ORIGINAL ARTICLE

FREQUENCY AND PATTERN OF HYPOGLYCAEMIA IN LOW BIRTH WEIGHT BABIES DURING FIRST 48 HOURS OF LIFE

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Background: Hypoglycaemia is one of the most frequent metabolic problems in early neonatal period and is associated with an increased risk of morbidity and mortality. This study aims to determine the pattern and frequency of hypoglycaemia in low birth weight (LBW) babies during first 48 hours after birth. **Methods:** This cross-sectional study was conducted at Neonatology Unit, Ayub Teaching Hospital Abbottabad from 1st Feb to 30th Sep 2024. Babies with birth weight <2.5 Kg, preterm and term were included in the study. Blood sugar was checked and a value of <47 mg/dL (2.6 mmol/L) was labelled as hypoglycaemia. **Results:** There were 184 neonates in the study. Sixty-eight (36.9%) had at least one low glucose reading. A large group (55, 80.9%) of patients were asymptomatic compared to 13 (19.1%) symptomatic patients. Hypoglycaemia was more common in females (51, 75%) compared to males (17, 25%) neonates. Hypoglycaemia was seen in 56 (82.4%) preterm and 12 (17.6%) term neonates. Frequency of hypoglycaemia was highest (34, 18.4%) in 1–2 hours after birth followed by 6 hours after birth (17, 9.2%). **Conclusion:** Hypoglycaemia is a common finding in low birth weight babies being asymptomatic in majority, and warrants early glucose monitoring and management for better outcome.

Keywords: Hypoglycaemia, Low birth weight babies, Neonates, Preterm

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INTRODUCTION

Hypoglycaemia is one of the most common conditions faced by low birth weight (LBW) babies in first few hours of life and can be symptomatic or asymptomatic. Different studies use different values of blood glucose to define hypoglycaemia in neonates, some define hypoglycaemia as blood glucose measurement of <2.22 mmol/L (40 mg/dL) within 24 hours and <2.78 mmol/L (50 mg/dL) thereafter.[1] Symptoms of hypoglycaemia in neonates include abnormal cry, pallor jitteriness, tremulous, hypotonia, reluctant to feed, hyper-excitability and tachycardia.[2] It is due to sudden metabolic transition from foetal state to an independent extrauterine state that requires a coordinated and integrated change of hormones and enzymes. Risk of hypoglycaemia is higher in certain groups. The important contributing factors include prematurity, small for gestational age (SGA), large for gestational age (LGA), and maternal diabetes mellitus.[3] Premature or LBW babies do not have mature glycogenolytic and gluconeogenic mechanisms due to which they are more prone to hypoglycaemia.[1]

Maintenance of blood glucose level depends on glycogen stores, maturation of glycogenolytic and gluconeogenic pathways. In the term-babies this dynamic process is self-limiting because they have ability to maintain normal blood glucose even in fasting state by breakdown of endogenous glycogen in the liver and kidney, hepatic synthesis of glucose by gluconeogenesis and production of ketone bodies from fatty acid oxidation as alternative fuel for brain.[4] Low birth weight babies or premature babies may have abnormally low blood glucose because of inability to adapt the above mechanisms of blood glucose level maintenance.[4] Globally the frequency of hypoglycaemia in LBW neonates is reported to be 32.5%.[5] The hypoglycaemia was documented in 131 (37.4%) preterm babies in a study[6] conducted in Multan.

Glucose is an essential nutrient for the brain. Abnormally low blood glucose levels (hypoglycaemia) lead to adverse effects on nervous system and produce long term neurological problems. The level that causes the nervous system effect is variable and different studies consider different levels. Plasma glucose concentrations below 2–6 mmol/L were associated with reductions in Bayley motor and mental development scores at 18 months, even after adjustment for confounding factors known to influence development. The increased incidence of LBW because of increased incidence of prematurity which makes such studies very important for recommendation of causes, prevention and treatment within 48 hours of life to reduce neonatal mortality and morbidity.[3,7,8]

As incidence of low birth weight babies born in developing countries is high and increasing because of various risk factors like poor nutrition and improper antenatal check up and most of the deliveries are at home in unhygienic conditions.[9] This study was designed to gain an insight into the frequency of neonatal hypoglycaemia so that early recognition and timely management strategies are instituted for better outcomes and reduction in risk of neurological sequelae.

