GLUCOSE LEVELS IN LATE PRETERM AND TERM NEWBORNS AT ONE HOUR OF LIFE AND FREQUENCY OF HYPOGLYCEMIA

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ABSTRACT

Objective: To determine glucose levels in late preterm and term newborns at one hour of life in our population, along with the frequency of symptomatic hypoglycemia and it's known risk factors.

Study Design: Descriptive study

Place and Duration of Study: Quaid-e-Azam International Hospital (QIH) Islamabad from July 2012 to September 2013.

Material and Methods: Two hundred and seventy newborns were selected by consecutive purposive non probability sampling who were born at QIH either by spontaneous vaginal delivery or cesarean section. Only healthy neonates were included. Gestational age, weight, fetal and maternal risk factors were assessed. Glucose level was measured by glucometer at 1 hour of life after first feed. Neonates that became symptomatic with low glucose levels were thoroughly studied, readings reconfirmed from laboratory and were promptly managed.

Results: Thirty (11%) babies showed sugar level < 30 mg/dl at 1 hour of life. Out of them 18(60%) were late preterm and 12(40%) were term babies. Out of them 12(40%) babies weighed <2kg, 8(26%) were between 2-2.5 kg and 6(20%) were 2.5-4.0 kg while 4(14%) babies were between 4.0 to 4.6 kg. Only 6(2.2%) newborns became symptomatic with low sugar level. Among symptomatic newnates, 4 mothers had gestational diabetes and other two were with pregnancy induced hypertension (PIH). Important risk factors were gestational diabetes, PIH, fetal distress and SGA babies. Safest lower glucose level was found to be 30 mg/dl at 1 hour after birth.

Conclusion: Plasma glucose levels measured at 1 hour of life in late preterm and term newborns in our population are consistent with international studies. Frequency of symptomatic hypoglycemia is quite low and normal newborns without risk factors do not need screening. However one needs to be vigilant in babies with risk factors.

Keywords: Gestational diabetes, Hypoglycemia, Pregnancy induced hypertension.

INTRODUCTION

Glucose is essential for cereberal energy metabolism. It accounts for nearly all the oxygen consumption in brain. Cerebral transport of glucose is a carrier mediated, facilitated diffusion process that is dependent on blood glucose concentration. Hypoglycemia represents a defect in one or several of complex interactions that regulate glucose homeostasis[1]. This is particularly important for neonates, in whom there is an abrupt transition from intrauterine life.

Acute interruption of maternal glucose transfer to the fetus at delivery imposes an immediate need to utilize endogenous glucose via glycogenolysis, gluconeogenesis, lipolysis and ketogenesis. This framework can explain several causes of neonatal hypoglycemia based on inappropriate changes in hormone secretion and unavailability of adequate reserves of substrates[1]. Hypoglycemia is well recognized clinical problem in neonatal period. It can cause neurological, intellectual, psychological sequelae in later life and even death, if not recognized and treated timely[2]. However current evidence in literature does not confirm a definite concentration of glucose that can discriminate normal from abnormal or that can lead to acute or chronic neurological damage[3]. Early identification of at risk babies and institution of prophylactic measures to prevent neonatal hypoglycemia are practiced inspite of lack of consistent definition of hypoglycemia all over the world.

Generally most centres take plasma glucose concentration <2.6 mmol/l (47mg/dl) as cutoff

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value to label as hypoglycemia inspite of taking proper feeds. Reported incidence of neonatal hypoglycemia in literature mentions very broad range (0.2 to 11.4%) in multiple studies[4]. However incidence increases much more in presence of factors i.e prematurity, small for gestational age, infants of diabetic mothers, cases of birth asphyxia and septicemia etc[5].

Transient, asymptomatic blood glucose levels as low as 30 mg/dl (1.7 mmol/L) are common in healthy neonates in the first hours after birth. Healthy term newborns with a normal gestation and delivery don't need routine glucose monitoring or screening according to American Academy of Pediatrics (AAP) guidelines[6].

Numerous studies regarding this subject are available in national as well as international literature. We carried out this study to augment the evidence in our population to enhance confidence in implementing international guidelines or introduce amendments, if warranted according to our own evidence.

MATERIAL AND METHODS

This descriptive study was conducted from July 2012 to September 2013 at Quaid- e-Azam International Hospital (QIH) Islamabad which is 400 beds tertiary care hospital.

Only healthy, late preterm (34-37 weeks gestational age) and term babies born by either spontaneous vaginal delivery or cesarean section in the hospital were included in this study. Babies with congenital abnormalities, RDS, sepsisor any known organic problem and gestational age less than 34 weeks were excluded. Total 270 babies were included in the study through non-probability purposive sampling. Their gestational age, birth weight, their known risk factors i.e PIH, gestational diabetes, twin pregnancy, maternal infection, and fetal distress were recorded.

Glucose level was measured by glucometer at 1 hour of life after feed. Patients with low sugar level (<30 mg/dl) and symptoms like lethargy, poor cry, jitteriness, fits, poorfeeding, apnea, were reassessed for known risk factors. Their blood sugar level was reconfirmed from laboratory and they all were promptly managed for hypoglycemia according to standard guidelines by I/V glucose infusion and frequent feeds. All babies with low glucose level were monitored every time before feeds for 48 hrs or till sugar level was above 47 mg/dl.

Data had been using SPSS version 17. Descriptive statistics were used to describe the results i.e frequency and percentage for qualitative variables.

