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A STUDY OF HYPONATREMIA IN CRITICALLY ILL CHILDREN IN PAEDIATRIC INTENSIVE CARE UNIT

Paediatric Medicine

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ABSTRACT

Background: Hyponatremia is the most common electrolyte disturbance in critically ill children. Although hyponatremia in hospitalized children is associated with adverse outcomes, the risk can be reduced by early diagnosis and intervention. **Objective:** This study was done to determine the frequency of hyponatremia among children admitted in pediatric intensive care unit (PICU). **Methods:** Demographic data, detailed history, systemic examinations, and routine blood and urine investigations were conducted if required for 700 critically ill children aged 1 month to more than 10 years admitted in the PICU. Serum sodium level was classified into the three grades of severity: Mild (130–134 mEq/L), moderate (125–129 mEq/L), and severe (<125 mEq/L). **Results:** The overall prevalence of hyponatremia was 35.1%. Hyponatremia (130.21) patients have significant lower sodium value than Normonatremia (138.92) and Hypernatremia (150.48). Mortality was significantly lower among the hyponatremic children (3.7%) as compared to hypernatremia (9.1%) and normonatremia (4.6%) **Conclusion:** Hyponatremia during admission increased the risk of mortality by 3.7 times. Low serum sodium levels at admission also predicted an increased dependency on ionotropic support and mechanical ventilation with dismal patient outcome in terms of survival.

KEYWORDS

PICU, hyponatremia

INTRODUCTION

Hospital-acquired hyponatremia is one of the most common electrolyte disorders occurring in approximately 29.7% of the critically ill children[1]. Hyponatremia, a very common electrolyte abnormality in hospitalized patients and is defined as a serum sodium level <135 mEq/L[2]. Both total body sodium and total body water determine the serum sodium concentration[3]. Hyponatremia can eventually lead to seizure and death depending magnitude and severity of onset[4]. Hyponatremia is a serious adverse event in the paediatric critical care population is especially complex as many patients require multiple continuous infusion and excess fluid volumes due to hypovolemic shock or blood pressure instability[5]. Severe hyponatremia (< 125 mEq/L) has a high mortality rate. In instances when the serum sodium level is less than 105 mEq/L, the mortality is over 50%[6]. As regard hypernatremia Mortality rates of 30-48% have been shown in patients in ICUs who have serum Na levels exceeding 150 mmol/L[7].

MATERIALAND METHOD:

Study Design: Hospital based comparative study.

Study Size: Minimum 761 patients were required for the present study to get an incidence of hyponatremia by 33.58% with 10% relative precision and 95% confidence.

$N=Z^2*(P*Q)/L^2$
Z=z-value of normal table=1.96
P=incidence of hyponatremia=33.56 %
L=10% relative precision
Q=100-P

Time Frame For The Study: September 2018 to May 2020

Inclusion Criteria:
Children of age group 1 month to 18 years, admitted in the PICU with severe clinical condition requiring intensive care, satisfying the criteria based on the Consensus Guidelines for PICUs in India, Indian Society of Critical Care Medicine (Paediatric Section) and Indian Academy of Paediatrics (Intensive Care Chapter).

Exclusion Criteria
1. PICU stay of less than 24 hours.
2. Infants < 1 month old.

Criteria For Hyponatremia
Mild Hyponatremia (130-134mEq/l)
Moderate Hyponatremia (125-129mEq/l)
Severe Hyponatremia (<125mEq/l)

OBSERVATION AND RESULTS

Table 1: Age Wise Distribution Of The Study

Age	Frequency	Percent (%)
1 month to 1 year	206	29.4
1 year to 5 year	259	37.0
5 year to 10 year	159	22.7
>10 year	76	10.9
Total	700	100.0
Mean ± SD	4.55 ± 3.91	

Table 2: Association Between Sodium Level And Outcome

			Outcome			Total
			Morbidity	Mortality	No Morbidity	
NA	Severe Hyponatremia	N	27	2	4	33
		%	81.8%	6.1%	12.1%	100.0%
	Moderate Hyponatremia	N	47	0	7	54
		%	87.0%	0.0%	13.0%	100.0%
	Mild Hyponatremia	N	101	7	51	159
		%	63.5%	4.4%	32.1%	100.0%
	Normonatremia	N	216	19	175	410
		%	52.7%	4.6%	42.7%	100.0%
	Hypernatremia	N	32	4	8	44
		%	72.7%	9.1%	18.2%	100.0%
Total	N		423	32	245	700
	%		60.4%	4.6%	35.0%	100.0%

X^2 value=42.14, p value=0.001 (S)

