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Original Research Article

Hospital in-Patient Based Prospective Study to Assess the Hyponatremia in Children of 2 Months to 5 Years of Age with Pneumonia and its Correlation with Outcome

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Abstract

Aim: To find the frequency of hyponatremia in 2 months to 5 years old children hospitalized with pneumonia and to correlate the hyponatremia with the severity of pneumonia.

Material & Methods: This hospital in-patient based prospective study was conducted in the department of Paediatrics in Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India over a period of 12 months. Patients were diagnosed to have pneumonia based on clinical signs and symptoms and confirmed with chest radiograph showing lobar/segmental or patchy consolidation.

Results: 80 children admitted with pneumonia were included in the study. 12 patients in pneumonia group and 6 patients in severe pneumonia group had mild hyponatremia. It was seen that mild hyponatremia was the commonest in both the pneumonia and severe pneumonia group. The difference was statistically significant (P value =0.01).

Conclusion: Hyponatremia is a common electrolyte imbalance found in pneumonia and more commonly seen in severe pneumonia. Hyponatremia is associated with increased mortality.

Keywords: Children, Hyponatremia, Mortality, Pneumonia.

Introduction

Pneumonia is a significant cause of mortality in childhood throughout the world particularly in developing countries [1]. Pneumonia accounts for 15% of all deaths of children under 5 years old, killing 808694 children in 2017 [2]. According to UNICEF data updated on December 2018, India has an under-five mortality rates of 39.4 per 1,000 live births [3].

Pneumonia is a frequent cause of hospitalization among children and is associated with several complications. One of the common electrolyte abnormalities seen in pneumonia is hyponatremia. Hyponatremia is defined as a serum sodium concentration of less than

135mq/dl [4]. Various studies done in western countries have reported a high prevalence of hyponatremia in community acquired pneumonia. Hyponatremia could result from a sodium deficit or surplus of water.

Acute, severe hyponatremia that develops within 48 hours can result in acute cerebral edema and various sequelae, such as headache, lethargy, seizures, and cardiac arrest due to brain stem herniation. Children are more vulnerable than adults to those sequelae because the brain/intracranial volume ratio is higher in children than in adults [5-7]

Exact cause of hyponatremia in community acquired pneumonia is still being studied. The basic pathophysiology is thought to be due to stress induced release of antidiuretic hormone (ADH). This inappropriate production of ADH produces water retention and hence euvolemic hyponatremia leading to SIADH. [8-11] Hyponatremia has also been documented as a marker of severe illness and increased mortality in few studies. [12]

Thus, we aim to find the frequency of hyponatremia in 2 months to 5 years old children hospitalized with pneumonia and to correlate the hyponatremia with the severity of pneumonia.

Material & Methods:

This hospital in-patient based prospective study was conducted in the department of Paediatrics in Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India over a period of 12 months.

Patients were diagnosed to have pneumonia based on clinical signs and symptoms and confirmed with chest radiograph showing lobar/segmental or patchy consolidation. Patients having the following features were excluded from the study e.g. -hospital acquired pneumonia, patients of asthma, patients with chronic renal and liver diseases, patients taking medication known to cause SIADH, patients having diarrhoea and dehydration, congestive heart failure, meningitis and endocrine diseases.

The clinical details of all patients, enrolled for the study, were recorded in proforma after taking informed consent from parents or local guardian. Other investigations undergone on the day of admission before starting intravenous fluids or antibiotics were: Hemogram, blood urea nitrogen, serum creatinine, erythrocyte sedimentation rate, C-reactive protein, serum sodium ion selective electrode method, automated chemistry analyzer , random blood sugar, blood culture, urine routine examination and mantoux test. Serum sodium level was measured on admission, at 24 and 48 hours.

Hyponatremia was taken as serum sodium < 135 mEq/L and normal value as 135-150 mEq/L. Hyponatremia when found was graded as mild, moderate and severe as stated, e.g-: mild: 131-134 mEq/L, moderate: 126-130 mEq/L, severe: ≤125 mEq/L. Two groups were considered on the basis of serum sodium level at 0 hour.

