Section: Pediatrics

Original Research Article

SCREENING OF HYPOGLYCEMIA IN EXCLUSIVELY BREASTFED HIGH-RISK NEONATES

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ABSTRACT

Background: Hypoglycemia is one of the most frequently encountered metabolic problems in, the incidence increases many folds. Many cases being asymptomatic. The absence of symptoms does not rule out CNS injury. In order to prevent brain injury, blood sugars should be monitored in high-risk babies. **Aims & Objectives**: To screen for Hypoglycemia in exclusively breastfed high-risk neonates and to study its association with birth weight, mode of delivery, gestational age, parity of mother and to determine time of onset of Hypoglycemia.

Materials and Methods: 150 neonates where enrolled who were exclusively breastfed high-risk neonates. It included small for gestational age [SGA], low birth weight [LBW], LATE PRETERM, large for gestational age [LGA], Infants of diabetic mother [IDM]. Infants who require NICU admission were excluded. Blood sugars were monitored at 2, 6,12,24,48 and 72 hours of life using glucometer strips. Lab confirmation was done only when levels were less than 25 mg/dl or when symptomatic.

Results: The incidence of Hypoglycemia in New-borns with risk factors was found to be 20.8% [32/150]. Among them Hypoglycemia in SGA babies was found to be 31.5% [10/32], in LBW 15.3% [8/52}. incidence was found to be higher in babies born through c-section [28%] than vaginal delivery [10%]. Babies born to primigravida and multigravida mother had 25% & 10.5% incidence respectively. Most babies developed Hypoglycemia at 2 hours of life and none after 48 hours.

Conclusion: Incidence of Hypoglycemia is fairly common in high-risk group, most being asymptomatic. Close monitoring is necessary to prevent sequel later in life.

Keywords: Hypoglycemia, Multigravida, SGA, NICU, Neonates.

INTRODUCTION

Hypoglycaemia is one of the commonest metabolic problems in contemporary Neonatal medicine. In the majority of healthy Neonates, the frequently observed low blood glucose concentrations are not related to any significant problem and merely reflect normally processes od metabolic adaptation to extract uterine life.[1-3]

However, when low blood glucose levels are prolonged or recurrent, they may result in a acute systemic effects and neurologic sequelae. The foetus in utero is entirely dependent on the mother for glucose.

At the time of birth, the Neonate must abruptly switch from having a continuous supply of glucose during periods of fasting and when feeding is interspersed intermittently, since prolonged periods of low plasma glucose are associated with increased risk groups including small for gestational age infants, preterm infants and infants of diabetic mother are at high risk of Hypoglycaemia.[4,5, 6]

Prevention, early diagnosis and prompt treatment are important for high -risk infants who develop Hypoglycaemia, to minimise the severity and duration of Hypoglycaemic episodes, which are associated with adverse outcomes.[7]

Aims & Objectives

Aims

- To screen for Hypoglycaemia in exclusively breastfed High-risk Neonates

Objectives

- To study associated risk factors like Birth Weight, Mode of Delivery, Gestational Age, Ponderal Index and Maternal Age.
- Also, time of one set of the development of Hypoglycaemia.

Sample size: 150 Patients.

MATERIAL AND METHODS

This is descriptive cross-sectional studies of 150 Neonates, after obtaining ethical clearance from the institution, which satisfied criteria of High Risk were enrolled, informed and consent was taken

The High-Risk group was defined as

1. Small for Gestational Age (SGA infants – Bt Wt less than or equal to 10th percentile)
2. Large for Gestational Age (LGA infants – Bt Wt greater than or equal to 90thpercentile)
3. Low Birth Weight infants (Bt Wt less than 2500 gm)
4. Macrosomia Infants (Bt Wr greater than 4000 gm)
5. IDM (Infant of Diabetic Mother)
6. LATE PRE-TERM (Gestational Age between 34 weeks to 36 weeks 7 days)

Lubchenco Chart was adopted for birth weight percentile

New-borns C¯a major congenital anomaly in whom breastfeeding can't be initiated and in whom exclusive breastfed couldn't carried out were excluded. The detailed history of mother and Neonate was taken.

