INCIDENCE OF HYPOGLYCEMIA IN FIRST 24 HOURS IN HIGH RISK NEONATES WHICH ARE EXCLUSIVELY BREAST FED IN DMCH

Pediatrics

Dr. Ankur Agrawal	PG student, Department of Pediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India.
Dr Vivekanand Paul*	Senior Resident, Department of Pediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Bihar, India. *Corresponding Author
Dr N P Gupta	Associate Professor, Department of Pediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Bihar, India.
Dr. Shilpi Kumari	PG student, Department of Pediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India.

ABSTRACT

Objectives: The objective of the study were to determine Incidence of hypoglycaemia in 1st 24 hours in high risk neonates which are exclusively breast fed in the region of northern Bihar. **Materials and methods:** Data were collected from the SNCU records of neonates admitted in Darbhanga Medical Hospital, Laheriasarai. Blood glucose level of all such babies were checked at the time of admission. **Results:** Out of 150 neonates, incidence of hypoglycaemia was seen in low birth weight babies 20(28.6%), macrosomic newborns 2(12.5%), infants of diabetic mothers 2(14.3%), and late preterm babies 3(13.6%). Hypoglycaemia was also seen in newborns whose mother's age >30 years, multigravida mothers, antenatally unbooked, mother's residence in rural areas, and mode of delivery is cesarean section. **Conclusion:** Incidence of hypoglycaemia was high in high risk newborns and depend on both maternal risk factors and neonatal risk factors.

KEYWORDS

Hypoglycaemia, low birth weight infants, macrosomic newborns.

INTRODUCTION

Hypoglycaemia is the most common metabolic disturbance occurring in the neonatal period. Screening at-risk infants and the management of low blood glucose levels in the first hours to days of life is a frequent issue in the care of the newborn infant.[1,2,3] In the majority of healthy neonates, the frequently observed low blood glucose concentrations are not related to any significant problem and merely reflect normal processes of metabolic adaptation to extrauterine life. However, when low blood glucose levels are prolonged or recurrent, they may result in acute systemic effects and neurologic sequelae[4]. Fetal brain receives a glucose concentration that is around 9 mg/dL lower than those of maternal plasma, so the actual glucose concentration in fetus is around 54 mg/dL. Soon after birth, with separation of placenta, there is a physiological decrease in the BGL of the newborn, with a nadir at around 1 to 2 hours of life.[5,6,7] Therefore, the BGL which is considered to be "normal" is variable and depends on multiple factors including birth weight, gestational age, body stores, feeding status, availability of energy sources, as well as presence or absence of disease.[8,9] There is no universal definition for hypoglycaemia. World Health Organisation defines hypoglycaemia as "blood glucose level (BGL) of less than 45 mg/dL."[10]. Aim of this study is to find out the incidence of hypoglycaemia in the 1st 24 hours in high risk neonates who are exclusively breast fed along with the risk factors associated with it.

MATERIALS AND METHODS

The study was carried out in the Department of Paediatrics, Darbhanga Medical Hospital, Laheriasarai. A total of 150 newborns were selected from the newborns admitted in the SNCU of the hospital. Permission from the hospital authority and ethical committee was taken before conducting this study. All high risk newborns who were exclusively breastfed were included in the study after obtaining proper informed consent from the mothers. Newborns which were excluded from the study were with a major congenital malformation in whom breastfeeding could not be initiated and in whom exclusive breastfeeding could not be continued or contraindicated.

The high risk newborns were defined as small for gestational age (SGA) infants (birth weight less than or equal to the 10th percentile for gestational age), large for gestational age (LGA) infants (birth weight more than or equal to the 90th percentile for gestational age), low birth weight (LBW) babies (birth weight less than 2500 g), macrosomic infants (birth weight more than 4000 g), infant of a diabetic mother (IDM) (maternal type 1 or type 2 diabetes mellitus or gestational diabetes mellitus), late preterm infant (LPI) (a premature infant born

between 34-36[6/7] gestational week). The birth weight percentiles were adopted from the Lubchenco chart(11).

Detailed history of the newborns that were included in the study was taken which included various maternal risk factors like GDM, PIH, hypothyroidism twin pregnancy, etc, and neonatal risk factors like prematurity, LBW, SGA, etc.

After warming the heels of the babies, capillary blood samples were taken and Blood glucose concentration were determined by using the glucometer and test strips (SD CodeFree, SD BIOSENSOR). The babies were observed for any signs and symptoms attributable to hypoglycaemia.

