



**ORIGINAL RESEARCH PAPER**

**Paediatrics**

**PATTERN OF ELECTROLYTE ABNORMALITIES IN PRETERM LOW BIRTH WEIGHT NEONATES ADMITTED IN NICU JMC, JHALAWAR**

**KEY WORDS:** Preterm, Low birth weight(LBW), Hyponatremia, Hypernatremia, Hyperkalemia, Hypokalemia

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**ABSTRACT**

In India, prematurity and low birth weight are responsible for 35.9% of neonatal deaths. Preterm infants often experience fluid, electrolyte, and metabolic imbalances due to their underdeveloped renal and skin functions. These infants are also more prone to dehydration or overhydration. Thus, it is crucial to have a strong awareness and understanding of the common electrolyte abnormalities to improve neonatal outcomes. Adequate management of fluids and electrolytes is necessary to ensure better outcomes for premature infants. Overall, early identification and treatment of these issues can help reduce the mortality rate among neonates in India. **Objectives:** Detecting abnormal serum electrolytes in preterm low birth weight babies is the aim of the study. **Methodology:** This study was conducted in the Department of Pediatrics at Jhalawar Medical College, Rajasthan, from October 2022 to February 2023. The research followed a cross-sectional design and included 100 patients admitted to the NICU who met the study's inclusion and exclusion criteria. Study subjects were selected through a simple random sampling technique, and information was collected from participants who provided consent and willingly participated in the study. **Results:** 100 preterm LBW neonates fulfilling the inclusion criteria were studied during this study period. Abnormal electrolytes were documented in 36(36%) out of 100 preterm LBW neonates and electrolyte status was normal in 64(64.0%) cases. Of 36 neonates who had abnormal electrolytes, hyperkalemia was the predominant electrolyte abnormality found in 16(16.0%) neonates, hyponatremia was found in 11(11.0%), hypokalemia in 5(5.0%) and hypernatremia 4(4.0%). **Conclusion:** Early identification, proper management, and close monitoring of electrolyte imbalances are crucial in preterm LBW neonates due to their high prevalence.

**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<sup>1</sup> but a significant proportion develop disabilities and impairments<sup>1</sup>. 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<sup>2</sup>. According to SRS health survey 2020 Under five mortality rate is 32, infant mortality is 28 and neonatal mortality rate is 20<sup>3</sup>. Despite decline in mortality in children in this age group in the last few decades. Neonatal mortality rate has not changed substantially. Sample Registration System (SRS) Statistical Report (2010-13) identify causes of infant mortality in India due to Prematurity & low birth weight is 35.9%<sup>4</sup>. Preterm delivery frequently requires hospitalization. Hospital admissions represent an underestimate of the true community incidence of prematurity. In a study by Chowdhury et al out of 92 preterm low birth weight infants admitted in ICU, 53 have some form of electrolytes abnormalities<sup>5</sup>.

Preterm infants commonly experience fluid, electrolyte, and metabolic imbalances due to their underdeveloped kidneys and skin. This puts them at greater risk for dehydration or overhydration<sup>6</sup>. Clinical indicators like depressed anterior fontanelle, altered skin turgor, and dry mucous membranes may not accurately detect dehydration in premature infants<sup>7</sup>. These infants need extra fluids to account for their higher insensible water losses and prevent complications such as hypernatremia, hyperkalemia, hypovolemia, and hypotension. Poor hydration can result in hyperosmolarity, which may increase the risk of intraventricular hemorrhage.

A >20% decrease in birth weight within the first week indicates severe uncompensated water loss. If weight loss is <2% per day for 4-5 days, excessive fluid intake may be the cause.<sup>7</sup>.

Early detection and knowledge of common electrolyte imbalances is crucial to improve outcomes in neonates. Renal function assessment in preterm infants can be challenging due to ongoing development and transient elevations in creatinine that may not have clinical significance.<sup>8</sup>.

Limited studies have examined electrolyte imbalances in premature infants in India. Prompt identification of such imbalances is crucial for proper fluid and electrolyte treatment and better outcomes. This study aims to investigate electrolyte imbalances in preterm, low birth weight neonates.

**Case Study**

This study was conducted at the Department of Pediatrics, Jhalawar Medical College, Rajasthan from October 2022 to February 2023. A total of 100 participants were included in the sample through simple random sampling. Patients admitted to the hospital with gestational age <37 completed weeks, birth weight <2500 grams, and no gross congenital abnormalities were eligible for the study. All participants provided consent and participated willingly. The study focused on the levels of serum sodium and potassium in the participants. A normal serum sodium level is between 135-145 mEq/l.

Hypernatremia is when the serum sodium level exceeds 145 mEq/l, while hyponatremia is when it falls below 135 mEq/l. Similarly, a normal serum potassium level is between 3.5-5.5mEq/l. Hyperkalemia is defined as a serum potassium level greater than 5.5 mEq/l, while hypokalemia is when the level falls below 3.5 meq/l. The collected data was carefully checked for errors before processing. Data processing involved registering schedules, editing, computerization, preparing dummy tables, analyzing, and matching the data.

