International Journal of Contemporary Pediatrics
Kumar TJ et al. Int J Contemp Pediatr. 2018 Sep;5(5):1952-1955
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20183538

Original Research Article

Incidence of hypoglycemia in newborns with risk factors

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Received: 03 July 2018
Accepted: 28 July 2018

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ABSTRACT

Background: The incidence of hypoglycemia varies worldwide according to the protocols and feeding Policies. There is paucity of data on Incidence of hypoglycemia in institutions where exclusive breastfeeding is followed. Objectives of this study was to study the incidence of hypoglycemia in newborns with risk factors and to study the differences in incidence between at risk groups.
Methods: The Observational study was conducted in babies born with risk factors for hypoglycemia, infant of diabetic mother (IGDM/IDM), 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.
Results: The incidence of hypoglycemia in newborns 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, 576 (30.3%) were asymptomatic hypoglycemia and 51 (3.0%) symptomatic hypoglycemia. Hypoglycemia was seen in 42% of SGA, 33% of IDM, 19% of preterm and 10% of LGA babies. About 51% of newborns developed hypoglycemia at 2 hours of life and about 31% of newborns at 6 hours of life. No hypoglycemic episodes were noted after 24 hours of life.
Conclusions: Hypoglycemia screening should be done at regular interval, more specifically at first 24 hours of life in at risk babies where Exclusive Breastfeeding is followed.

Keywords: Incidence, Hypoglycemia, Newborns, Risk factors

INTRODUCTION

Neonatal hypoglycemia is a common metabolic problem especially in the presence of risk factors for hypoglycemia. Hypoglycemia in newborn is defined as blood glucose level below 47 mg/dl.[1] The risk factors for hypoglycemia are 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).

The fetus depends entirely on maternal supply and placental transfer of glucose, amino acids, free fatty acids, ketones, and glycerol for its energy needs. The normal lower limit of fetal glucose concentration is around 54 mg/dL in most of gestation, particularly after 20 weeks.[2,3] At birth, the blood glucose concentration of newborn is about 70% of the maternal level. It reaches rapidly to a nadir by 1 hour to a value as low as 20 to 25 mg/dl.[4] This nadir and the lower levels of blood glucose are prevalent in all healthy neonates. These levels are transient and begin to rise over the first hours and days of life. This is normal adaptation for postnatal life and it helps to establish postnatal glucose homeostasis.[4-6] Glucose homeostasis via initiation of glucose production is one of the critical physiological events, which results in

smooth transition and adaptation to extra uterine life. Few newborn babies have some difficulty during transition to the extra uterine life that results in altered glucose homeostasis and low plasma glucose levels.

Hypoglycemia may be symptomatic in the form of lethargy, irritability, jitteriness, apnea, seizures etc., or may not manifest clinically and be totally asymptomatic. Symptomatic hypoglycemia is associated with poor neurodevelopmental outcome, but the neurodevelopmental outcome of asymptomatic hypoglycemia is uncertain. These asymptomatic hypoglycemic infants should also be treated in view of the possible adverse long-term effects.[7,8]

Symptomatic hypoglycemia should be treated with parenteral continuous glucose infusion. Breastfeeding is the initial management of asymptomatic hypoglycemia. Infants on exclusive breastfeeding tend to have lower blood glucose concentrations than infants on formula feeding.[4,9,10]

Different units follow different protocols for management of asymptomatic hypoglycemia. Many units resort to give sugar fortified feeds or supplementary formula feeds. The incidence of hypoglycemia varies according to the screening protocols and feeding methods. We proposed to study the incidence of hypoglycemia in an institution where exclusive breastfeeding policy is followed.

METHODS

This Observational study was conducted at Institute of Obstetrics and Gynecology, Egmore in a period between January 2017 and June 2017. The study population included those babies born with risk factors for hypoglycemia but otherwise healthy infants, such as Infant of diabetic mother (IGDM/IDM), LGA (birth weight >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.

During the study period of six months duration, 1883 babies born with risk factors for hypoglycemia were screened. Parents were explained about baby's risk for hypoglycemia and consent for blood tests at regular intervals was obtained. Under aseptic precautions heel prick was made and capillary blood glucose was checked using Glucometer (Dr. Morepen gluco one) at 2, 6, 12, 24 and 48 hours of life, prior to feeds. Confirmation of blood glucose was done by obtaining the sample to the laboratory only if the capillary glucose level was less than 25 mg/dl or if the baby was symptomatic.

