hypoglycemia accompanied by hypoxia or convulsion and the prediction of future mental or neurologic disabilities.

Some authors claim the neonatal brain is able to use lactate and beta- hydroxyl butyrate than glucose, thus having a better tolerance of hypoglycemia when compared to the adult brain (Hawdon et al., 1992).

### Clinical presentation

The hypoglycemic newborn may be asymptomatic.

### Signs

- Lethargy
  - Apathy
  - Hypotonia
  - Sweating
  - Poor suck
  - Poor feeding
  - Cyanosis
  - Apnea spells
  - Weak cry
  - Hypothermia
  - Absent Moro reflex
  - Coma
  - Jitteriness
  - Irritability
  - Tachycardia
  - High pitched cry, seizures, abnormal eye movements
- These symptoms are not specific and a differential diagnosis has to rule out:
- diseases of the central nervous system
  - congenital adrenal hyperplasia
  - sepsis
  - metabolic disorders: hyponatremia, hypocalcemia, hypomagnesemia, s.o.

### Glucose measurement

- By reagent strips; capillary blood is drawn from the lateral sole of the heel; it's better to gently warm up the heel prior to the puncture.

- Laboratory confirmatory tests performed from the venous or arterial blood; venous blood glucose is higher than arterial blood glucose, especially in sick babies.

Routine monitoring of blood glucose is not necessary in all term babies- transient hypoglycemia in healthy term newborns is self-limited and has neither significant signs nor sequelae

### Reasons for choosing this subject

The interest in neonatal hypoglycemia stems in its importance, in the great number of babies affected by it, in its complex epidemiology and clinical features.

### Objectives

- Evaluation of cases of hypoglycemia occurring during 2 years
- Spotting the risk factors for hypoglycemia- quite a frequent issue
- Study of the evolution of hypoglycemic babies
- Pointing out the diagnostic and management approaches to hypoglycemia.

### MATERIAL AND METHODS

We carried out a retrospective study of babies with hypoglycemia; we included the infants born in Romania, Galati St. Andrew Department Emergency Hospital between 1.01.2010-31.12.2011.

The study was approved by the hospital ethics committee.

The study group consisted of 402 babies with hypoglycemia; several factors were taken into account:

- Gestational age
- Birth weight
- Maternal risk factors
- Type of hypoglycemia
- Presence of neonatal hypoxia
- Neonatal pathology
- Clinical features
- Cure
- Mortality

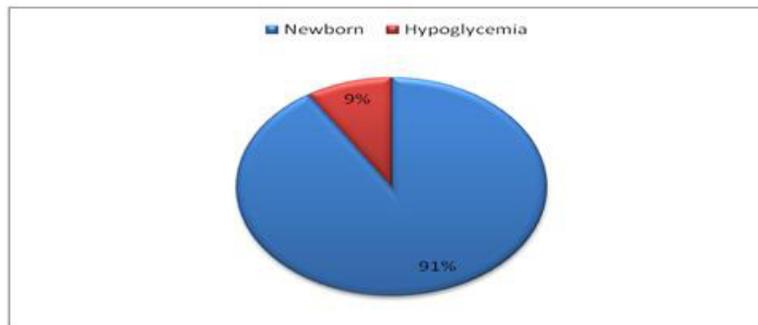
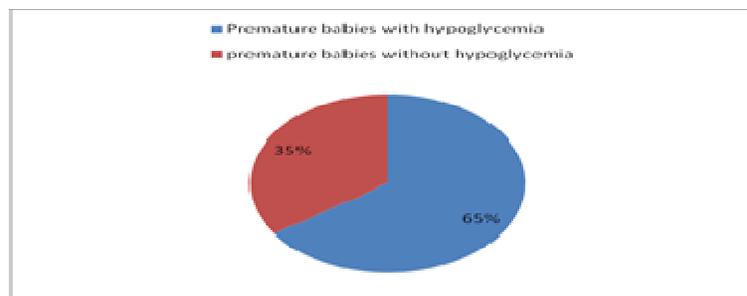
Blood glucose of the newborns in the study group was measured by reagent strips( capillary blood) and confirmatory laboratory tests( venous blood).

### RESULTS AND DISCUSSIONS

There were 402 babies with hypoglycemia out of 4070 infants born in our maternity between 1.01.2010-31.12.2011 - a 9% total incidence. The inborn babies were distributed according to their gestational age as

**Table 1.** Number of inborn babies- 2010-2011

Year	
2010	2302
2011	1768
Overall number of babies	4070

**Figure 1.** Incidence of hypoglycemia**Figure 2.** Premature babies with and without hypoglycemia

follows: 482- preemies, 228- postmature infants and 3360 term newborns.

210 out of the overall 4017 babies were small for gestational age; 107(50,9%) of them had hypoglycemia.

The study group also comprised 141 large for gestational age babies; 65,2 % of them (92 infants) had hypoglycemia.

203 out of the 3719 appropriate for gestational age babies (5,4 %) had hypoglycemia.

### Gestational age

In our study group(402 babies with hypoglycemia) 315 (78%) of the infants were premature, 14%- postmature and 8 % were term born.

Preemies ' distribution according to their ponderal index:

- 54 small for gestational age
- 76 large for gestational age
- 185 appropriate for gestational age

We noticed a higher incidence of hypoglycemia in appropriate for gestational age premature babies; this is accord to the literature data.

Distribution of hypoglycemic postmature newborns:

- small for gestational age- 35 babies
- large for gestational age- 8 babies
- appropriate for gestational age- 13 babies

We noticed a higher incidence of small for gestational age postmature infants.

