

HYPONATREMIA IN CHILDREN OF 2 MONTHS TO 5 YEARS OF AGE WITH PNEUMONIA AND ITS CORRELATION WITH OUTCOME

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Abstract

Background: Hyponatremia is a common electrolyte imbalance observed in children with pneumonia. Presence of hyponatremia may increase the morbidity and mortality in pneumonia. The purpose of the study was 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.

Methods: This prospective observational study involved 100 children of 2 months to 5 years, admitted in tertiary care hospital with pneumonia. Subjects were classified as pneumonia and severe pneumonia according to WHO criteria. Relevant demographic, clinical data and outcome of the patients were noted. Serum sodium was analyzed and was correlated with severity of pneumonia.

Results: Out of 100 children included in this study, 64 were boys and 36 were girls. Hyponatremia was found in 43.0% of children with pneumonia. Mild hyponatremia was the commonest and seen in 26 children. Mortality was more in children with hyponatremia compared to normonatremia.

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 countries¹. 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 a 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 135mg/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.

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.⁵⁻⁸

Hyponatremia has also been documented as a marker of severe illness and increased mortality in few studies⁹

However, Indian studies on hyponatremia in community acquired pneumonia in children are few. Hence this study was done to find out the frequency of hyponatremia in community acquired pneumonia in under 5 children hospitalized in rural tertiary setting and to correlate the serum sodium levels to severity of pneumonia.

Material and Methods

This hospital in-patient based prospective study was conducted in the department of Paediatrics in Jhalawar medical college, Jhalawar over 4 months from Dec 2019 to March 2020.

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: \leq 125 mEq/L. Two groups were considered on the basis of serum sodium level at 0 hour.

Data analysis

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 \leq 0.01 was considered strongly significant. P value between 0.05 -0.01 was considered moderately significant.

Results

100 children admitted with pneumonia were included in the study. 77 patients were in 2 months to 2 years of age group and 23 patients were in 2-5 years of age group. 63 patients were males and 37 patients were females. 56 patients had pneumonia and 44 patients had severe pneumonia.

Frequency of hyponatremia: Out of 100 patients included in the study, 43 patients with pneumonia had hyponatremia. According to severity, hyponatremia was divided into three categories: mild, moderate and severe. Out of 43 children with hyponatremia, majority of the patients i.e. 26 children had mild hyponatremia, followed by moderate hyponatremia in 12 patients and severe hyponatremia in 5 patients.

Table 1: Correlation of hyponatremia with severity of pneumonia.

WHO classification	Hyponatremia	Normonatremia	p-value
Pneumonia	24	30	0.001
Severe pneumonia	19	27	
Total	43	57	

19 out of 46 patients with severe pneumonia had hyponatremia compared to 24 out of 54 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 2: Correlation of Severity of pneumonia with severity of hyponatremia.

WHO classification	Hyponatremia			p-value
	Mild	Moderate	Severe	
Pneumonia	15	5	4	0.001
Severe pneumonia	11	7	1	
Total	26	12	5	

15 patients in pneumonia group and 11 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 3: Correlation of hyponatremia to outcome

Outcome	Hyponatremia	Normonatremia	p-value
Improved	41	56	0.001
Death	2	1	
Total	43	57	

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.

Discussion

Pneumonia is one of the common causes of hospital admission of children. Hyponatremia is commonly observed electrolyte abnormality in them and is commonly seen to be associated with high morbidity and mortality. So, the frequency of hyponatremia was studied in pneumonia and its association with severity of illness, duration of hospital stay and mortality.

In the present study, 36% of children were in age group of 2 months to 2 years and 64% of children were in the age group of 2 to 5 years. Serious infections including Pneumonia are commoner in less than 2 years of age group because of waning protective passive immunity by maternal antibodies and their immature immune system.

Among 100 children included in the study, 64 were males and 36 were females. This distribution is similar to studies done by Mandal et al¹⁰ and Duru et al¹⁰ showing 62 % and 57 % males respectively in their studies. In the present study, hyponatremia was seen in 43 children with pneumonia.

Studies done by Don M et al¹³ and Otheo et al¹⁴ showed almost similar frequency of hyponatremia in pneumonia i.e. 45.4% and 39.7% respectively. Indian study done by Chaitra et al¹⁵ also found hyponatremia in 47.2% of children with pneumonia. However, some studies done in India, showed hyponatremia in 21-27 % of patients with pneumonia¹¹⁻¹⁶. In a study done in India

by Mandal et al¹¹ recorded hyponatremia in 21% of pneumonia patients and in a study done at PGI Chandigarh, 27% of patients had hyponatremia.¹⁶

Conclusions

Hyponatremia is commonly seen in children with pneumonia with incidence of 43.0% in the present study and is more common in severe pneumonia. Hyponatremia is significantly associated with increased mortality.

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