# PATTERN OF ELECTROLYTE ABNORMALITIES IN PRETERM LOW BIRTH WEIGHT NEONATES

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**Abstract:**

*Prematurity and low birth weight contributes to 27.8% of neonatal deaths in rural areas of Bangladesh. Fluid, electrolyte and metabolic abnormalities are the commonest derangements encountered in preterm infants due to their renal immaturity and relatively immature skin. Premature infant are at increased risk of developing dehydration or overhydration[4]. Therefore, high index of suspicion, prompt recognition and thorough understanding of common electrolyte abnormalities are necessary to improve neonatal outcome. Appropriate fluid and electrolyte management is essential for better neonatal outcome.*

**Objectives***: To identify the serum electrolytes abnormalities in preterm low birth weight neonates.*

**Methodology:** *It was a cross- sectional study and carried out in the Department of Neonatology, Dhaka Medical College Hospital, Dhaka between January 2017 to August 2017. Information was collected who gave consent and participated in the study willingly. The sample size was 50. Patients admitted in the above mentioned hospital and after meeting the inclusion and exclusion criteria a simple random sampling technique was applied for selecting the study subjects.*

**Results:** *Fifty preterm LBW neonates fulfilling the inclusion criteria were studied during this study period. Abnormal electrolytes were documented in 20(40%) out of 50 preterm LBW neonates and electrolyte status was normal in 30(60.0%) cases. Of 20 neonates who had abnormal electrolytes, hyperkalemia was the predominant electrolyte abnormality found in 8(16.0%) neonates, hyponatremia was found in 7(14.0%), hypokalemia in 3(6.0%) and hypernatremia 2(4.0%).*

**Conclusion***: Electrolyte abnormalities are common in preterm LBW neonates. So, identification of electrolyte abnormalities and proper management of fluid and electrolytes and close monitoring are important.*

## Introduction

Being born prematurely is a threat to survival and the subsequent quality of life. It is encouraging that many adults who were born very preterm function well in later life[1] but a significant proportion develop disabilities and impairments[1]. Preterm is defined as gestational age less than 37 completed weeks at birth and low birth weight (LBW), as weight less than 2,500 gram[2]. According to Bangladesh demographic and health survey 2014 Under five mortality rate is 46, infant mortality is 38 and neonatal mortality rate is 28[3]. Despite decline in mortality in children in this age group in the last few decades. Neonatal mortality rate has not changed substantially. Health and Science Bulletin of ICDDR,B published in March 2006 reported that prematurity and low birth weight contributes to 27.8% of neonatal deaths in rural areas of Bangladesh[4]. In Bangladesh, preterm delivery is a common condition demanding hospital admission. Hospital admissions represent an underestimate of the true community incidence of prematurity. In a study conducted at Dhaka Shishu Hospital ICU from July 2001 through December 2003 showed that out of 92 preterm low birth weight infants admitted in ICU, 53 have some form of electrolytes abnormalities [5].

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Fluid, electrolyte and metabolic abnormalities are the commonest derangements encountered in preterm infants due to their renal immaturity and relatively immature skin. They are at increased risk of developing dehydration or overhydration[6]. Clinical parameters such as altered skin turgor, dry mucous membrane, depressed anterior fontanelle are not sensitive indicators of dehydration in premature infants[7]. Premature infants require excess fluid to compensate for their larger insensible water losses and to avoid hypernatremia, hyperkalemia, hypovolumia, and hypotension. Inadequate hydration leads to hyperosmolarity and may be a risk factor for intraventricular hemorrhage.

A loss of >20% birth weight during first week of life is extreme and suggests uncompensated insensible water loss. If weight loss is <2% per day for the 4-5 days, fluid administration is probably excessive [7].

Therefore, high index of suspicion, prompt recognition and thorough understanding of common electrolyte abnormalities are necessary to improve neonatal outcome. The investigation of renal function in preterm neonate is complicated because of continuing renal development, rise in creatinine is transient and may not be clinically significant[8].

