

Frequency of Hyponatremia in Children Presenting With Pneumonia

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Abstract

Background: Pneumonia and other lower respiratory tract infections are the leading causes of death worldwide. An inhaled infectious organism must bypass the host's normal nonimmune and immune defense mechanisms in order to cause pneumonia. Hyponatremia is the most common electrolyte imbalance seen in clinical practice, and a common laboratory finding in children with pneumonia. But varied frequencies have been noticed in literature. So we conducted this study.

Objective: To assess the frequency of hyponatremia in children presenting with pneumonia

Material and methods

Study design: Cross sectional study

Setting: Unit II, Department of Paediatric Medicine, Mayo Hospital, Lahore.

Duration: 13-07-2017 to 13-01-2018

Data Collection Procedure: 120 children fulfilled the selection criteria were included in the study from OPD of Department of Paediatric Medicine, Mayo Hospital, Lahore. Then blood sample was obtained by using 3cc BD syringe and stored in sterile container. All samples were sent to the laboratory of the hospital for assessment of serum sodium level. Reports were assessed and if level

will be $<135\text{mmol/L}$, then hyponatremia was labeled. All the information was recorded on proforma. Data was entered & analyzed by using SPSS version 20.

Results: The mean age of children was 28.8 ± 16.05 months. There were 77 (64.2%) males while 43 (35.8%) females. The mean weight of children was 13.24 ± 4.63 kg. The mean duration of pneumonia was 9.51 ± 1.74 days. The mean serum sodium level of children was 136.28 ± 7.04 mEq/L. There were 34 (28.3%) had hyponatremia while 86 (71.7%) did not develop hyponatremia.

Conclusion: The frequency of hyponatremia was high in children with pneumonia. Now in future, we will screen for serum sodium level in children with pneumonia.

Keywords: Hyponatremia, children, pneumonia, serum sodium level

Introduction

Pneumonia and other lower respiratory tract infections are the leading causes of death worldwide. Because pneumonia is common and is associated with significant morbidity and mortality, properly diagnosing pneumonia, correctly recognizing any complications or underlying conditions, and appropriately treating patients are important.[1] It is a leading cause of childhood death in

countries with high mortality rates among children under 5 years of age, and it continues to be the second leading cause of death among such children in Pakistan.[2]

An inhaled infectious organism must bypass the host's normal nonimmune and immune defense mechanisms in order to cause pneumonia. The nonimmune mechanisms include aerodynamic filtering of inhaled particles based on size, shape, and electrostatic charges; the cough reflex; mucociliary clearance; and several secreted substances (eg, lysozymes, complement, defensins).[3, 4] Hyponatremia is the most commonly encountered electrolyte disorder in children.[5] Hyponatremia, a very common electrolyte abnormality in hospitalized patients and is defined as a serum sodium level <135 mEq/L.[6]

In an under developed country, like Pakistan, the epidemiology of hyponatremia has hardly ever been explored whereas the administration of hypotonic IV fluids is widely practiced here.[5] Hyponatraemia is the most common electrolyte imbalance seen in clinical practice, and a common laboratory finding in children with pneumonia.[7] It has been reported that the hyponatremia was present in 26% children having pneumonia.[8] It has been reported that the frequency of hyponatremia was 33.3% in children presenting with pneumonia.[9] But high frequencies has also been found in other researches i.e. 45.4-58.4%.[10-12]

This study was conducted to assess the frequency of hyponatremia in children presenting with pneumonia. Literature has reported that hyponatremia is a common complication of pneumonia. But varied results have been noticed in literature. Some showed very high frequency while other studies showed low frequencies. Moreover, there is no local evidence available in this regard. So we are unable to get the extent of problem in local population. So, we want to conduct this study to get local evidence as well as to confirm the extent of problem in local

population. This will help us to implement the protocol for screening of children with pneumonia for serum sodium level in local setting. So that the children with pneumonia who also have hyponatremia can be cured for hyponatremia as well as strategies may be planned to prevent hyponatremia in children with pneumonia. This will help to improve our practice and knowledge.