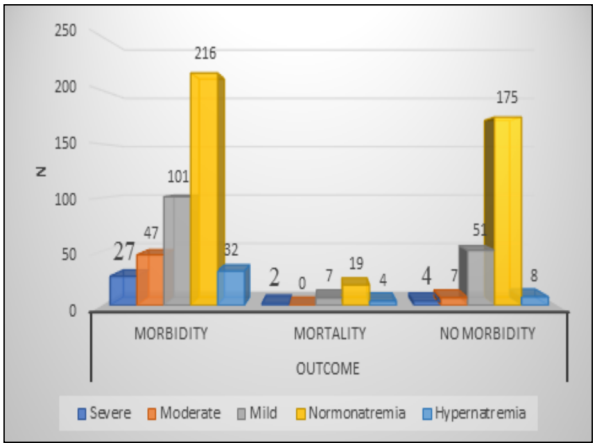

Table 3: Severity Of Sodium Level And Outcome

			Outcome			Total
			Morbidity	Mortality	No Morbidity	
Severity	Hyponatremia	N	175	9	62	246
		%	71.1%	3.7%	25.2%	100.0%
	Normonatremia	N	216	19	175	410
		%	52.7%	4.6%	42.7%	100.0%
	Hypernatremia	N	32	4	8	44
		%	72.7%	9.1%	18.2%	100.0%
Total	N		423	32	245	700
	%		60.4%	4.6%	35.0%	100.0%

X^2 value=29.47, p value=0.001 (S)

DISCUSSION:

In our study, majority of PICU admission were in the age group of 1-5 year and mean age was 4.55 year. This can be supported by the study done by **Subba Rao et al** (2000)[8] where the mean age was 4.09 years. In the study out of 700 cases, 246 (35.1%) had hyponatremia and 410 (58.6%) had normonatremia. Our incidence of 35.1% is similar to the rates of hyponatremia in earlier studies which ranged from 18.5% to 50%. **Carandang F (2013)[9] et al** was recorded incidence of hyponatremia (34.7%). There were 159 (22.7%) cases of mild, 54 (7.7%) cases of moderate and 33 (4.7%) cases of severe hyponatremia respectively. Similarly, **Funk GC (2010)[10] et al**. reported a 17.7% incidence of hyponatremia in the intensive care unit, with 13.8% classified as mild, 2.7% as moderate, and 1.2% as severe hyponatremia.In the present study, 60.4% of patients had morbidity and 4.57% patients had mortality. Incidence of mortality in hyponatraemic group was 28.1% (9/32). In our study, severe hyponatremia patients have showed 6.1% of mortality rate (2/33) and mild hyponatremia has showed 4.4% of mortality rate (7/159).

SUMMARY

The study showed majority 22.7% had mild hyponatremia, 7.7% had moderate hyponatremia and 4.7% had severe hyponatremia while 58.6% had Normonatremia and 6.3% had Hypernatremia. Total hyponatremia was 35.1% in 246 cases. 60.4% of patients had morbidity and 4.57% patients had mortality. 1-5 years age groups showed higher number of hyponatremia patients which showed statistically significant results. Males have higher hyponatremia patients as compared to female but results were statistically insignificant. Out of 32 mortality of the study, Mortality was found only in mild (4.4%), and severe (6.1%) hyponatremia.

CONCLUSION:

This study shows that hyponatremia occurs frequently in children requiring critical care management. About one third (35.1%) had hyponatremia at admission to PICU. Among hyponatraemic group sever hyponatremia shows 6.1% mortality and mild hyponatremia shows 4.4% mortality. From our study, hyponatremia is common entity in varied clinical conditions in children and is an important cause of morbidity and mortality. Early Detection and management of hyponatremia among the PICU admitted cases will reduce the hospital stay and indirectly the cost of treatment.

REFERENCES:

1 Bindu MH, Beeregowda Y. Study of hyponatremia in critically ill children admitted to paediatric intensive care unit. Eur J Pharm Med Res 2017;4:427-31.
2 Singhi S. Hyponatremia in hospitalized critically ill children: Current concepts. Indian J Pediatr 2004;71:803-7.
3 Nelson's text book of paediatrics, 20th edition, South-Asian edition. PArt-VII. Chapter-52. Elsevier publication; 2015:212-218
4 Zornow M, Prough D. Fluid management in patients with traumatic brain injury. New horizons (Baltimore, Md). 1995;3(3):488-98.
5 Singh M. Emergency paediatrics, 5th edition. Section-1, Chapter-5. CBS publisher:2016;64-89.
6 Ramnani K, Phuljhele S, Rathore P. Hyponatremia in critically ill mechanically ventilated children. Int J Contemp Pediatr 2016;3:713-7.
7 Paidy AR, Thapar RK, Gupta RK. Electrolyte disturbances in critically ill children admitted to paediatric tertiary care centre. J Evol Med Dent Sci (JEMDS) 2017;6:3269-73,
8 Subba Rao SD, Thomas B. Electolyte abnormalities in children admitted to pediatric intensive care unit. Indian Pediatrics 2000;37:1348-1352.
9 Carandang F, Anglemyer A, Longhurst CA et al. Association between maintenance fluid tonicity and hospital-acquired hyponatremia. J Pediatr 2013;163(6): doi:10.1016/j.jpeds.2013.07.020
10 Funk GC, Lindner G, Druml W, Metnitz B, Schwarz C, Bauer P, et al. Incidence and prognosis of dysnatremias present on ICU admission. Intensive Care Med 2010;36:304-11.