A few studies have been conducted on assessment of electrolytes abnormalities in the context of permaturity in Bangladesh. But it seems to be essential for immediate management for planning appropriate fluid and electrolyte therapy and thereby for improved outcome. With this objective, the present study has been conducted to find out the electrolytes abnormalities of the preterm low birth weight neonates.

**Study Procedure: :** It was a cross- sectional study and carried out in the Department of Neonatology, Dhaka Medical College Hospital, Dhaka between January 2017 to August 2017. Information was collected who gave consent and participated in the study willingly. The sample size was 50. Patients admitted in the hospital and Gestational age <37 completed weeks, Birth weight <2500 grams with no gross congenital abnormalities are included this study. Simple random sampling technique was applied for selecting the sample patients. Normal serum sodium level is (133-146 mmol/l). Hypernatremia is defined as serum sodium level greater than 146 mmol/l. Hyponatremia is defined as serum sodium level less than 133 mmol/l. Normal serum potassium level is (3.60-6.7 mmol/l). Hyperkalemia is defined as serum potasium level greater than 6.7 mmol/l. Hypokalemia is defined as serum potassium level less than 3.6 mmol/l[5,6]. All collected questionnaire was checked very carefully to identify the error in the data. Data processing work was consist of registration schedules, editing computerization, preparation of dummy table, analyzing and matching of data.

## Results

Fifty preterm LBW neonates fulfilling the inclusion criteria were studied during this study period. Sex distribution of preterm LBW neonates were 25(50%) male and 25(50%) female babies and male female ratio was 1:1. There were 26 (52.0%) LBW and 24(48.0%) VLBW babies (Table I), 30(60%) babies had gestational age 28-33 weeks and 20(48%) had gestational age 34-36 weeks (Table II) and 36(72.0%) were AGA and 14(28.0%) babies were SGA with AGA: SGA was 18:7 (Table III).

**Table-1**

*Distribution of preterm babies by birth weight*

| Birth weight | Frequency | Percent |
|---|---|---|
| LBW | 26 | 52.0% |
| VLBW | 24 | 48.0% |
| Total | 50 | 100.0 |

Table shows distribution of preterm LBW babies by birthweight. There were 26(52.0%) LBW and 24(48.0%) VLBW babies

**Table-II**

*Distribution of preterm LBW babies according to gestational age.*

| Gestational age (weeks) | Frequency | Percent |
|---|---|---|
| 28-33 weeks | 30 | 60.0 |
| 34-36 weeks | 20 | 40.0 |
| Total | 50 | 100.0 |

Table II shows distribution of preterm LBW babies according to gestational age. 30 (60.0%) babies had gestational age 28-33 weeks and 20 (40.0%) had gestational age 34-36 weeks.

**Table III**

*Distribution of preterm newborns by intrauterine growth and gestational age*

| Classification | No of babies | Percent (%) |
| --- | --- | --- |
| AGA | 36 | 72.0 |
| SGA | 14 | 28.0 |
| Total | 50 | 100.0 |

Table III shows distribution of preterm newborns by intrauterine growth and gestational age. 36 (72.0%) babies were AGA and 14(28.0%) babies were SGA.

**Table -IV**

*Type of electrolyte abnormalities*

| Electrolytes abnormalities | Frequency | Percent |
| --- | --- | --- |
| Normal | 30 | 60.0 |
| Hyperkalemia | 8 | 16.0 |
| Hyponatremia | 7 | 14.0 |
| Hypokalemia | 3 | 6.0 |
| Hypernatermia | 2 | 4.0 |
| Total | 50 | 100.0 |

Abnormal electrolytes were documented in 20(40%) out of 50 preterm LBW neonates and electrolyte status was normal in 30(60.0%) cases. Of 20 neonates who had abnormal electrolytes, hyperkalemia was the predominant electrolyte abnormality found in 8(16.0%) neonates, hyponatremia was found in 7(14.0%), hypokalemia in 3(6.0%) and hypernatremia 2(4.0%). None of them had mixed electrolyte abnormalities (Table 8).
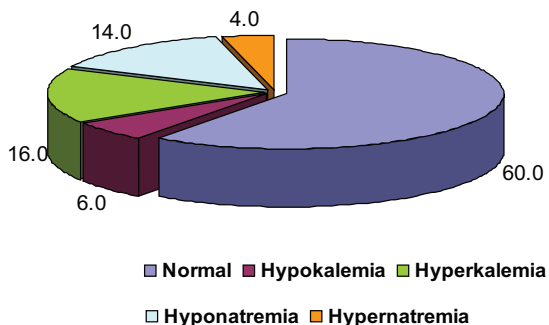