Following the detection of hypoglycaemia, the neonates were managed as per hospital protocol.

p-value < 0.05 was considered statistically significant.

RESULTS

A total of 553 deliveries occurred in the hospital during the study, out of which 150 newborns were included in the study. Overall 403 newborns were excluded from the study: 10 newborns because their mother's refused to give consent; 376 newborns because of being non high risk; 12 newborns due to congenital malformation; 5 newborns in whom exclusive breast feeding could not be continued. Figure 1, Table 1

Out of the 150 newborns that were included in the study, 34 newborns developed hypoglycaemia within the first 24 hours of life while 116 newborns didn't develop hypoglycaemia. Therefore, the incidence of hypoglycaemia in high risk newborns is 22% in the study. Table 2
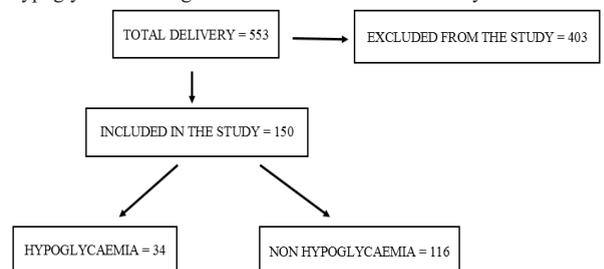

Figure 1: Flow diagram of the distribution of cases in the present study.

Table 1: Demographic data of the enrolled neonates and their mothers.

N=150		Number of cases	Percentage of cases
Sex	Male	80	53.3%
	Female	70	46.7%
Residence	Urban	85	56.7%
	Rural	65	43.3%
Religion	Hindu	60	40%
	Muslim	86	57.3%
	Others	4	2.7%
Antenatal history	Booked	86	57.3%
	Unbooked	64	42.7%
Obstetric history	Primigravida	66	44%
	Multigravida	84	56%
Maternal age	<30 years	88	58.7%
	>30 years	62	41.3%
Maternal history	Nil	66	44%
	GDM	48	32%
	DM	12	8%
	PIH	6	4%
	Hypothyroidism	8	5.3%
	PROM	4	2.7%
	Others	6	4%
Mode of delivery	NVD	82	54.7%
	Forceps	4	2.6%
	Vacuum	3	2%
	Elective CS	13	8.7%
	Emergency CS	48	32%

Table 2: Characteristics of high-risk neonates that were included in the study.

N=150		Number of cases	Percentage of cases
Inclusion criteria	SGA	19	12.7%
	LGA	9	6%
	MACROSOMIC	70	46.7%
	LBW	16	10.7%
	IDM	14	9.3%
	Late Preterm	22	14.7%

Table 3: Characteristics of the hypoglycaemic neonates (n = 34).

N=34		Number of cases	Incidence	P-value
Sex	Male	19	55.9%	0.7
	Female	15	44.1%	
Residence	Urban	12	35.3%	0.02
	Rural	22	64.7%	
Religion	Hindu	17	50%	0.4
	Muslim	16	47%	
	Others	1	3%	
Antenatal history	Booked	14	41.2%	0.03
	Unbooked	20	58.8%	
Obstetric history	Primigravida	9	26.5%	0.02
	Multigravida	25	73.5%	
Maternal age	<30 years	14	41.2%	0.02
	>30 years	20	58.8%	
Mode of delivery	Vaginal	14	41.2%	0.02
	Cesarean section	20	58.8%	

Table 4: Distribution of hypoglycaemia in the high-risk neonates in the present study (n = 150).

HIGH RISK NEWBORNS (N=150)	HYPOGLYCAEMIA ABSENT		HYPOGLYCAEMIA PRESENT		P-VALUE
	Number of newborns	Percentage of newborns	Number of newborns	Percentage of newborns	
SGA(N=19)	14	73.7%	5	26.3%	0.08
LGA(N=9)	7	77.8%	2	22.2%	0.2
LBW(N=70)	50	71.4%	20	28.6%	0.003
MACROSOMIC(N=16)	14	87.5%	2	12.5%	0.01
IDM(N=14)	12	85.7%	2	14.3%	0.02
LATE PRETERM (N=22)	19	86.4%	3	13.6%	0.004