Objective

To assess the frequency of hyponatremia in children presenting with pneumonia

Materials and Methods

This Cross sectional study was conducted in Unit II, Department of Paediatric Medicine, Mayo Hospital, Lahore from 13-07-2017 to 13-01-2018. Sample size of 120 cases with 95% confidence level, 8% margin of error and taking expected percentage of hyponatremia i.e. 26% in children with pneumonia. Non- probability, consecutive sampling technique was used.

Children of age 6months to 5years of either gender presenting with pneumonia were enrolled while children with primary neurologic, cardiac or hematologic disease and children with malnutrition were excluded. Pneumonia was defined as fever (body temp $>100^{\circ}$) along with cough >1 week, nasal congestion ≥ 1 week, thoracic pain and chest in drawing (on clinical examination) (any 3 or more) A written informed consent was taken from parents. Demographic information (name, age, gender, weight, duration of pneumonia) were obtained. Then blood sample was obtained by using 3cc BD syringe and stored in sterile container. All samples were sent to the laboratory of the hospital for assessment of serum sodium level. Reports were assessed and if level will be <135 mmol/L, then hyponatremia was labeled.

Statistical analysis

Data was entered & analyzed by using SPSS version 20. Mean and SD was calculated for quantitative variables and

qualitative variables were presented as frequency and percentage. Data was stratified for effect modifiers and post-stratification, chi-square test was applied with p-value ≤ 0.05 taken as significant.

Results

The mean age of children was 28.8 ± 16.05 months. There were 77 (64.2%) males while 43 (35.8%) females. The mean weight of children was 13.24 ± 4.63 kg. The mean duration of pneumonia was 9.51 ± 1.74 days. The mean serum sodium level of children was 136.28 ± 7.04 mEq/L. There were 34 (28.3%) had hyponatremia while 86 (71.7%) did not develop hyponatremia. Data was stratified for age of children. In children aged 6-12 months, 10 (40%) had hyponatremia. In children aged 13-36 months, 16 (28.6%) had hyponatremia. In children aged 37-60 months, 8 (20.5%) had hyponatremia. The difference was insignificant among all age groups ($p > 0.05$). Data was stratified for genders of children. In male children, 19

(24.7%) had hyponatremia. In female children, 15 (34.9%) had hyponatremia. The difference was insignificant among all age groups ($p > 0.05$). Data was stratified for weight of children. In children weighted 5.50-10.50 kg, 15 (42.9%) had hyponatremia. In children aged weighted 10.51-15.50 kg, 10 (22.7%) had hyponatremia. In children weighted 15.51-22.00 kg, 9 (22.0%) had hyponatremia. The difference was insignificant among all weight groups ($p > 0.05$). Data was stratified for duration of pneumonia. In children having pneumonia from 7-9 days, 13 (22.0%) had hyponatremia. In children having pneumonia from 10-12 days, 21 (34.4%) had hyponatremia. The difference was insignificant among all age groups ($p > 0.05$).

Table 1

	Mean	Standard deviation	Minimum	Maximum
Age (months)	28.8	16.05	6	60
Weight (Kg)	13.24	4.63	5.5	21.58
Duration of illness (days)	9.51	1.74	7	12
Serum Na level in (mEq/L)	136.28	7.04	120	145