**Fig.-1:** *Type of electrolyte abnormalities*

**Table- V**

*Serum Sodium Level Analysis*

| Serum Sodium Level | Frequency |
| --- | --- |
| Normal(133-146mmol/l) | 41 |
| Hyponatremia (<133mmol/l) | 7 |
| Hypernatremia (>146mmol/l) | 2 |
| Mean ± SD | 37.98±5.3 |

Table shows serum sodium level analysis. Sodium level was normal in 41(82%), abnormal in 9(18.0%), hyponatremia was found in 7(14.0%) and hypernatremia was found in 2(4.0%). Mean sodium level was 137.98±5.3 mmol/l, range was 130-156 mmol/l.

**Table -VI**

*Serum Potassium Level Analysis*

| Serum Potassium Level | Frequency |
| --- | --- |
| Normal (3.60-6.7mmol/L) | 39 |
| Hyperkalemia (> 6.7.0mmol/L) | 8 |
| Hypokalemia (< 3.60 mmol/L) | 3 |
| Mean ± SD | 5.27±1.13 |

Table shows mean potassium level was 5.27±1.13 mmol/l, range was 3.60-7.00 mmol/l. Serum potassium. level was normal in 39(78.0%), abnormal in 11(22.0%), hyperkalemia was found in 8(16.0%) and hypokalemiamia was found in 3(6.0%)

**Discussion**

This study found that 20 (40%) of preterm LBW babies have electrolyte abnormalities. Hyperkalemia 8 (16%) was the commonest abnormality detected. Hyponatremia 7 (14%), hypokalemia 3 (6%) and hypernatremia 2 (4%) were found. Hyperkalemia was found in 8(16.0%) babies in this study. This findings are in contrast to those by Yuan et al[9] who found hyperkalemia in 44% of sick premature neonates. One fact relevant to this difference in findings might be that the present study included healthy preterm babies, Hossain MM et al have found hyperkalemia in 58.5% (31) neonates out of 53 preterm LBW admitted in ICU. The difference revealed in the study may be due to most of our babies are healthy and

mean gestational age 33 weeks at which age nephronogenesis is almost complete although maturation is still going on. Another important finding is that most of the studies were conducted ICU patients, who are by definition their prematurity is not in a stable condition.

In this study hyponatremia was found in 7(14.0%) babies, gestational age was between 30-32 weeks. Al-Dahhan et al[11] found negative sodium balance in 100% of neonates <30 weeks gestation, in 70% of neonates at 30-32 weeks, in 46% at 33-35 weeks and 0% greater than 36 weeks.

Hypokalemia was found in 3(6.0%) neonate with no significant abnormalities, who have gestational age $\geq$ 34 weeks. In a search for the causes of hypokalemia, we found the baby could not be put to the mothers breast frequently for suckling due to maternal illness and primiparity. Inadequate feeding in early days of life may cause hypokalemia[12] which is within tolerable limits and this might be the possible explanation of hypokalemia in this healthy preterm baby. Hypernatremia was found in 2(4.0%) neonates in this study. Hossain MM et al[5] have found hypernatremia in 37.5% (31) neonates out of 53 preterm LBW admitted in ICU. It may be due to excessive insensible water loss and it was responded to fluid challenge and measures taken to reduce insensible water loss.

So, from above findings it is evident that prematurity causes transient renal impairment, in preterm neonates which is inversely related to gestational age.

## Conclusion
Electrolyte abnormalities are common in preterm LBW neonates. So identification of electrolyte abnormalities and proper management of fluid and electrolytes and close monitoring are important.

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