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Incidence of Hypoglycemia in Healthy Neonates in First Hour of Life, And Its Recurrence at 24 Hours

Madhav A.
Assistant Professor, Department of Paediatrics,
Travancore Medical College, Kollam, Kerala

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ABSTRACT
OBJECTIVE : To determine the incidence of hypoglycemia in neonates in the first hour of life, and risk factors for hypoglycemia in these babies, and to determine recurrence of hypoglycemia in those hypoglycemic initially.
METHODS : During the study period of 9 months, all neonates delivered were included, whose parents gave informed consent for the study. 504 neonates were included in this study, from Travancore Medical College, Kollam. Those neonates who developed sepsis or respiratory distress needing oxygen, or were otherwise sick and hence were shifted to NICU within the first 24 hours, and those who were premature < 32 weeks of gestation, were excluded. Hypoglycemia was defined as blood glucose value less than 47 mg/dl, in this study. Blood glucose was estimated at 1 hour, and then a repeat measurement at 24 hours for those neonates who were hypoglycemic in the first hour.
RESULTS : 23.8% of neonates in post-natal ward developed hypoglycemia in the first 1 hour after birth. 13% of those who were hypoglycemic initially, developed hypoglycemia at 24 hours also. None had severe hypoglycemia. 1.98% (8.3% of total hypoglycemic neonates) had symptomatic hypoglycemia. Infants of diabetic mothers (p - 0.006), mothers with gestational hypertension, neonates small for gestational age and male gender (p - 0.015) were associated with increased incidence of hypoglycemia in this study.
CONCLUSION : All neonates need close monitoring for hypoglycemia in the first 24 hours, especially low birth weight infants and infants of diabetic mothers.

I. INTRODUCTION

Hypoglycemia in neonates causes much apprehension, and if missed due to improper screening, or poorly treated, can lead to adverse neurological outcomes (1). Most episodes of hypoglycemia have been found in the first 24 hours of life (2), especially in the first one hour (3). Most studies on hypoglycemia in neonates include only neonates belonging to high-risk groups, like small for gestational age, preterm, large for gestational age, infant of diabetic mother etc. Hence, this study was planned to estimate its incidence, including all the neonates irrespective of risk factors. Risk factors for hypoglycemia in these babies were also noted.

II. MATERIALS & METHODS

This study was done at Travancore Medical College, Kollam from April to December 2021. During the study period, all neonates delivered were included, whose parents gave informed consent for the study. Those neonates who developed sepsis or respiratory distress needing oxygen, or were otherwise sick and hence were shifted to NICU within the first 24 hours, and those who were premature < 32 weeks of gestation, were excluded. Informed consent was obtained from the parents. Necessary details regarding risk factors were noted in a proforma. Blood glucose was estimated at 1 hour, and then a repeat measurement at 24 hours for those neonates who were hypoglycemic in the first hour. Blood drop was obtained by heel prick and glucose value estimated using glucometer strips. Cost for these strips and needle and all other costs were borne by the investigator.

Hypoglycemia was defined as blood glucose value < 47 mg/dl, for the purpose of this study. Severe hypoglycemia was taken as blood glucose < 25 mg/dl. Preterm was defined as neonates born before 37 completed weeks of gestation. Low birth weight was taken as < 2.5 kg birth weight.

Blood glucose was estimated at 1 hour, and then a repeat measurement at 24 hours for those neonates who were hypoglycemic in the first hour. Those neonates who were found to have hypoglycemia were managed as per protocol in the institution, including additional blood glucose estimations as required, in addition to the values at six hourly intervals.

Data analysis was conducted using SPSS version 19. Qualitative data was expressed as percentage. and quantitative data as mean and standard deviation. Association with risk factors

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was gauged using the Chi-squared test. p value of < 0.05 was taken as significant.

III. RESULTS

504 neonates were included in this study, from Travancore Medical College, Kollam. 23.8% of neonates developed hypoglycemia in the first 1 hour after birth. 13% of those who were hypoglycemic developed hypoglycemia at 24 hours also. Mostly infant of diabetic mothers and preterm infants had recurrence of hypoglycemia at 24 hours of age (see table 1). None had severe hypoglycemia. Majority (91.66% of total hypoglycemic neonates) were asymptomatic. 8.3% of total hypoglycemic neonates had symptomatic hypoglycemia (1.98% of all neonates). Symptoms seen were jitteriness (40%), poor sucking (30%), lethargy (30%), irritability (10%). No neonates had severe hypoglycemia (< 25 mg/dl).

