

A New Marker of Morbidity in Critically Sick Children: Serum Electrolyte Level - A Cross Sectional Study at Tertiary Care Center

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ABSTRACT

Objectives: To find out the association between dyselectrolytemia and morbidity in critically ill children and also to assess the association between degree of hyponatremia and morbidity.

Materials and Methods: Children aged 1 month – 12 yrs, admitted in Pediatric Intensive Care Unit (PICU) at department of pediatrics S. P. Medical College Bikaner were included in the study. This was a hospital based, observational, cross sectional study. Morbidity was defined as PICU stay > 5 days.

Results: Total 200 children aged 1 mo-12 yrs were included in the study. Abnormal serum sodium level and abnormal serum potassium levels were significantly associated with increased hospital stay (p value 0.000). Association between degree of hyponatremia and hospital stay was also significant. (p value 0.003).

Conclusion: Electrolyte abnormalities are common in critically ill children and contribute to significant morbidity.

Keywords: Electrolytes, Hyponatremia, PICU.

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INTRODUCTION

Electrolytes play a vital role in maintaining the homeostasis within the body. They help to maintain the myocardial and neurological function, fluid balance, oxygen delivery and acid base balance.^{1,2} Electrolyte disturbances are one of the medical complications leading to death in children with underlying medical illness unless it is handled urgently and appropriately. It must be emphasized that many electrolyte disturbances in critically sick patients can be prevented by close attention to the prescription of intravenous fluids and nutrition. Prevention of electrolyte disturbances is preferable to treatment.³⁻⁵

Hence we planned a study to find out the association between dyselectrolytemia and morbidity in critically ill children and also to evaluate the association between degree of hyponatremia and morbidity.

MATERIALS AND METHODS

The study was conducted at Department of Pediatrics and Department of Medicine, S. P. Medical College Bikaner. The duration of the study was one year from March 2017 to February 2018. Children \geq 1 month to \leq 12 years who were admitted in Pediatric Intensive Care Unit (PICU) were included in the study. Children on ventilator support, those with any major congenital malformation and those whose parents did not give consent were excluded from the study.

This was a hospital based, observational, cross sectional study. After taking informed consent, the children admitted in PICU were randomly selected and included in the study. A total of 200 children were included in the study. (Figure 1)

In our study hyponatremia was defined as serum sodium level < 135 meq/L and hypernatremia as serum sodium level > 150 meq/L.

Hypokalemia was defined as serum potassium level < 3.5 meq/L and hyperkalemia as serum potassium level > 5.5 meq/L. Serum sodium level of 131 to < 135 meq/L was taken as mild hyponatremia, 125 to < 131 meq/L as moderate hyponatremia and < 125 meq/L as severe hyponatremia. Morbidity was defined as PICU stay > 5 days.

Chi square test was used to test the significance of difference in morbidity in patients with normal and abnormal electrolyte levels.

RESULTS

The total number of children included in the study was 200 (Figure 1). Hundred and six were male (53%) and 94 were female (47%). Ninety six of the children were between the ages \geq 1 month to < 1 year (48%), 74 were between the ages \geq 1 year to < 4 years (37%), 24 of the children were between the ages \geq 4 years to < 8 years (12%) and the rest belonged to the age group \geq 8 years to \leq 12 years (3%).

Out of the study subjects 76 were admitted with respiratory illnesses (38%), 59 due to infectious causes (29.5%), 11 with central nervous system causes (5.5%), 7 with metabolic diseases (3.5%), 2 with renal diseases (1%) and the rest were admitted due to mixed causes (22.5%).

Fifty four of the children had hyponatremia (27%), 11 had hypernatremia (5.5%), 18 had hypokalemia (9%) and 34 children had hyperkalemia (17%). None of the study subjects had mixed electrolyte abnormalities. Among the patients with severe hyperkalemia (serum potassium level > 6.5 meq/L) 5 patients had abnormal ECG. Among the patients with hyponatremia 11

suffered from Syndrome of Inappropriate Anti Diuretic Hormone secretion (SIADH).

Abnormal serum potassium level is significantly related to hospital stay with p value of 0.000 (Table 2). Similarly abnormal serum sodium level also has significant relationship with hospital stay (p value 0.000). (Table 1)

Among the patients with hyponatremia, 28 had mild hyponatremia (51.9%), 17 had moderate hyponatremia (31.5%) and 9 suffered from severe hyponatremia (16.6%).

P value of 0.003 signifies statistically significant association between degree of hyponatremia and hospital stay.(Table 3)