Capillary blood samples were taken after warning the heirs of the infants, blood glucose concentration was determined by using the Glucometer (ONE TOUCH). Glucometer used bio amperometry as test principle. In this glucose dehydrogenase in the strip converts the glucose in the blood sample to Gluconolactone. This reaction creates a harmless electrical current that the glucometer interprets for that blood glucose. A sterile lancet was used to prick the infant on prenunned heels to ensure proper blood circulation. Blood was drawn into the strip automatically.

Screening was carried out at 2 hours, 6 hours, 12 hours, 24 hours, 48 hours and 72 hours of life and recorded. Infants were observed for signs of Hypoglycemia.

Whole blood sample was collected in fluoride vial by aseptic technique and sent for laboratory examination by glucose oxidase method when the babies had Symptomatic Hypoglycemia. Hypoglycemia definition, that was used in the study was blood glucose level below 40 mg/dl.

RESULTS

Table 1: Gender

Sex					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	FEMALE	59	39.3	39.3	39.3
	MALE	91	60.7	60.7	100
	Total	150	100	100	

Table 2: Gravida

PRMI/MULTIGRAVIDA					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MULTI GRAVIDA	38	25.3	25.3	25.3
	PRIMI GRAVIDA	112	74.7	74.7	100
	Total	150	100	100	

Table 3: Mode of delivery

Mode of delivery					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Caesarean Section	94	62.7	62.7	62.7
	VAGINAL	56	37.3	37.3	100
	Total	150	100	100	

Table 4: SGA

SGA					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	118	78.7	78.7	78.7
	Yes	32	21.3	21.3	100
	Total	150	100	100	

Table 5: Low birth weight

LBW					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	74	49.3	49.3	49.3

	Yes	76	50.7	50.7	100
	Total	150	100	100	

Table 6: Preterm

Late Preterm					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	122	81.3	81.3	81.3
	Yes	28	18.7	18.7	100
	Total	150	100	100	

Table 7: LGA

LGA					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	128	85.3	85.3	85.3
	Yes	22	14.7	14.7	100
	Total	150	100	100	

Table 8: Macrosomia

Macrosomia					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	138	92	92	92
	Yes	12	8	8	100
	Total	150	100	100	

Table 9: IDA

IDM					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	98	65.3	65.3	65.3
	Yes	52	34.7	34.7	100
	Total	150	100	100	

Table 10: Pondreal Index

PI					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	<2.5	106	70.7	70.7	70.7
	>2.5	44	29.3	29.3	100
	Total	150	100	100	

Table 11: Hypoglycemia at 2 hrs

HG 2					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	NO	135	90	90	90
	YES	15	10	10	100
	Total	150	100	100	

Table 12: HG 6

HG 6					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	NO	142	94.7	94.7	94.7
	YES	8	5.3	5.3	100
	Total	150	100	100	

Table 13: HG 12

HG 12					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	NO	144	96	96	96
	YES	6	4	4	100
	Total	150	100	100	

Table 14: HG 24

HG 24					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	NO	148	98.7	98.7	98.7
	YES	2	1.3	1.3	100
	Total	150	100	100	

Table 15: HG 48

HG 48					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	149	99.3	99.3	99.3
	YES	1	0.7	0.7	100
	Total	150	100	100	

Table 16: HG 72

HG 72					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	150	100	100	100
	YES	0	0	0	100
	Total	150	100	100	

Table 17: Symptoms

Asymptomatic/Symptomatic					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Asymptomatic	31	20.7	20.7	20.7
	None	118	78.7	78.7	99.3
	Symptomatic	1	0.7	0.7	100
	Total	150	100	100	

Table 18: Hypoglycemia

HYPOGLYCEMIA					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	118	78.7	78.7	78.7
	YES	32	21.3	21.3	100
	Total	150	100	100	

Table 19: Maternal complications

Maternal Complication					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GDM	49	32.7	32.7	32.7
	Hypertension	11	7.3	7.3	40
	Hypo Thyroidism	21	14	14	54
	Hypo Thyroidism & GDM	3	2	2	56
	None	55	36.7	36.7	92.7
	Oligohydramnios	1	0.7	0.7	93.3
	PROM	5	3.3	3.3	96.7
	TORCH	5	3.3	3.3	100
	Total	150	100	100	

DISCUSSION

In the present study, out of 150 neonates,32 were found to be Hypoglycemic whereas 118 new-borns did not have hypoglycaemia. Hence Incidence of hypoglycaemia in exclusively breastfed high-risk neonates is 21.3% [32/150]

There is a wide variation in the incidence of hypoglycaemia in various studies because, various researchers have used different definitions of hypoglycaemia. A variety of methods of detection of hypoglycaemia and their studies have used different inclusion and exclusion criteria for the studies. Population characteristics may also have led to variation in the figures of incidence.