Descriptive and inferential statistical analysis has been carried out in the present study. Results on categorical measurements are presented in number (%). The Statistical software namely SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate tables etc.

RESULTS

7808 babies were live born in our hospital during the study period. Of these, 1883 (24.1%) infants with one or more of the risk factors for hypoglycemia were screened. The incidence of hypoglycemia in newborns with risk factors was 33.3%. In that, 576 (30.3%) neonates had asymptomatic hypoglycemia, 51 (3%) neonates had symptomatic hypoglycemia.

Table 1: Clinical characteristics of high risk neonates.

Characteristics	Number (%)	Incidence (%) (95%CI)
Sex		
Male	1035 (54.9)	35.0 (32.09 - 37.99)
Female	848 (45)	31.1(27.99 - 34.44)
Gestational age		
Preterm (<37 weeks)	810 (43)	19.0 (16.35 - 21.87)
Term (>37 weeks)	1073 (56.9)	44 .0 (41.00 - 47.03)
Birth weight		
Birth weight (<2500 gm)	1450 (77)	28.2 (25.89 - 30.59)
Birth weight (>2500 gm)	433 (22.9)	50.1 (45.19 - 54.81)
Status at birth		
Small for gestational age	791 (42)	42.0 (38.53 - 45.53)
Large for gestational age	358 (18.8)	10.7 (7.69 - 14.37)
Appropriate for gestational age	734 (38.9)	44.9 (41.26 - 48.58)
Maternal age		
Maternal age <30 yrs	1419 (75.3)	38.0 (35.47 - 40.58)
Maternal age >30 yrs	464 (24.6)	18.9 (15.43 - 22.76)
Maternal BMI (kg/m^2)		
18.5-25	864 (45.8)	21.6 (18.89 - 24.49)
25-30	684 (36.3)	28.2 (24.85 - 31.73)
>30	335 (17.7)	73.7 (68.64 - 78.33)
Maternal morbidity		
Maternal Diabetes mellitus	1167(62)	33.2(30.9 - 35.98)
Maternal Hypertension	1193(63)	38.9(36.12 - 41.73)
Mode of delivery		
LSCS delivery	1299(69)	40.9(38.21 - 43.63)
Vaginal delivery	584 (31)	16.2(13.30 - 19.44)
Parity		
Primi mother	1076(57.1)	36.6(33.71 - 39.55)
Multi gravida	807 (42.8)	28.8(25.69 - 32.06)

According to maternal factors, the incidence of hypoglycemia in infants born to mothers less than 30 years of age was 38% incidence in infants born to

mothers more than 30 years of age was 19%. Based on maternal BMI, 74% incidence in infants born to mothers with BMI of >30. The incidence of hypoglycemia in babies born to mother with gestational hypertension was 39%. The incidence of hypoglycemia in babies born to mother with gestational diabetes and diabetes mellitus were 33%. The incidence of hypoglycemia in babies born by LSCS and Vaginal delivery was 41 and 16%. The incidence of hypoglycemia in babies born to primi mother and multi gravida was 37% and 29% respectively (Table 1).

The incidence of hypoglycemia in babies born between 35 and 37 weeks and >37 weeks with any one of the risk factors was 19% and 44% respectively. The incidence of hypoglycemia in male and female neonates with risk factors was 35% and 31% respectively. The incidence of Hypoglycemia in SGA, AGA and LGA were 42 %, 45% and 10% respectively (Table 1).

Almost (51%) half of the hypoglycemia was detected at 2 hours of life and rest of the hypoglycemia 31% was detected at 6 hours, 16% at 12 hours and 2% at 24 hours of life and no hypoglycemic events were noted beyond 24 hours.

DISCUSSION

There is wide variation in reports of incidence of hypoglycemia across the world. The incidence varies with the method of hypoglycemia screening, frequency of screening and feeding practices. There is no universally accepted Point-Of-Care (POC) method to identify the low level of blood glucose accurately and reliable to use it as the sole method of screening for hypoglycemia in newborn at risks. There also is marked variability in obtaining and processing blood samples for analyses of glucose concentrations and the incidence also varies according to it.

Symptomatic hypoglycemia should be treated with parenteral continuous glucose infusion. Breastfeeding is the initial management of asymptomatic hypoglycemia. Different units follow different protocols for management of asymptomatic hypoglycemia. Many units resort to give sugar fortified feeds or supplementary formula feeds. The incidence of hypoglycemia varies according to the protocols and feeding methods. There is a paucity of data on the incidence of hypoglycemia where exclusive breastfeeding policy is followed.