Out of 504 newborns, 10.31% were preterm and born at 32 to 37 completed weeks of gestation (preterms less than 32 weeks were sick and hence excluded). Incidence of hypoglycemia was 28.8% in preterm neonates (see table 1). 50.39% were male neonates. Incidence of hypoglycemia was 28.34% in male neonates (p value significant) and 19.2% in female neonates. 10.11% were infants of diabetic mothers. Incidence of hypoglycemia was 39.21% in infants of diabetic mothers (p value significant). 19.44% were low birth weight. Incidence of hypoglycemia was 22.44% in low birth weight term newborns. 16.26% of babies were small for gestational age. Incidence of hypoglycemia was 29.26% in small for gestational age term neonates. 8.3% were large for gestational age. Incidence of hypoglycemia was 14.28% in large for gestational age babies. 40% babies were born by cesarian section. Incidence of hypoglycemia was 26.73% in babies born by cesarian section. 37.1% were primigravidae mother. Incidence of hypoglycemia was 24% in neonates born to primigravidae mothers. Premature rupture of membranes had occurred in 5.95% of neonates, and hypoglycemia was seen in 20% of them. 4.1% mothers had gestational hypertension. Incidence of hypoglycemia was 38% in neonates born to mothers with gestational hypertension. Thus, infants of diabetic mothers (p - 0.006), mothers with gestational hypertension, neonates small for gestational age and male gender (p - 0.015) were associated with increased incidence of hypoglycemia in this study.
(refer table 1).

Risk factor	Number of neonates	Percentage of neonates	Hypoglycemia	Incidence (%)	P value	Recurrence in those hypoglycemic initially	Percentage of recurrence in those hypoglycemic initially	Symptomatic
Male gender	254	50.39	72	28.34	0.0159 (significant)	3	4.16	0
Prematurity	52	10.31	15	28.84	0.367	2	13.33	3
Low birth weight	98	19.44	22	22.44	0.72	1	4.54	3
Small for gestational age	82	16.26	24	29.26	0.204	2	8.33	0
Large for gestational age	42	8.33	6	14.28	0.13	0	0	0
LSCS	202	40.07	54	26.73	0.57	0	0	0
Primigravida mother	187	37.1	45	24.06	0.91	1	2.22	0

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IDM	51	10.11	20	39.21	0.006 (significant)	4	20	4
GHTN	21	4.16	8	38.09	0.11	0	0	0
PROM	30	5.95	6	20	0.61	0	0	0
Overall	504	100	120	23.8		13	10.83	10 (8.33%)

Table 1 - shows incidence, odds ratio of each risk factor and significance, and recurrent and significant hypoglycemia (LSCS - Lower segment cesarian section, IDM - Infant of diabetic mother, GHTN - Gestational hypertension, PROM - premature rupture of membranes).

IV. DISCUSSION

There is substantial variation in incidence of hypoglycemia in neonates reported in various studies. Equally mind-boggling are the cut-offs for hypoglycemia adopted by various studies, as well as population enrolled (4). The overall incidence of 23.8% in this study was similar to a study by Stark et al (5), who reported an incidence of 27%. 29.2% incidence was seen in small for gestational age, in this study, compared to another study which reported incidence of 16%, but on the second day of life (6). Another study (7) reported incidence in infants of diabetic mother as 16.6% (less compared to this study), large for gestational age as 12.7% (similar to this study), small for gestational age as 12.2% (less compared to this study) and late preterm as 34% (similar to this study). Increased incidence in male gender was also seen in other studies (8, 9). Incidence of hypoglycemia was much lower (16.9%) in another study (10).

Incidence of hypoglycemia in neonates is significant enough to warrant routine screening of glucose values even in non-risk neonates (11). Importance of screening infants of diabetic mothers has been highlighted in other studies also (12). One study had even studied the utility of prophylactic dextrose gel in at-risk neonates to prevent hypoglycemia (13). Further research is needed in this area. Large for gestational age is a significant risk factor for hypoglycemia in some studies (14), though our study did not show a high incidence. Another study also stated that large for gestational age did not show a high incidence (15), but reported a lower overall incidence of 3.4%.

Another study, also from Kerala, noted overall incidence as 15.3%, and identified prematurity and small for gestational age as main risk factors (3). The same study reported jitteriness and poor feeding as the common symptoms (similar to this study), and that incidence of hypoglycemia was maximum in the first hour of life (3), hence warranting the need for glucose estimation in the first hour. A study from Medical College, Kozhikode, Kerala reported a lower incidence of 41/1000 live births, and also identified oligohydramnios as a risk factor (16). Incidence might vary with geographical location also; a study from Uganda reported a much lower occurrence of 2.2% (1416 participants) (17). A study from Nepal reported a much higher incidence of 41%, highlighting the geographical variation (18).

Incidence of hypoglycemia is maximum in the first hour in large for gestational age neonates in a study (19). A study from eastern India reported incidence of hypoglycemia as 20.8% in 250 high risk neonates, of which 3.2% were symptomatic (20). Another study reported incidence of hypoglycemia of 10% in asymptomatic newborns (21). Another recent study reported incidence of hypoglycemia as 39.3% in high risk neonates (22).

V. CONCLUSION

All neonates need close monitoring for hypoglycemia in first 24 hours, especially male neonates, neonates who are small for gestational age and infant of diabetic mothers, and neonates of mothers with gestational hypertension. Since there is chance of long-term adverse effects (23, 24), including visual-motor impairment and executive dysfunction, as seen in a meta-analysis (25), it is essential to monitor for hypoglycemia.

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