**RESULTS**

100 preterm LBW neonates fulfilling the inclusion criteria

were studied during this study period. Sex distribution of preterm LBW neonates were 55(55%) male and 45(45%) female babies and male female ratio was 11:9. There were 54(54.0%) LBW and 46(46.0%) VLBW babies (Table I), 65(65%) babies had gestational age 28-33 weeks and 35(35%) had gestational age 34-36 weeks (Table II) and 70(70%) were AGA and 30(30%) babies were SGA with AGA: SGA was 7:3 (Table III).

**Table-1 Distribution of preterm babies by birth weight**

Birth weight	Frequency	Percent
LBW	54	54.0%
VLBW	46	46.0%
Total	100	100.0

Table shows distribution of preterm LBW babies by birthweight. There were 45(54.0%) LBW and 46(46.0%) VLBW babies.

**Table-II Distribution of preterm LBW babies according to gestational age.**

Gestational age (weeks)	Frequency	Percent
28-33 weeks	65	65.0%
34-36 weeks	35	35.0%
Total	100	100.0

Table II shows distribution of preterm LBW babies according to gestational age. 65 (65%) babies had gestational age 28-33 weeks and 35 (35%) had gestational age 34-36 weeks.

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

Classification	No of babies	Percent (%)
AGA	70	70.0%
SGA	30	30.0%
Total	100	100.0

Table III shows distribution of preterm newborns by intrauterine growth and gestational age. 70(70.0%) babies were AGA and 30(30.0%) babies were SGA.

**Table -IV Type of electrolyte abnormalities**

Electrolytes abnormalities	Frequency	Percent
Normal	64	64.0
Hyperkalemia	16	16.0
Hyponatremia	11	11.0
Hypokalemia	5	5.0
Hypernatremia	4	4.0
Total	100	100.0

Abnormal electrolytes were documented in 36(36%) out of 100 preterm LBW neonates and electrolyte status was normal in 64(64.0%) cases. Of 36 neonates who had abnormal electrolytes, hyperkalemia was the predominant electrolyte abnormality found in 16(16.0%) neonates, hyponatremia was found in 11(11.0%), hypokalemia in 5(5.0%) and hypernatremia 4(4.0%). None of them had mixed electrolyte abnormalities.

PERCENTAGE



- Hyperkalemia
- Hyponatremia
- Hypokalemia
- Hypernatremia

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

**Table-V Serum Sodium Level Analysis**

Serum Sodium Level	Frequency
Normal(135-145mEq/l)	82
Hyponatremia (<135mEq/l)	14
Hypernatremia (>145mEq/l)	4
Mean ± SD	138.08±5.7

Table shows serum sodium level analysis. Sodium level was normal in 82(82%), abnormal in 18(18.0%), hyponatremia was found in 14(14.0%) and hypernatremia was found in 4(4.0%). Mean sodium level was 138.08±5.7 mEq/l, range was 128-158 mEq/l.

**Table -VI Serum Potassium Level Analysis**

Serum Potassium Level	Frequency
Normal (3.5-5.5mEq/L)	79
Hyperkalemia (> 5.5mEq/L)	16
Hypokalemia (< 3.5mEq/L)	5
Mean ± SD	5.18±1.15

Table shows mean potassium level was 5.18±1.15 mEq/l, range was 3.3-7 mEq/l. Serum potassium level was normal in 79(79.0%), abnormal in 11(22.0%), hyperkalemia was found in 16(16.0%) and hypokalemia was found in 5(5.0%)

**DISCUSSION**

This study found that 36 (36%) of preterm LBW babies have electrolyte abnormalities. Hyperkalemia 16 (16%) was the commonest abnormality detected. Hyponatremia 11 (11%), hypokalemia 5 (5%) and hypernatremia 4 (4%) were found. Hyperkalemia was found in 16(16.0%) babies in this study. This findings are in contrast to those by Yuan et al<sup>9</sup> 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 nephrogenesis 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 11(11.0%) babies, gestational age was between 30-32 weeks. Al-Dahhan et al<sup>11</sup> 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 5(5.0%) neonate with no significant abnormalities, who have gestational age 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<sup>12</sup> which is within tolerable limits and this might be the possible explanation of hypokalemia in this healthy preterm baby. Hypernatremia was found in 4(4.0%) neonates in this study. Hossain MM et al<sup>5</sup> 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.

Premature birth leads to temporary kidney dysfunction in preterm babies, and the severity of impairment decreases with increasing gestational age, as per the aforementioned research.

**CONCLUSIONS**

Early identification, proper management, and close monitoring of electrolyte imbalances are crucial in preterm LBW neonates due to their high prevalence.

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