In the present study, 1883 babies were screened for hypoglycemia out of which 627 (33.3%) babies were hypoglycemic. Kaiser et al reported incidence of hypoglycemia of 19.3% in 1395 newborns with GA's between 23 and 42 weeks using a cutoff of <45 mg/dl.[11] The incidence is much lower compared to ours due to universal screening. Other studies also documented much lower incidences due to universal screening. Smolkin et al reported a 5% incidence of hypoglycemia among 519 full term newborns with no risk factors born by elective caesarean section below 35 mg/dl as cutoff.[12] DePuy et al, using universal point of care glucose screening in 4892 full term infants born to non-diabetic mothers weighing >2500gram during the first day of life, found only 2.4% of glucose levels below 50 mg/dl.[13] Singh et al studied in Indian infants at risk of hypoglycemia and reported 27% incidence but the studied population size was small.[14]

The incidence of hypoglycemia was found to be high in male newborns (35%) similar to Singh et al report of 32.1%. The incidence of hypoglycemia was 42% in SGA, which is higher than that with the Holtrop et al and in Bhat et al reports.[15,16] In Holtrop et al the frequency of hypoglycemia in SGA infants was 14.7%.[15] In Bhat et al study, the incidence of hypoglycemia was 25.2% in SGA babies.[16] De et al study showed incidence of hypoglycemia in SGA was 64.2%, but the population size was very small.[17] Holtrop, et al had excluded newborns of diabetic mothers and their newborns were not exclusively breastfed.[15] Bhat, et al included all SGA newborns, whether breastfed, formula-fed, or on intravenous fluids. These factors could have lowered the incidence of hypoglycemia in their studies.[16] High incidence of hypoglycemia in SGA in our study can be explained due to high risk pregnancies managed in our institution.

The incidence of hypoglycemia in low birth weight newborns was 28%. Singh et al study showed incidence of hypoglycemia in low birth weight newborns 29.5%, Saini et al showed 24%, De et al showed 64.8% incidence of hypoglycemia in low birth weight newborns but the population size was small.[17.18]

The incidence of hypoglycemia was found to be 33% in Infant of diabetic mothers. The incidence of hypoglycemia in IDM was found to be 28.6% in singh et al reports and 30% in cordero et al study.[14,19]

The frequency of hypoglycemia in LGA infants was 5% in Holtrop et al study and 14.6 % in Singh et al study.[15,14] The incidence of hypoglycemia in LGA in this study was 10%.

The incidence of hypoglycemia in preterm babies was 19%, which is lower than Singh et al and De et al study.[17] In Singh et al the incidence of hypoglycemia in preterm infants was 36.9%.[14] In De et al study, the incidence of hypoglycemia was 77.7% in preterm babies.[17] The reason for this may be due to small size population included in their study. This is also because most of our preterm babies are high risk with morbidities like very low birth weight (<1500 grams), RDS etc., requiring NICU admission and hence not included in the present study.

In the present study, the incidence of hypoglycemia in babies born to mothers with hypertension was 39% whereas the incidence in babies born to hypertensive mothers reported by Singh et al. was 33.3%. Variation in

the incidences of hypoglycemia across different studies may be explained by the differences in the screening methods and frequency, feeding methods and frequency.

In this study, almost (51%) half of the hypoglycemia was detected at 2 hours of life and rest of the hypoglycemia 31% was detected at 6 hours, 16% at 12 hours and 2% at 24 hours of life and no hypoglycemic events were noted beyond 24 hours.

CONCLUSION

The incidence of hypoglycemia in healthy newborns with risk factors on exclusive breastfeeding was 33.3%. According to risk factors, hypoglycemia was seen in 42% of SGA, 33% of IDM, 19% of preterm and 10% of LGA. About 51% of newborns developed hypoglycemia at 2 hours of life. About 31% of newborns developed hypoglycemia at 6 hours of life. No babies developed hypoglycemia after 24 hours of life. So, newborns with risk factors for hypoglycemia should be screened at regular interval for blood glucose level more specifically at first 24 hours of life to enable us to support breastfeeding to prevent hypoglycemia and potential neurodevelopmental damage.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kumar TJ, Vaideeswaran M, Seeralar AT. Incidence of hypoglycemia in newborns with risk factors. Int J Contemp Pediatr 2018;5:1952-5.