Figure 1: Showing the flow of patients

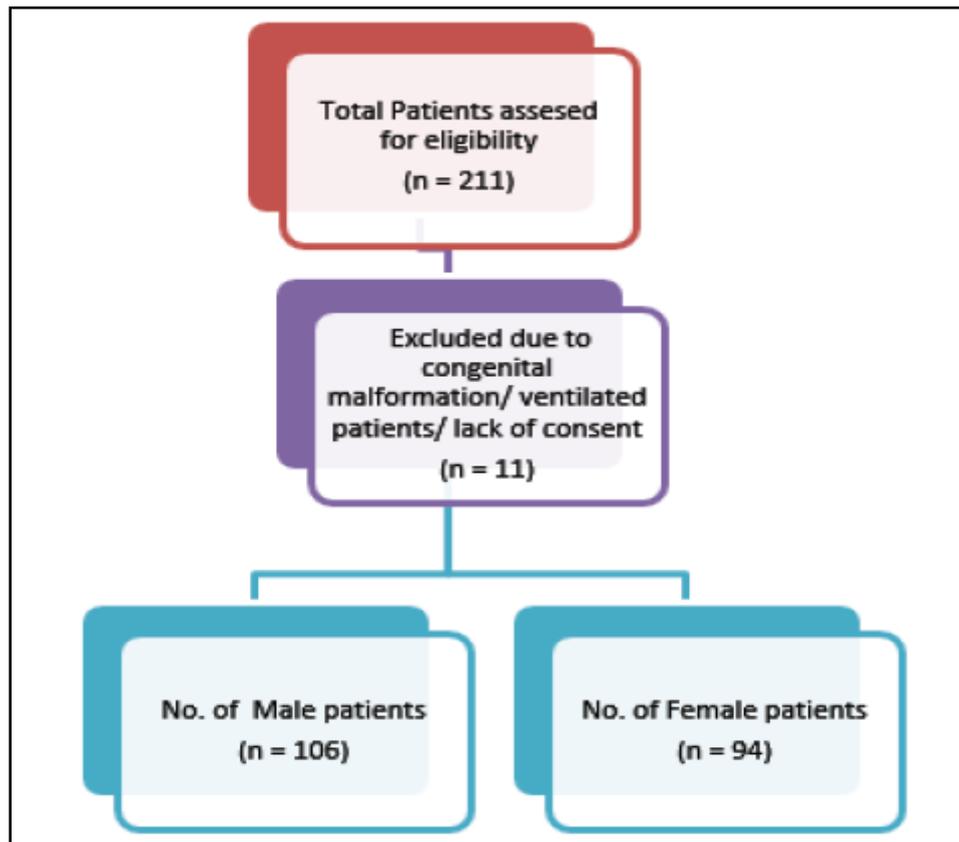


Table 1: Showing relationship between serum sodium level and hospital stay

	Hospital Stay (PICU)		Total	P Value
	≤5 days	>5 days		
Serum Sodium level				0.000
Hyponatremia	22	32	54	
Hypernatremia	1	10	11	
Normonatremia	89	46	135	
Total	112	88	200	

Table 2: Showing relationship between serum potassium level and hospital stay

		Hospital Stay (PICU)		Total	P Value
		≤5 days	>5 days		
Serum Potassium level	Hypo	6	12	18	0.000
	Hyper	5	29	34	
	Normo	101	47	148	
		112	88	200	

Table 3: Showing relationship between degree of hyponatremia and hospital stay

	Hospital stay (PICU)		Total	P Value
	≤5 days	≥5 days		
Degree of hyponatremia –				0.003
Mild (130-134)	<u>14</u>	<u>4</u>	18	
Moderate (125-129)	<u>5</u>	<u>6</u>	11	
Severe (<125)	<u>0</u>	<u>6</u>	6	
Total	<u>19</u>	<u>16</u>	35	

DISCUSSION

In our study there was male predominance (53%). Majority of the study subjects were infants (48%) and the cause of admission in PICU in the majority was due to respiratory illnesses (38%). A study conducted by Neha Agarwal et al also had male predominance but majority were in the age group 1 to 6 years and the maximum number of patients had central nervous system pathology.⁶ In our study morbidity was defined as PICU stay > 5 days similar to a study by Bindu et al.⁷ 58.5% of the study subjects had electrolyte abnormalities in our study. The incidence is higher compared to a study by Girma Elala et al where it is 45.1%.⁸ The incidence of hyponatremia according to our study was 27%. The finding is similar to a study by Sunit Singhi et al who reported 29.8% incidence of hyponatremia.⁹ Hyponatremia was present in 5.5% of the patients as per our study. The incidence of hyponatremia was 4.9% according to a study by S.D. Subba Rao et al. Hyperkalemia was present in 17% of the children in our study which is comparable to 18.18% in a study by Mayank Jain et al.¹⁰ The incidence of hypokalemia in our study (9%) is higher than that reported in a study by S.D. Subba Rao et al (3.6%) but less than that found in a study by Dr. C. Rukesh Chary et al (11.27%).¹¹

Prolonged duration of stay in case of electrolyte abnormalities was shown in a study by Neha Agarwal et al and Girma Elala et al.

Similarly the mean duration of stay was significantly higher than patients who had normal electrolyte levels in a study by Dr. C. Rukesh Chary et al.¹¹ Singhi S et al in their prospective study of 727 sick children found that the mean duration of hospital stay (7.7 +_ 0.4 days) among 217 children with serum sodium < 130 meq/L was about 30% longer than that of 510 children with serum sodium > 131 meq/L (5.9 +_ 0.3 days).⁹ These results are similar to the results of our study.

LIMITATIONS

The main limitation of our study was that it did not define the various factors which could have contributed to the higher morbidity. Further studies need to be done to find out the correlation between electrolyte abnormalities and the morbidity.

CONCLUSION

The present study showed that electrolyte abnormalities are common in critically ill children and contribute to significant morbidity. Therefore timely recognition through regular monitoring and appropriate correction of electrolyte abnormalities will help in improving the outcome besides the usual management of the primary disease.

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