Parth Patel et al,[8] l, in 2019 studied Neonatal hypoglycaemia with sample size of 75 neonates.The incidence of hypoglycaemia [20%] was found to be similar to the present study. The inclusion and exclusion criteria, timing for screening for hypoglycaemia in both the studies were identical.

Subash Chandra Shaw et al 2018, reported incidence of hypoglycaemia as 20.8% with sample size 250 enrolled neonates, which is similar to present study.

In 2018 Kumar TJ et al,[9] conducted similar studies with large sample size and found incidence of hypoglycaemia was 33.3%.

Bromiker et al, in 2017 Jerusalem,[10] Israel, studied early Neonatal hypoglycaemia, incidence of, and risk factors, they took two cut off for hypoglycaem iadefinitions namely 40 mg/dl and 47mg/dl. When 40mg/dl was taken into consideration incidence was found to be 34% and with 47 mg/dl incidence was found to be 12.1%. The relatively high incidence of hypoglycaemia in present study can be attributed to the place of study [Tertiary Centre] where high-risk neonates were delivered.

Present study shows higher incidence of hypoglycaemia in case male infants [24.2%] than female in fants [16.9%]. Similar observation was made by Parth Patel et al in 2019 with incidence 27.3% vs 14.3% [P value 0.45]. However, when the incidence of hypoglycaemia was compared with each other, there is no sex prelidiction [Pvalue 0.29]. Similar predictions were made by Saini et al in 2018 from Haryana and Jonas D et al in year 2014 from Austria.

Kumar TJet al,[9] observed similar incidence of hypoglycaemia of 35% in Male neonates. Singh et al, reported incidence as 32.1%.

Parity of mother and hypoglycaemia

When parity of mother was considered, it was observed that incidence is more in case of new-borns born to Primi GRAVIDA mother [28/112] than that of new-borns to born to Multi GRAVIDA mother [4/38], incidence being 25% vs 10.5% [P value 0.04]. Similar findings were made by Poornima Samayam et al, in 2015,[11] where they found 23.07%of neonates born to Primi GRAVIDA mother had hypoglycaemia against 5.4% neonates born to Multi GRAVIDA mother.

Conflicting results were found by Parth Patel et al,[16] where they found incidence higher in case of Multi parous mother neonates than Primi GRAVIDA mother neonates. The observation in the present study can be explained by inexperience of Primi Gravida mother in starting and continuing Breastfeed and problems like inverted nipples, delay in lactogenesis in Primi GRAVIDA mother.

Mode of delivery and hypoglycaemia

The infants who were delivered by caesarean section were found to beat higher risk (28%) vs those born through normal vaginal delivery (10%) for development of hypoglycaemia. Similar observation was made by Parth Patel et al,[8] with variation in incidence from present study40.9% vs16.2% in babies born through caesarean and vaginal delivery respectively. These observations may be attributed to delayed lactogenesis, delayed skin to skin contact and impaired thermoregulation in case of caesarean bornnew-borns.

High risk groups and hypoglycaemia

When risk factors were considered

- 100 out of 32 SGA babies developed hypoglycaemia(incidence31.5%,)
- 18 out of 76 low birth weight babies had hypoglycaemia (incidence 23.6%)
- 4 OUTOF22LGA babies had hypoglycaemia (incidence18.1%)
- 1 in 12of Macrosomic babies had hypoglycaemia (incidence 8.3%)
- 4 out of 28 late pre term babies had hypoglycaemia (incidence14.2%)
- 8 0utof IDM babies had hypoglycaemia (incidence 15.3 %)

The values in present studies can be compared to observations made by Parth patel et al,[8] where it was found that the incidence of hypoglycaemia in SGA neonate was 37.5% (6/16), in LGA neonate was 18% (2/11), in Macrosomic neonates 20% (2/10), in LBW neonates 24% (9/38), in IDM was 14% (4/25) and in late preterm was 14% (2/12).