Distribution of term newborns:

- small for gestational age – 18 babies
- large for gestational age- 8 babies
- appropriate for gestational age – 5 babies

Presence of birth asphyxia in the study group :

- severe asphyxia – 58 babies
- moderate asphyxia – 83 babies
- mild asphyxia- 126 babies
- no birth asphyxia – 135 babies

When taking into account gestational age and birth asphyxia we noticed a high incidence of asphyxiated preemies (82%).

249 of the babies in our study group had symptomatic hypoglycemia whereas 154 were asymptomatic .

Hypoglycemia with clinical signs was further described as transitory or persistent; in our group 381 infants had transitory hypoglycemia and 21 - persistent

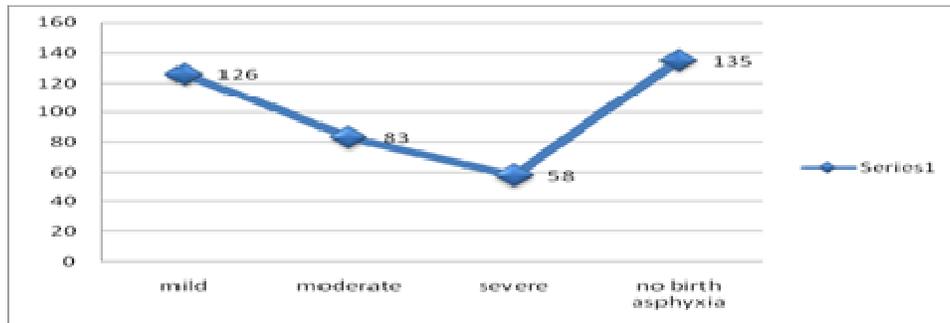


Figure 3. Presence of birth hypoxia

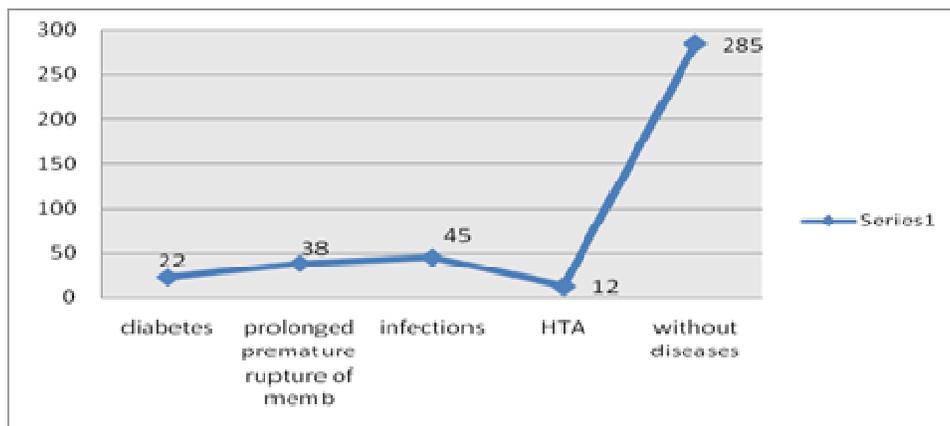


Figure 4. Maternal risk factors

hypoglycemia.

Early onset hypoglycemia occurred in 279 babies, having a high incidence in preemies, and late onset hypoglycemia occurred in 123 babies

#### **Risk factors in our study group**

- Maternal risk factors- diabetes, prolonged premature rupture of membranes, infections, hypertension

- Fetal risk factors- prematurity, small for gestational age babies, large for gestational age babies, postmature babies, sepsis, hypoxia, respiratory distress.

Prematurity was highly predictive for neonatal hypoglycemia- 315 babies in our study group; 267 babies suffered various degrees of birth asphyxia; 9 babies with sepsis had hypoglycemia.

Babies in the study group had different diseases beside hypoglycemia :

- Respiratory distress syndrome – 245 cases
- Cerebral hemorrhage – 109 cases
- Necrotizing enterocolitis– 39 cases
- Sepsis – 9 cases
- Seizures- 23 cases

Symptoms of hypoglycemia in our study group were various :

- Hypotonia - 269 cases
- Jitteriness – 93 cases
- Hyperexcitability– 15 cases
- Seizures – 23 cases
- Cyanosis – 64 cases
- Tachycardia- 28 cases
- Weak cry – 217 cases
- Poor feeding- 87 cases
- Poor temperature control – 46 cases

The most frequent clinical sign of hypoglycemia in our babies was hypotonia, followed by a weak cry and jitteriness.

153 of our babies did not need treatment- just enteral feeds- whereas 249 babies with various diseases needed:

- 10% dextrose by intravenous bolus-124 cases
- Intravenous infusion of 10% dextrose- 278 cases
- Intravenous infusion of 12,5% dextrose- 73 cases
- Hydrocortisone – 13 cases
- Oxygen (by headbox or in the incubator) – 293 cases
- Mechanical ventilation - 96 cases
- Diuretics – 128 cases

- Anticonvulsants– 56 cases
- Antibiotics-205 cases

367 of our babies had a good outcome; the 9% mortality in our study group was due to the various diseases associated to hypoglycemia

## CONCLUSIONS

Hypoglycemia occurs frequently in neonatal wards. It had a 9,8% incidence in our overall study group, a 65% incidence in the premature babies group, a 65,2% incidence in the large for gestational age babies group, a 50,9% incidence in the small for gestational age babies group and a 5,4% incidence in the appropriate for gestational age babies group. These results are in accordance with the literature data. The incidence of hypoglycemia depends on the gestational age and on the ponderal index. In our study some hypoglycemic babies also had other serious diseases, leading to a 9% mortality rate whereas 91% of our hypoglycemic babies had a good outcome. Blood glucose monitoring and adequate cure of hypoglycemia lower the risk of subsequent neurologic sequelae.

## Conflict of Interest

The authors not submitted manuscript elsewhere and they don't have conflict of interest

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