RESULTS

Out of 270 babies, 165(61%) were males and 105(39%) females. A total of 120(44.4%) were late preterm and 150(55.6%) term babies. Whereas 108(40%) babies were born by SVD while 162(60%) were delivered by LSCS. Weight analysis revealed that 165(61%) babies were AGA, 95(35%) were SGA while 10(4%) were LGA. Fetal distress was recorded in 27(10%) babies. Only 30 (11%) babies showed sugar level below 30 mg/dl at 1 hour of life (Table). Out of them 18(60%) were between 34 to 37 weeks (late preterm) and 12(40%) were above 37 weeks of gestation (term). Out of them 12(40%) babies weighed <2kg, 8(27%) were between 2-2.5kg (SGA) total being 67% and 6(20%) were 2.5-4.0kg (AGA) while 4(13%) babies were between 4.0 to 4.6 kg (LGA). All these LGA babies were infants of diabetic mothers (IDM) Fetal distress was recorded in 20(74%) babies. Only 6 (2.2%) newborns were symptomatic with sugar level below 30 mg/dl. In these babies blood sugar was reconfirmed from laboratory and they all were promptly managed according to standard guidelines for hypoglycemia. Risk factors were identified in

Table-: Frequency of sugar level in neonates at one hour of life (n=270).

Blood sugar level	No of newborns n(%)
Less than 30 mg/dl	30(11)
31 – 40 mg/dl	72(26)
41- 50 mg/dl	80(29)
51-60 mg/dl	38(14)
61- 70 mg/dl	18(6.6)
71 -80 mg/dl	14(5)
More than 80 mg/dl	18(6.6)

these symptomatic newborns. Mothers of four babies had gestational diabetes (LGA babies) and other two had pregnancy induced hypertension (SGA babies). Safest lower glucose level was found to be 30 mg/dl (1.7 mmol/L). Important risk factors were gestational diabetes, PIH, fetal distress and SGA babies.

DISCUSSION

Hypoglycemia is a significant metabolic problem in neonatal period. But due to lack of a unanimously agreed value of blood sugar for neonatal hypoglycemia in literature, approach for its identification and hence management still remains a bit controversial. However generally most agreed level to label as hypoglycemia in neonatal period is plasma glucose level of less than 30 mg/dL (1.7 mmol/L) in the first 4 hours of life and less than 47 mg/dL (2.5 mmol/L) thereafter[6-8].

It is a well read and discussed topic by pediatricians. Incidence of neonatal hypoglycemia has a broad range mentioned in large number of studies all over world (ranging from 0.2 to 11.4%)[4]. This wide variation may be due to nonuniformity of samples under study. Many studies have included all the babies while others have included only high risk babies. So diversity in results is bound to happen. In local studies incidence ranges from 3.5% to 40.8%. Shamas has mentioned 3.5% who included all newborns while Hamid reports as high as 40.8% because he included only babies with high risk factors[9,10]. Dashti from Tehran repots 15.5% including all newborns[11]. But our study shows only 2.2% which is consistent with local and international figures for late term and term infants without other risk factors like sepsis and birth asphyxia[9,12]. But incidence increases much more in presence of risk factors like prematurity, small for gestational age babies, infants of diabetic mothers, birth asphyxia, fetal distress and septicemia[10]. In our study also blood sugar <30 mg/dl at 01 hour of life was seen more in SGA/LBW babies (67%) and LGA babies (13%) and babies with fetal distress (74%). These babies need screening for hypoglycemia in the first few hours of life.

It has been difficult to define pathological neonatal hypoglycemia as a precise numerical blood glucose level. Low blood glucose levels normally occur after birth, and most infants are asymptomatic despite very low blood glucose levels as also in our study that only 2.2% out of 11% babies with blood sugar level <30 mg/dl became symptomatic. However, some infants are symptomatic at the same or even higher blood glucose levels[13]. This variability is due to a number of factors that affect the infant's response to decrease in blood glucose level, including the infant's gestational age, postnatal age, the presence of other sources of energy (e.g, ketone bodies), and other factors that affect glucose metabolism. Thus, the diagnosis of clinically significant hypoglycemia is dependent on the clinical setting and cannot solely be based on a specific blood glucose level[14].

It is estimated that 10% of normal term newborns cannot maintain a plasma glucose concentration above 30 mg/dL (1.7 mmol/L) if their first feeding is delayed for three to six hours after birth[15]. Although transient asymptomatic hypoglycemia in healthy infants appears to be part of the normal transition to extrauterine life, persistent or recurrent hypoglycemia can result in neurological sequelae.

Ideally, neonatal hypoglycemia would be defined as the blood glucose concentration at which intervention should be initiated to avoid significant morbidity, especially neurological sequelae. However, this definition remains elusive because the blood glucose level and duration of hypoglycemia associated with poor neurodevelopmental outcome has not been established[11,12]. In 2000 A consensus statement proposed the use of practical operational thresholds for glucose concentrations at which intervention should be considered to provide a margin of safety for the management of neonatal hypoglycemia[16].

Majority studies have identified almost similar risk factors like IUGR, SGA, gestational diabetes and prematurity. Important risk factors in our study were gestational diabetes, pregnancy induced hypertension, SGA and

fetal distress. It is compareable with other studies except PIH[9-11]. So recognizing infants at risk for neonatal hypoglycemia and managing them by providing measures like prevention (early feeding) and treatment (i/v glucose) can provide a margin of safety to prevent any untoward effects in these babies.

CONCLUSION

Glucose levels in initial neonatal period and incidence of hypoglycemia in our population are almost consistent with international literature. However currently there is no evidence for one definite numerical figure which can discriminate euglycemia from hypoglycemia or can predict future acute or chronic neurological damage. So like other countries a significantly low plasma glucose concentration should be ascertained and treated to restore normal glucose levels, especially in newborns with risk factors.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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