In the study, it was found that hypoglycaemia in newborns depends on the mother's age, gravida of mother, the route of delivery, antenatally booked and residence. Hypoglycaemia was found to be more in newborns whose mother's age was >30 years than in newborns whose mother's age was <30 years. Incidence of hypoglycaemia was more in the newborns born to multigravida mothers than in newborns born to primigravida mothers. Incidence of hypoglycaemia was found to be more in newborns delivered through cesarean section compared to newborns delivered through vaginal route. Incidence of hypogly caemia was also found to be dependent on whether mother was antenatally booked or unbooked as incidence of hypoglycaemia was found to be more in newborns whose mothers were antenatally unbooked. Incidence of hypoglycaemia also depends on mothers residence as incidence of hypoglycaemia was higher in newborns whose mothers live in rural area. These observations were found to be statistically significant after applying the tests of proportion. Table 3

In the study, out of 70 Low birth weight newborns, 28.6% (20/70) newborns were hypoglycaemic, which was found to be statistically significant. (Proportion test, p-value: 0.003). Out of 14 Infants of diabetic mothers 14.3% (2/14) newborns were hypoglycaemic, which was found to be statistically significant. (Proportion test, p-value: 0.02). Out of 22 Late preterm infants 13.6% (3/22) newborns were hypoglycaemic, which was found to be statistically significant. (Proportion test, p-value: 0.004). Out of 16 macrosomic newborns, 12.5% (2/16) newborns were hypoglycaemic which was found to be statistically significant. (Proportion test, p-value: 0.01). Out of 19 short of gestational age newborns, 26.3% (5/19) newborns were hypoglycaemic, which was not found to be statistically significant. (Proportion test, p-value: 0.08). Out of 9 large for gestational age newborns, 22.2% (2/9) newborns were hypoglycaemic, which was not found to be statistically significant. (Proportion test, p-value: 0.2). Table 4

DISCUSSION

In the present study, out of 150 newborns that were included in the study, 34 newborns were found to be hypoglycaemic whereas 116 newborns did not have hypoglycaemia. Hence the incidence of hypoglycaemia in high risk neonates which are exclusively breast fed was 22%.

In the study the incidence of hypoglycaemia was 22%, which is similar to many studies worldwide, including a study done at Haryana, India by author Saini A, et al.(12) in the year 2018 in which incidence of hypoglycaemia was 24%. Another study done at Boston, USA by Turner D, et al.(13) in the year 2019 in which incidence of hypoglycaemia was found to be 40%. Another study done at Maharashtra, India by author Mehta YP, et al.(14) in the year 2017, the incidence of hypoglycaemia was found to be 22%.

The relatively higher incidence of hypoglycaemia in this study among the high risk newborns that are exclusively breast fed can be due to certain population characteristics such as multiparty and high gravida due to high prevalence in this region. This study has also enrolled relatively large number of infants of diabetic mothers which is a reflection of high prevalence of diabetes in the population.

In this study, we found that incidence of hypoglycaemia was higher in newborns whose mother lives in rural areas as compared to the newborns whose mothers lives in urban areas, which was different from the results concluded from the study by Harris DL, et al.(15) in the year 2012. This variations in the incidence of hypoglycaemia can be explained by poor access of mothers to the medical services in rural areas.

In this study, we found that incidence of hypoglycaemia was higher in newborns whose maternal age >30 years, which was different from the results concluded from the study conducted by Kumar TJ, et al. [16] in the year 2018, where the incidence of hypoglycaemia in newborns whose mothers age <30 years was 38%, while the incidence of hypoglycaemia in newborns whose mothers age >30 years was 18.9%. In this study, the mothers whose age >30 years, that were enrolled in the study usually were multiparty and poor health due to poor access to medical services.

In this study, we found that incidence of hypoglycaemia was higher in the newborns whose mothers were unbooked antenatally, which was

different from the results concluded from the study by Kanagagiri R, et al.(17) in the year 2018. This variations in the incidence of hypoglycaemia can be explained mother's poor health and poor access to medical services.

In this study, we found that incidence of hypoglycaemia was higher in multigravida mothers than primigravida mothers. This result was similar to the results that was obtained in the study conducted by Sasidharan CK, et al.(18). But the results was different from the results concluded from the study conducted by Purnima Samayam, et al.(19) in the year 2015 where the incidence of hypoglycaemia in primigravida mothers was 23.07% and in the multigravida mothers was 5.4%. This variations in the results can also be explained by maternal age and the poor access to medical services in multifarious mothers.

In this study, we found that infants who were delivered by cesarean section had higher incidence of hypoglycaemia than the infants delivered by vaginal route (p-value: 0.02). This can be explained due to lactogenesis, delayed skin to skin contact and impaired thermoregulation.

