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ORIGINAL ARTICLE

An Overview of Hypoglycemia in Preterm Newborns

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ABSTRACT

Objective: To have an overview of hypoglycemia and its frequency in preterm newborns at a tertiary care hospital.

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Received ^{21st} October 2020; Accepted for publication 17th May 2021 Study Design: Cross-sectional study.

Place and Duration of Study: The Neonatal Intensive Care Unit, Pediatrics Department, CMH Multan, from November 2017 to May 2018.

Material and Methods: Consecutive 350 preterm newborns were taken in this cross – sectional study and 1 to 2 ml venous blood sample was taken within 24 hours of birth and sent to the Pathology Department of CMH Multan for random blood glucose levels to determine hypoglycemia.

Results: Of these 350 study cases, 230 (65.7 %) were male preterm neonates while 120 (34.3 %) were female neonates having mean gestational 32.66 \pm 2.97 weeks. Mean birth weight was 1702.35 \pm 102.42 grams and 254 (72.6%) had birth weight more than 1500 grams. Mean random blood sugar level was 42.18 \pm 7.34 mg/dl and hypoglycemia was noted in 131 (37.4%).

Conclusion: Very high frequency of hypoglycemia was noted in preterm infants in our study. Hypoglycemia was significantly associated with female gender, increasing parity and low birth weight.

Key Words: Frequency, Hypoglycemia, Preterm infants

INTRODUCTION

Glucose is essentially required to perform routine brain cell functions. Normal blood sugar level among newborns leads to the healthy neurological development.¹⁻³ Hence, early diagnosis and correction of hypoglycemia among newborns at risk is of paramount importance to avoid sequelae developing from neonatal hypoglycemia. Different underlying factors may disturb blood glucose levels among healthy term infants including such as birth weight, perinatal outcomes, gestational age, mode of delivery, pattern of diseases and feeding behaviors.¹ Hypoglycemia is defined as a single blood glucose reading of less than 40 mg/dL in neonates.⁴⁻⁶ Among all mammals, human babies are unique owing to the fact that they have significantly large sized brain relative to the size of body. Whereas brain exclusively needs glucose to perform its normal functions, blood sugar levels of body correlate with brain weight and cerebral utilization of glucose is dependent on optimal arterial plasma glucose levels. In neonatal or fetal brains, storage of glycogen or glucose is lower while those with intrauterine growth restriction (IUGR) and premature newborns have little alternate substrate due to underlying conditions "polycythemia, hyperviscosity, such as hypotension, and decreased cardiac output" which

reduce the flow of cerebral plasma and transportation of blood sugar to the brain.⁷ Furthermore these are quite common problems encountered in preterm neonates and IUGR.

Coexisting hypoglycemia leads to the development of hypoxic-ischemic neuronal injuries and vice versa, however there is yet no such evidence to prove whether early diagnosis of hypoglycemia in such newborns, particularly at the time of delivery, may lead to earlier management and could alter subsequent neurological outcomes.⁷ Hypoglycemia is one of the major issues encountered in first couple of days of life and it is the most prevalent biochemical derangement demonstrated by healthcare professionals. However, optimal treatment strategies for management, the unfortunately remains elusive and has been a matter of varying interpretations in reported literature.⁸⁻¹⁵ Among newborns, hypoglycemia may present symptomatically or be asymptomatic and most commonly observed symptoms include "jitteriness, convulsions, apathy, hypotonia, coma, refusal to feed, cyanosis, high pitched cry and hypothermia".¹⁰ These symptoms are relatively non-specific and can easily be overlooked and missed in small sick newborn babies which points towards the importance of biochemical confirmation of the condition led by response to the treatment.

At the time of birth, exclusive transfer of glucose from placenta is discontinued and neonates need sufficient amount of glucose for vital organs including brain. In full term neonates, this transfer of glucose is attained by highly coordinated metabolic and hormonal adaptive changes. Preterm newborns, on the other hand are at increased risk of abnormal glucose homeostasis which makes them more prone to the hypoglycemia as a result of low glycogen and fat storage which may have occurred in 3rd trimester of pregnancy.¹⁶ A study conducted by Zanardo *et al* from Italy has reported hypoglycemia in preterm infants to be 35 %.¹⁷

Owing to the scarcity of local data on this topic particularly in our country we planned to conduct this study in our population of Southern Punjab to generate baseline information. The results of this study will help pediatricians to anticipate hypoglycemia among targeted population which will help them to diagnose this entity early and treat it timely to avoid certain complications in neurological development. This will help us to decrease neonatal morbidities as well as mortality in preterm neonates.

MATERIAL AND METHODS

Consecutive 350 preterm newborns were taken in this study. Sample size is (n = 350), calculated by using Epi – Info software with p = 35 % frequency of Hypoglycemia in preterm neonates and using margin of error d = 5 %.¹⁷Preterm newborns between 24 - 36 weeks of gestational age assessed on LMP of either sex were included in this cross-sectional study. Those with Down's syndrome, congenital heart disease, cystic fibrosis and twin pregnancies were excluded. All the patients were enrolled from Department of Pediatrics, Combined Military Hospital, Multan. Once registered, 1 to 2 ml venous blood sample was taken within 24 of birth and sent to the Pathology Department of Combined Military Hospital, Multan for random blood glucose levels to diagnose hypoglycemia (Random blood sugar less than 40 mg/dl within 24 hours of birth). All relevant information like residential status. maternal literacy, parity and monthly family income was noted.