Data was entered in the Microsoft Excel spread sheet and analyzed. The statistical software namely SAS 9.2, SPSS 15.0 Stata 10.1, Medcal 9.0.1, Systat 12.0 and R environment ver 2.11.1 were used for analysis of data. The primary and secondary outcomes were expressed as percentage. Chi Square test was used to determine the association between outcome variable and dependent variable. P value </=0.01 was considered strongly significant. P value between 0.05 -0.01 was considered moderately significant.

Results:

80 children admitted with pneumonia were included in the study. 60 patients were in 2 months to 2 years of age group and 20 patients were in 2-5 years of age group. 65 patients were males, and 15 patients were females.

11 out of 31 patients with severe pneumonia had hyponatremia compared to 39 out of 49 patients with pneumonia. Hyponatremia was more commonly seen in severe pneumonia group when compared to the pneumonia group. The difference was found to be statistically significant (p<0.01). [Table 1]

Table 1: Correlation of hyponatremia with severity of pneumonia.

WHO classification	Hyponatremia	Normonatremia	P value
Pneumonia	20	39	0.001
Severe pneumonia	11	10	
Total	31	49	

12 patients in pneumonia group and 6 patients in severe pneumonia group had mild hyponatremia. It was seen that mild hyponatremia was the commonest in both the pneumonia and severe pneumonia group. The difference was statistically significant (P value =0.01). [Table 2]

Table 2: Correlation of Severity of pneumonia with severity of hyponatremia.

WHO classification	Hyponatremia			P value
	Mild	Moderate	Severe	
Pneumonia	12	3	2	0.001
Severe pneumonia	6	7	1	
Total	18	10	3	

Mortality in patients with pneumonia was 1 out of 3 patients. Mortality was 2 patients with hyponatremia compared to 1 patients with normonatremia. The difference was statistically significant. [Table 3]

Table 3: Correlation of hyponatremia to outcome

Outcome	Hyponatremia	Normonatremia	P value
Improved	29	48	0.001
Death	2	1	
Total	31	49	

Discussion:

Studies done by Don M et al and Otheo et all [13-14] showed almost similar frequency of hyponatremia in pneumonia i.e. 45.4% and 39.7% respectively. Indian study done by Chaitra et al [15] also found hyponatremia in 47.2% of children with pneumonia. However, some studies done in India, showed hyponatremia in 21-27 % of patients with pneumonia [15-16]. In a study done in India by Mandal et al [15] recorded hyponatremia in 21% of pneumonia patients and in a study done at PGI Chandigarh, 27% of patients had hyponatremia [15].

In a study done by Karki L et al [17] reported that hyponatremia at admission was significantly associated with a longer duration of hospital stay and higher death rate.

Recently, few studies are being done to find out the exact cause of hyponatremia in community acquired pneumonia. Swart RM et al [18] in their article on hyponatremia and inflammation mentioned data supporting a role in the non-osmotic release of vasopressin and thought that this mechanism may play role in clinically significant forms of hyponatremia. However, Tagarro A et al [19] in their study to determine the proportion of

syndrome of inappropriate antidiuretic hormone (SIADH) secretion among patients with CAP with hyponatremia found that true SIADH is a rare event in patients with CAP with hyponatremia but has a good correlation with inflammatory markers. Hausman-Kedem M et al [20] in their study concluded that B-type natriuretic peptide (BNP) is unlikely to play a causative role in the mechanism of hyponatremia in community acquired pneumonia.

Study done by Don M et al [13] showed that hyponatremia was associated with severity of community acquired pneumonia assessed by fever, need of hospitalization and serum nonspecific inflammatory markers and this was statistically significant with P value <0.01. [21]

Conclusion:

Hyponatremia is a common electrolyte imbalance found in pneumonia and more commonly seen in severe pneumonia. Hyponatremia is associated with increased mortality.

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