CONCLUSION

From the study, it is concluded that incidence of hypoglycaemia was high in high risk newborns. The blood glucose levels in newborns was dependent on both maternal risk factors and neonatal risk factors. Maternal risk factors include age of mother, parity of mother, residence of mothers, maternal morbidity and mode of delivery. Neonatal risk factors gestational age and birth weight of newborns. There was no association between blood glucose levels and sex of newborns, religion of mothers and the APGAR score.

So the healthy high risk newborns can be exclusively breast fed, but their glucose levels should be regularly monitored. Any asymptomatic hypoglycaemia in newborns should be managed promptly.

REFERENCES

1. Adamkin DH. Neonatal hypoglycemia. Semin Fetal Neonatal Med. 2017 Feb;22(1):36-41.
2. Tin W. Defining neonatal hypoglycaemia: a continuing debate. Semin Fetal Neonatal Med. 2014 Feb;19(1):27-32.
3. Committee on Fetus and Newborn. Adamkin DH. Postnatal glucose homeostasis in late-preterm and term infants. Pediatrics. 2011 Mar;127(3):575-9.
4. Cornblath M, Hawdon JM, Williams AF, Aynsley-green A, Ward-platt MP, et al. (2000) Controversies regarding definition of neonatal hypoglycemia : Suggested operational thresholds. Pediatrics 105: 1141-1145.
5. Marconi, AM, Paolini, C, Buscaglia, M, Zerbe, G, Battaglia, FC, Pardi, G. The impact of gestational age and fetal growth on the maternal-fetal glucose concentration difference. Obstet Gynecol. 1996;87:937–942.
6. Kalhan, SC, D'Angelo, LJ, Savin, SM, Adam, PA. Glucose production in pregnant women at term gestation. Sources of glucose for human fetus. J Clin Invest. 1979;63:388–394.
7. Hoseth, E, Joergensen, A, Ebbesen, F, Moeller, M. Blood glucose levels in a population of healthy, breast fed, term infants of appropriate size for gestational age. Arch Dis Child Fetal Neonatal Ed. 2000;83:F117–F119.
8. Cornblath, M, Hawdon, JM, Williams, AF. Controversies regarding definition of neonatal hypoglycemia: suggested operational thresholds. Pediatrics. 2000;105:1141–1145.
9. Hussain, K, Blankenstein, O, De Lonlay, P, Christesen, HT. Hyperinsulinaemic hypoglycaemia: biochemical basis and the importance of maintaining normoglycaemia during management. Arch Dis Child. 2007;92:568–570.
10. Arya, VB, Senniappan, S, Guemes, M, Hussain, K. Neonatal hypoglycemia. Indian J Pediatr. 2014;81:58–65.
11. Lubchenco LO, Hansman C, Dressler M, Boyd E (1963) Intrauterine growth as estimated. Pediatrics 32: 793-800.
12. Saini A, Gaur BK, Singh P (2018) Hypoglycemia in low birth weight neonates: Frequency, pattern, and likely determinants. IJCP 5: 526-532.
13. Turner D, Monthé-Drèze C, Cherkerzian S, Gregory K, Sen S (2019) Maternal obesity and cesarean section delivery: additional risk factors for neonatal hypoglycemia? J Perinatol 39: 1057-1064.
14. Mehta YP, Munde BP (2017) Study of blood sugar levels in high risk neonates using glucometer method and laboratory glucose oxidase peroxidase method. Int J Contemp Pediatr 4: 1185.
15. Harris DL, Weston PJ, Harding JE (2012) Incidence of neonatal hypoglycemia in babies identified as at risk. J Pediatr 161: 787-791.
16. Kumar TJ, Vaideeswaran M. AST (2018) Incidence of hypoglycemia in newborns with risk factors. Int J Contemp Pediatr 5: 1952-1955.
17. Kanagagiri R, Y TS, Suryaprakash T (2018) Incidence of hypoglycemia in high risk neonates and its relationship with gestational age birth weight and ponderal index. IOSR J Dent Med Sci 17: 20-26.
18. Sasidharan CK, Gokul E, Sabitha S (2004) Incidence and risk factors for neonatal hypoglycaemia in Kerala, India. Ceylon Med J 49: 110-113.
19. Samayam P, Balasundaram R (2015) Study of asymptomatic hypoglycemia in full term exclusively breastfed neonates in first 48 hours of life. J Clin Diagnostic Res 9: 7-10.