Data was analyzed by using SPSS Version 22. Mean and SD were calculated for the numerical data like RBS, birth weight and gestational age. Frequencies and percentages have been tabulated for qualitative variables like gender, residential status, mother's education, mother's parity and Hypoglycemia. Effect modifiers like maternal age, gestational age, birth weight, gender and parity were controlled by stratification of data at 0.05 level of significance (95% CI).

RESULTS

Of these 350 study cases, 230 (65.7 %) were male preterm neonates while 120 (34.3 %) were female neonates. Mean gestational age was 32.66 ± 2.97 weeks (ranging from 25 weeks to 36 weeks) and 242 (69.1 %) were aged more than 30 weeks. Mean maternal age was 28.65 \pm 3.52 years and 254 (72.6%) were aged up to 30 years. Mean parity was 2.11 \pm 0.82 and 266 (76%) had parity up to 3. Mean birth weight was noted to be 1702.35 \pm 102.42 grams and 254 (72.6%) had birth weight more than 1500 grams. Mean random blood sugar level was 42.18 ± 7.34 mg/dl and hypoglycemia was noted in 131 (37.4%) cases of our study (table 1 to 3).

TABLE 1: Stratification of Hypoglycemia with regards to parity (n = 350)

	Hypoglycemia		
Parity	Yes (n=131)	No (n=219)	value
Up to 3 (n=266)	84	182	
More than 3 (n=84)	47	037	0.005
Total	350		

TABLE 2: Stratification of hypoglycemia with regards to birth weight (n = 350)

	Hypoglycemia		n
Birth weight	Yes (n=131)	No (n=219)	value
Up to 1500 grams (n=96)	59	037	
More than 1500 grams (n=254)	72	182	0.005
Total	350		

TABLE 3: Stratification of hypoglycemia with regards to gender (n = 350)

	Hypoglycemia		5
Gender	Yes (n=131)	No (n=219)	value
Male (n=230)	72	158	
Female (n=120)	59	061	0.002
Total	35		

DISCUSSION

Hypoglycemia remains one of the commonly encountered pathologies in highly sick neonates and has significant impact on the outcome of neonates particularly among preterm infants as they lack metabolic reserves due to various comorbidities.¹⁸

Gestational age alone remains the strongest factor leading to hypoglycemia in preterm infants especially those weighing less than 1500 gm can lead to sequelae of neurological dysfunction causing seizures, language, vision and speech alterations.²⁰ Of these 350 study cases, 230

(65.7%) were male preterm neonates while 120 (34.3 %) were female neonates. Khan *et al* also reported male gender predominance among preterm neonates with 57 % preterm male neonates, in compliance to our study.¹⁸

Mean gestational age was 32.66 ± 2.97 weeks (ranging from 25 weeks to 36 weeks) and 242 (69.1 %) were having gestational age of more than 30 weeks. Khan *et al* reported 33 ± 2.4 weeks gestational age, close to our study results.²¹

Mean maternal age was 28.65 ± 3.52 years and 254 (72.6%) were aged up to 30 years. Mean parity was 2.11 ± 0.82 and 266 (76%) had parity up to 3 (table 1).

Mean birth weight of our patients was 1702.35 \pm 102.42 grams and 254 (72.6%) had birth weight more than 1500 grams (table 2). A study conducted by Fernandez Martinez *et al* showed association of low birth weight with hypoglycemia but no association was reported with gestational age, mode of delivery and gender of baby, which is not compliant with our study.²⁰ Khan *et al* reported 1.88 \pm 0.5 kg, mean birth weight in preterm neonates close to our results.²¹

Mean random blood sugar level was 42.18 ± 7.34 mg/dl and hypoglycemia was noted in 131 (37.4%) of our study cases (table 3). A study conducted by Zanardo et al has reported hypoglycemia in preterm infants to be 35%.¹⁷ A study conducted by Johanna stark showed 27% incidence of hypoglycemia in neonates identified with risk factors.⁶ A study conducted by Fernandez Martinez et al showed 41.66% hypoglycemic episodes in preterm newborns which is slightly higher than our study.²⁰ Another study conducted in Italy has also reported 32 % hypoglycemia cases which is in compliance with our study results.²² Healthcare professionals must vigilant to screen for low be glucose concentrations and signs of serious hypoglycemia in these high risk babies and make sure that such newborns should not be discharged early without solid monitoring that they can maintain euglycemic state through their routine feed cycles.23

CONCLUSION

Very high frequency of hypoglycemia was noted in

preterm infants in our study. Hypoglycemia was significantly associated with female gender, increasing parity and low birth weight. A proper blood glucose monitoring protocol should be followed during nursing care of preterm babies keeping in view these relevant predisposing factors. However, more studies are required to establish guidelines of blood glucose screening and relevance of risk factors in preterm babies in our set up.

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