MATERIAL AND METHODS

This cross-sectional study was conducted at Neonatology Unit, Ayub Teaching Hospital, Abbottabad from 1st Feb to 30th Sep 2024 after approval from Ethical Committee of the Hospital. WHO sample size calculator was used to calculate the sample size of 184 cases, with a 7% margin of error, 95% confidence level taking the expected incidence of hypoglycaemia as 37.4%.[6] Sampling technique was non-probability consecutive sampling. All term and preterm neonates with birth weight <2.5 Kg who presented in Nursery within first 48 hours of life were included in the study. Low birth weight babies born to diabetic mothers, and those with congenital anomalies were excluded from the study. Low birth weight babies with sepsis and hypoxic ischemic encephalopathy were also excluded from the study.

Demographic data were recorded on a specifically designed proforma. Complete physical examination including the anthropometry was done at the time of enrolment. The gestational age of each newborn was calculated by using obstetric notes and a new Ballard score. Blood was obtained via heel prick and serial monitoring of blood glucose was done at birth, 1–2 hours, 6 hours, 12–24 hours and 24–48 after birth on AccuCheck® glucometer, and value below 47 mg/dL (2.6 mmol/L) was considered hypoglycaemia. Babies who during observation developed poor feeding, jitteriness, irritability, lethargy, tremors, weak cry, apnoea, fits, vomiting, tachypnoea, and sweating were considered to have clinical signs of hypoglycaemia and were put on I/V fluids.

Data were entered and analysed on SPSS-22. For quantitative variables Mean±SD were calculated. Frequencies and percentages were measured for qualitative variables. Independent *t*-test was used for quantitative variables, Chi-square for qualitative variables, and $p \leq 0.05$ was considered significant.

RESULTS

There were 184 LBW babies in our study, 118 (64.1%) were preterm and 66 (35.9%) were term babies. A total of 83 (45.11%) patients were male and 101 (54.9%) were female. Sixty-eight (36.9%) patients were hypoglycaemic. Among the 68 hypoglycaemic LBW babies, 55 (80.9%) babies were asymptomatic and 13 (19.1%) were symptomatic. Hypoglycaemia was found in 82.4% of preterm and 17.6% of term neonates. Out of 68, hypoglycaemia was present in 10 neonates weighing <1 Kg, 22 neonates weighed 1–1.5 Kg, and 36 neonates weighed between 1.5 to <2.5 Kg. Hypoglycaemia was noted in 17 (25%) male neonates and 51 (75%) female neonates. The mean birth weight and gestational age was 1.74±0.25 Kg and 35.83±4.67 weeks respectively. (Table-1).

The mean blood glucose levels in study population were 3.12±0.41 mmol/L at birth (cord), 2.75±0.59 mmol/L at 1–2 hours, 2.81±0.45 mmol/L at 6 hours, 2.95±0.23 mmol/L at 12–24 hours and 3.13±0.53 mmol/L at 24–48 hours after birth. (Table-2).

There were statistically significant differences in blood glucose levels of LBW babies with variation of birth weight at 1–2 hours (p=0.03) and 6 hours (p=0.04) (Table-3).

Out of 68 infants, 8 cases had hypoglycaemia at birth (3 had blood glucose <1.94 mmol/L and 5 had blood glucose between 1.94–<2.6 mmol/L), 34 cases had hypoglycaemia at 1–2 hours (14 had blood glucose <1.94 mmol/L and 20 had blood glucose between 1.94–<2.6 mmol/L), 17 cases had hypoglycaemia at 6 hours (7 had blood glucose <1.94 mmol/L and 10 had blood glucose between 1.94–<2.6 mmol/L), 6 cases had hypoglycaemia at 12–24 hours (2 had blood glucose <1.94 mmol/L and 4 had blood glucose between 1.94–<2.6 mmol/L), and 4 cases had hypoglycaemia at 24–48 hours (1 had blood glucose <1.94 mmol/L and 3 had blood glucose between 1.94–<2.6 mmol/L). (Table-4).