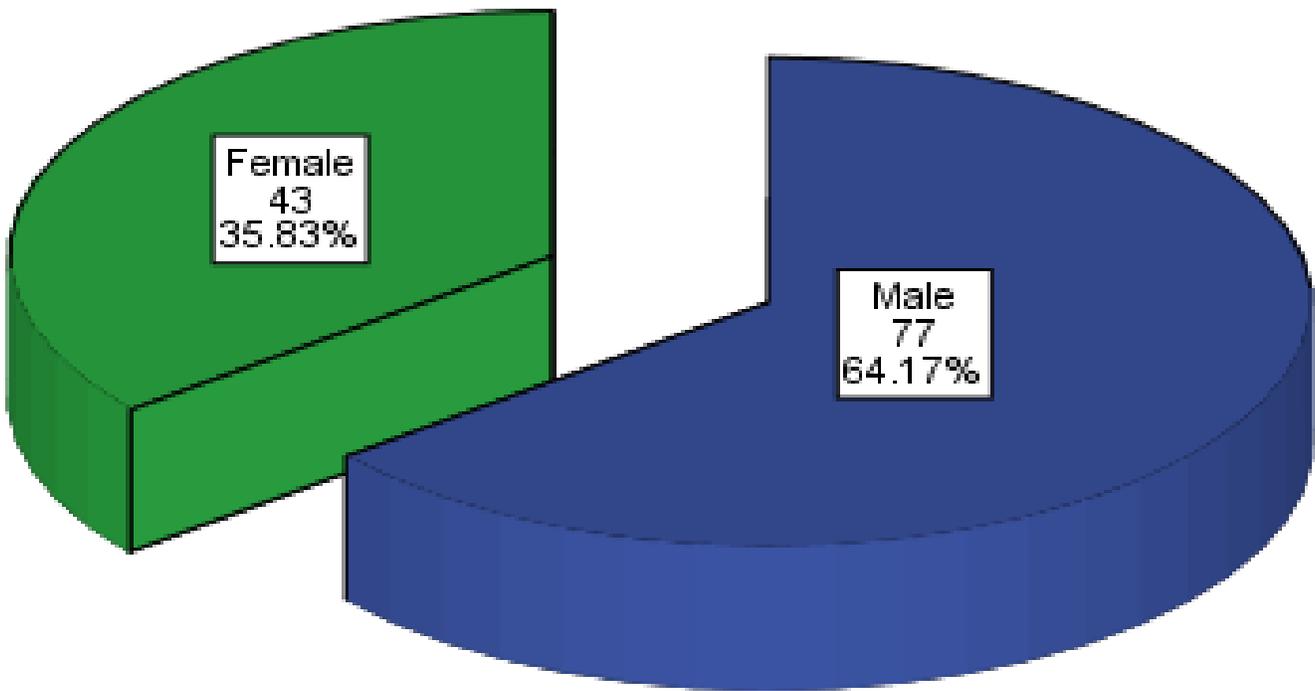


Fig 1: Distribution of gender of patients

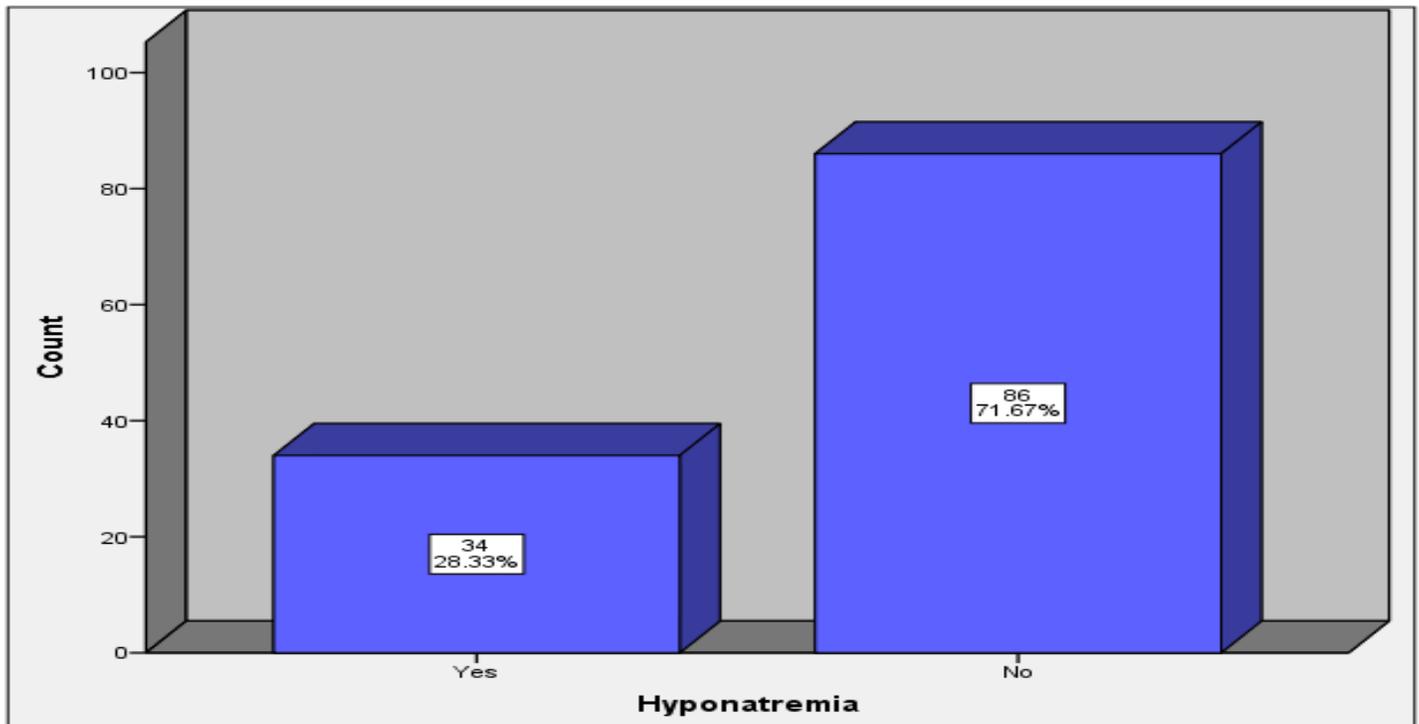


Fig 2: Distribution of hyponatremia in children

Table 2: Comparison of hyponatremia in age groups

		Age (months)			Total	p-value	
		6-12	13-36	37-60			
Hyponatremia	Yes	10	16	8	34	0.240 (Insignificant)	
		40.0%	28.6%	20.5%	28.3%		
	No	15	40	31	86		
		60.0%	71.4%	79.5%	71.7%		
Total		25	56	39	120		
		100%	100%	100%	100%		
		Weight (kg)			Total		0.077 (Insignificant)
		5.50-10.50	10.51-15.50	15.51-22.00			
Hyponatremia	Yes	15	10	9	34	0.234 (Insignificant)	
		42.9%	22.7%	22.0%	28.3%		
	No	20	34	32	86		
		57.1%	77.3%	78.0%	71.7%		
Total		35	44	41	120		
		100%	100%	100%	100%		
		Gender of child		Total	0.234 (Insignificant)		
		Male	Female				
Hyponatremia	Yes	19		15	34	0.132 (Insignificant)	
		24.7%		34.9%	28.3%		
	No	58		28	86		
		75.3%		65.1%	71.7%		
Total		77		43	120		
		100%		100%	100%		
		Duration (days)		Total	0.132 (Insignificant)		
		7-9	10-12				
Hyponatremia	Yes	13		21	34	0.132 (Insignificant)	
		22.0%		34.4%	28.3%		
	No	46		40	86		
		78.0%		65.6%	71.7%		
Total		59		61	120		
		100%		100%	100%		

Discussion

Pneumonia is a leading cause of childhood death in countries with high mortality rates among children under 5 years of age, and it continues to be the second leading cause of death among such children in Pakistan.[13] In Abbottabad, in the north-western part of Pakistan, the cause-specific mortality rate from pneumonia in children under 5 years of age was reported to be 14 deaths per 1000 children annually before interventions.[14]

In a village at approximately 1525 m above sea level in the Northern Areas of Pakistan, 44% of all deaths in children under 5 years of age between 1988 and 1991 were due to pneumonia, based on verbal autopsy methods. [15] Surveillance of mortality by the Aga Khan Health Services, Pakistan in the Northern Areas, based on verbal autopsy, indicated that pneumonia continues to cause approximately 33% of deaths in infants and 37% of deaths in children aged 1–4 years. [16]