The incidence of hypoglycaemia was 42% in SGA, which is higher than that with the Holtrop et al,[12] and in Bhat et al,[13] reports. In Holtrop etal the frequency of hypoglycaemia in SGA infants was 14.7%. In Bhat et al study, the incidence of hypoglycaemia was 25.2% in SGA babies. De et al,[14] study showed incidence of hypoglycaemia in SGA was 64.2%, but the population size was very small. Holtrop, et al had excluded new-borns of diabetic mothers and their new-borns were not exclusively breastfed. Bhat, et al included all SGA new-borns, whether breastfed, formula-fed, or on intravenous fluids. These factors could have lowered the incidence of hypoglycaemia in their studies. High incidence of hypoglycaemia inSGA in present study can be explained due to High-risk pregnancies managed in the place of study

The incidence of hypoglycaemia in Low-Birth-Weight new-borns was 28%. Singh,[15] et al study showed incidence of hypoglycaemia in low-birth-weight new- borns29.5%,Saini et al showed24% [16], De et al,[14] showed64.8%incidenceof hypoglycaemia in low-birth-weight new-borns but the population size was small.

The incidence of hypoglycaemia was found to be 33% in Infant of diabetic mothers. The incidence of hypoglycaemia in IDM was found to be 28.6% in Singh et al,[15] reports and 30% in Cordero et al study.

Ponderalindex and hypoglycaemia

In present study incidence of hypoglycaemia in neonates with ponderalindex less than 2.5 is 18.2 % (24/106) and with Ponderal index greater than and equal to 2.5 is22.6 % (8/44) p value here is o.544. so, there is no statistical significance exist between ponderalindex and hypoglycaemia.

Kanangari et al reported,[17] reported incidence of hypoglycaemia in SGA babies 21% and AGA babies 8 %. In this studies SGA AND IUGR were taken as synonyms. Hence both the studies and results could not be compared.

Time of onset of hypoglycaemia

According to present studies 15 out of 32 babies were found to have hypoglycaemia at 2 hours of life [p value 0.01], 8 /32 at 6 hours of life [p value -0.01], 6/32 at 12 hours of life, [p value 0.01], 2 /32 at 24 hours of life [p value 0.04], 1/32 at 48 hours of life [p value 0.06], and none at 72 hours of life.

Patelp et al,[8] reported hypoglycaemia in neonates as follows: 26.7 % at 2hours of life, 40 % at 6 hours of life ,20 % at 12 hours of life, 6.7 % at 24 hours of life, 6.7 % at 48 hours of life and none at 72 hours. These two studies are comparable. Almost all of the studies including present study has shown most of the babies developed hypoglycaemia before 24 hours of life [p value 0.001].

Asymptomatic/symptomatic hypoglycaemia

This study shows only on neonate among 32whodevelopedhypoglycaemia had symptoms of hypoglycaemia, rest 31 neonates were asymptomatic [p value 0.01].

Parthp at el ,[8] reported all the neonates in their studies were asymptomatic. Princy Singh et al in 2017, Bhat et al,[13] Holtrop p,[12] reported similar statistics further emphasising need for screening of hypoglycaemia in high- risk neonates.

Limitations of Study

This study excludes neonates in whom breastfeeding could not be initiated or continued, who required IV fluids, had major congenital malformations & NICU admissions.

The enrolled neonates who developed other complications like sepsis, hyperbilirubinemia had to be excluded.

Pre terms with gestational age less than 34 completed weeks where not part of studies because majority of such new-borns required NICU admission.

Since this study has excluded sick, NICU admitted babies, association between APGAR score and hypoglycaemia couldn't established. Babies with low APGAR score often required NICU admission.

CONCLUSION

The Present study has shown that, neonates with high-risk have high-risk of developing hypoglycaemia. Blood glucose values of new-borns was affected by Gestational age, Birth Weight, Mode of delivery and Parity of mother. There was no association between hypoglycaemia and sex of the baby and ponderal index. We conclude that high-risk new-borns who are healthy can be exclusively breastfed, but their blood glucose levels need to be monitored at least48 hours, particularly in first 24 hours. The study has shown maximum neonates develop hypoglycaemia within first 6 hours of life. So, blood sugars should be monitored more frequently in first 6 hours of life, hence traditional monitoring of blood sugars every second hourly is recommended. Most of the neonates were asymptomatic for hypoglycaemia according to present study, so hypoglycaemia needs to be detected and managed promptly.

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