Table-1: Patients' characteristics

Variables		Frequency	Percentage
Gender of total babies	Male	83	45.1
	Female	101	54.9
Presence of hypoglycaemia	Yes	68	36.9
	No	116	63.0
Type of hypoglycaemia (n=68)	Asymptomatic	55	80.9
	Symptomatic	13	19.1
Gestation of hypoglycaemic babies	Preterm	56	82.4
	Term (SGA)	12	17.6
Gender of hypoglycaemic babies	Male	17	25.00
	Female	51	75.00
Birth weight of hypoglycaemic babies	Up to 1 Kg	10	14.7
	>1–1.5 Kg	22	32.4
	>1.5–<2.5 Kg	36	52.9

Table-2: Blood glucose levels in study population at different sampling time (Mean±SD)

Age in hours	Blood glucose level (mmol/L)
At birth	3.12±0.41
1–2 hours	2.75±0.59
6 hours	2.81±0.45
12–24 hours	2. 95±0.23
24–48 hours	3.13±0.52

Table-3: Blood glucose (mmol/L) distribution according to birth weight (Mean±SD)

Sampling Time	Birth weight (Kg)		*p*
	<1.5	>1.5–<2.5	
At birth	4.07±0.21	3.83±0.28	0.42
1–2 hours	2.14±0.36	2.32±0.31	0.03*
6 hours	2.48±0.42	3.08±0.57	0.04*
12–24 hours	2.88±0.53	3.24±0.40	0.08
24–48 hours	3.38±0.41	3.93±0.63	0.14

Table-4: Frequency of hypoglycaemia at different sampling times [n (%)]

Sampling time	Blood glucose (mmol/L)		
	<1.94	1.94–<2.6	≥2.6
At birth	3 (1.6)	5 (2.7)	176 (95.6)
1–2 hours	14 (7.6)	20 (10.8)	150 (81.5)
6 hours	7 (3.8)	10 (5.4)	167 (90.7)
12–24 hours	2 (1.1)	4 (2.2)	178 (96.7)
24–48 hours	1 (0.5)	3 (1.6)	180 (97.8)

DISCUSSION

Neonates mount adaptive responses including mobilization of glucose and fatty acids from glycogen and triglyceride depots to meet the energy demands because nutrient supply from mother are discontinued after birth. These responses occur smoothly in term neonates but preterm and small for gestational age neonates tend to have low blood glucose because of low glycogen and fat levels, relatively high blood insulin levels and the fledgling gluconeogenic pathway, so they fail to mount an appropriate and adequate counter regulatory metabolic and endocrine response.[4,10] About one third of the patients in our study were hypoglycaemic. These finding are consistent with Hayat *et al*[6] who used cut-off value for hypoglycaemia as 2.22 mmol/L (40 mg/dL) in contrast to ours 2.6 mmol/L (47 mg/dL). In another study, 71.4% were found to be hypoglycaemic.[3] Khairuzzaman *et al*[4] reported 31.8% while George *et al*[5] reported 32.5%. Wang LY *et al*[11], reported 19.4% and Hosagasi NH *et al*[12], reported 17.8%. This variability of hypoglycaemia frequency may well be due to different definitions of hypoglycaemia, definitions used for classification of LBW babies, different policies of feeding and different degrees of neonatal sickness and the timing of testing of blood sugar levels done in these studies. Female were more affected than male in our study although the difference was not statistically significant. Similar results have been reported from Taiwan[13] (79 females *vs* 69 males).

The risk of hypoglycaemia is increased in premature, small for gestational age newborns. In our study, hypoglycaemia was more common in preterm compared to term babies. Zhou W *et al*[14] also reported more preterm babies as hypoglycaemic than term babies (55.6% *vs* 14.9%). Among the hypoglycaemic LBW babies, majority of babies was asymptomatic which is consistent with Khairuzzaman *et al*[4].

The mean blood glucose levels were significantly lower at 1–2 hours after birth and gradually increased to reach normal levels with increasing age. These finding are consistent with the findings of Yunarto *et al*[15]. Similar results were reported by Siddique *et al*[16], where hypoglycaemia was predominantly documented in first 24 hours and more commonly found in small for gestational age babies with no statistically significant differences.

CONCLUSION

Hypoglycaemia is well known complication of low birth weight babies and is asymptomatic in large majority. It warrants early glucose monitoring and use of pre-emptive measures for better outcome.

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