The mean serum sodium level of children was 136.28 ± 7.04 mEq/L. There were 34 (28.3%) had hyponatremia while 86 (71.7%) did not develop hyponatremia. It has been reported that the hyponatremia was present in 26% children having pneumonia. [8] It has been reported that the frequency of hyponatremia was 33.3% in children presenting with pneumonia. [9] Severity of hospital acquired hyponatremia was recorded as mild in 191 (79.6%), moderate in 35 (14.6%) and severe in 14 (5.8%) children. [5] The incidence of hospital induced hyponatremia in children has been reported to be 10% in an observational study by Hoorn and colleagues. [17]

Five percent of these went on to develop hyponatremic encephalopathy. In another study of infants suffering from bronchiolitis who were transferred to intensive care unit, the reported incidence of hyponatremia was 33% with 4% developing neurological injury. [18] Yet another study by Stelfox et al reported the occurrence of hyponatremia in

917 (11%) of 8142 patients admitted to medical /surgical intensive care unit s. [19]

The true incidence of hyponatremic encephalopathy which is the major consequence of hyponatremia leading to permanent brain injury is not known due to lack of large prospective studies. Three different studies by Wattad et al, Sarnaik et al and Halberthal et al have reported the incidence of hyponatremic encephalopathy as 53%, 60% and 78% respectively in children with serum sodium <125 mEq/l. [20, 21, 22]

But high frequencies has also been found in other researches i.e. 45.4-58.4%. Thus, hyponatremia seems to be associated with the severity of pneumonia, assessed by fever, need of hospitalization and serum non-specific inflammatory markers.10-12 Hasegawa et al showed the incidence of hospital acquired hyponatremia to be 17%. [22]

In another study by Armon et al the incidence of hyponatremia in patients on intravenous fluids was 24% and 5% had serum sodium concentration <130 mEq/L. [23] The mean age of children was 28.8 ± 16.05 months. Data was stratified for age of children. In children aged 6-12 months, 10 (40%) had hyponatremia. In children aged 13-36 months, 16 (28.6%) had hyponatremia. In children aged 37-60 months, 8 (20.5%) had hyponatremia. The difference was insignificant among all age groups ($p > 0.05$).

There were 77 (64.2%) males while 43 (35.8%) females. Data was stratified for genders of children. In male children, 19 (24.7%) had hyponatremia. In female children, 15 (34.9%) had hyponatremia. The difference was insignificant among all age groups ($p > 0.05$).

The mean weight of children was 13.24 ± 4.63 kg. Data was stratified for weight of children. In children weighted 5.50-10.50 kg, 15 (42.9%) had hyponatremia. In children aged weighted 10.51-15.50 kg, 10 (22.7%) had

hyponatremia. In children weighted 15.51-22.00kg, 9 (22.0%) had hyponatremia. The difference was insignificant among all weight groups ($p>0.05$).

The mean duration of pneumonia was 9.51 ± 1.74 days. Data was stratified for duration of pneumonia. In children having pneumonia from 7-9 days, 13 (22.0%) had hyponatremia. In children having pneumonia from 10-12 days, 21 (34.4%) had hyponatremia. The difference was insignificant among all age groups ($p>0.05$).

Conclusion

The frequency of hyponatremia was high in children with pneumonia. Now we have got the local evidence and it showed high frequency of hyponatremia in children with pneumonia. Now in future, we will screen for serum sodium level in children with pneumonia. So that the children with pneumonia who also have hyponatremia can be cured for hyponatremia as well as strategies may be planned to prevent hyponatremia in children with pneumonia and improve the outcome and prognosis.

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Proforma

Frequency of hyponatremia in children presenting with pneumonia

Case no: MR no: Date:

Name:

Age:

Sex: M F

Weight:

Duration of pneumonia:

Laboratory findings:

Serum sodium level: mmol/L

Hyponatremia: Present Absent

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