Original Research Article

A Study on Hyponatremia among Pediatric Patients With Pneumonia At A Tertiary Care Centre Of Bihar

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Received: 26-11-2021 / Revised: 18-12-2021 / Accepted: 08-01-2022

Abstract

Introduction: Lower respiratory tract infections (LRTIs) are common during childhood and can have high morbidity and mortality rates if not treated. The 2005 report of the World Health Organization states that LRTIs cause approximately 19% of the 10.5 million annual deaths. Hyponatremia related to pediatric pneumonia is most typically due to the syndrome of unsuitable antidiuretic hormone secretion (SIADH). The rationale of this study is to find out the prevalence of hyponatremia in a child with pneumonia so that while treating pneumonia, hyponatremia is not overlooked and treated simultaneously. **Methodology:** It is a prospective study with sample size of 60. Children between 2 month to 5 years visiting OPD clinic and admitted to Patna Medical College & Hospital between January 2013 to June 2013 in the duration of 6 months with clinically or radiologically confirmed pneumonia were the study population. Inclusion criteria were children between 2 months to 5 years with radiologically confirmed pneumonia and clinical features defined as per modified WHO/BTS guidelines. All children were screened for dyselectrolytemia on admission. Other investigations were done whenever required. Collected data were analyzed by frequencies, percentages, mean, and standard deviation by Chi-square test using SPSS 16.0. **Results:** The mean age of children was 2.2 ± 1.9 years. Maximum number of children belonged to age group between 2 months to 24 months. There was a male preponderance a male to female ratio of 2.3:1. Respiratory rate was increased in all the children. The range of respiratory rate for children aged 2 months to 12 months was 52 to 80 per minute and for those above 12 months were 46 to 76 per minute. Hyponatremia was revealed in 86.7% of the children with pneumonia. **Conclusion:** The children admitted with pneumonia have higher morbidity when associated with hyponatremia. Hence along with management of pneumonia, hyponatremia should also be cautiously addressed in these patients.

Key Words: Hyponatremia, Pneumonia

Introduction

Lower respiratory tract infections (LRTIs) are common during childhood and can have high morbidity and mortality[1] rates if not treated. The 2005 report of the World Health Organization states that LRTIs cause approximately 19% of the 10.5 million annual deaths[2]. Itis among the serious health problems specifically in less than 5 years of age requiring hospitalization and attributes to 30% of deaths yearly worldwide[3] especially due to pneumonia as the leading cause. LRTI is infection listed below the level of the throat where there is swelling of the airways/pulmonary tissue due to viral or bacterial infection and might be taken to include: Bronchiolitis, bronchitis, pneumonia and empyema. Pneumonia is the leading reason for major illness and death in children accounting for 20-25% in under[4] age around the world and it can be generally specified as swelling of the lung parenchyma. Bronchiolitis is a typical childhood disease and its most typical etiologic representative is breathing syncytial[3, 5] virus (RSV).

Hospitalization is required in around 1% of afflicted kids, primarily because of dehydration, insufficient oral intake, or breathing deficiency. Between 10-15% of hospitalized children needs extensive care due to impending[3,4,5] breathing failure. Fluids and electrolytes are the primary pillars in the upkeep of body homeostasis. The most essential among electrolytes is salt, the abundant cation of the extracellular fluid. Hyponatremia is the most common electrolyte abnormality seen in the intensive care unit (ICU), with an occurrence as high as 30% in some[5,6] reports.

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Hyponatremia typically establishes in severe inflammatory diseases such as meningitis, breathing tract infections, febrile convulsions, and Kawasaki disease in children[7-10]. Patients with pneumonia the most typical diseases that come across in pediatric basic practice, are at particular danger of establishing hyponatremia due to[11-13] antidiuretic hormonal agent (ADH) over-secretion. Hyponatremia related to pediatric pneumonia is most typically due to the syndrome of unsuitable antidiuretic hormone secretion (SIADH). Hyponatremia is defined as a serum sodium level below 135 mmol/L[14]. It is the most common clinical electrolyte imbalance[15]. The hyponatremia rate inpatients is 15%-30%[16].

Hyponatremia can be classified into three groups as mild (131-135 mmol/L), moderate (126-130 mmol/L), and severe (≤125 mmol/L)[17]. Mild hyponatremia is the most common type and usually produces no clinical findings. Severe hyponatremia is rare and has high morbidity and mortality rates if not treated[18, 19]. The main causes of hyponatremia are volume depletion (bleeding, vomiting, diarrhea, and urinary loss), syndrome of inappropriate antidiuretic hormone (SIADH) secretion, congestive heart failure, thiazide diuretics, cirrhosis, renal failure, primary polydipsia, adrenal insufficiency, hypothyroidism, and pregnancy[20]. Several lung disorders, including pneumonia, can cause SIADH through unknown mechanisms[21].

It was in 1920 when Lussky and co-workers described the retention of water in children with pneumonia, which was found to be associated with an increased blood volume and a low plasma chloride value, these findings are explained by the syndrome of inappropriate secretion of antidiuretic hormone which has been described in children with pneumonia. However it was in 1962 that the correlation of hyponatremia and pneumonia in children was firstdescribed by Stormont and water house[22]. Dhavan and colleagues from chandigarh reported that hyponatremia was found in 31% of children

with pneumonia and SIADH was the cause in almost 94% cases[23]. Alkahtani Hassan Naseer and colleagues reported that hyponatremia is common amongst kids hospitalized with lower breathing tract infections typically due to SIADH which substantially increases the morbidity and mortality[24]. Chaitra K.M. and his colleagues concluded that mild hyponatremia is common among children with lower respiratory tract infections[25]. The rationale of this study is to find out the prevalence of hyponatremia in a child with pneumonia so that while treating pneumonia, hyponatremia is not overlooked and treated simultaneously.

Methodology

The study population consisted of children with pneumonia aged 2 months–5 years who were seen at pediatrics OPD or admitted for treatment and monitoring at Patna Medical College & Hospital, between January 2013 to June 2013 in the duration of 6 months. It is a prospective study with sample size of 60. Children between 2 month to 5 years visiting OPD clinic and admitted to Patna Medical College & Hospital with clinically or radiologically confirmed pneumonia were the study population. Inclusion criteria were children between 2 months to 5 years with radiologically confirmed pneumonia and clinical features defined as per modified WHO/BTS guidelines. Exclusion criteria 1. Infants less than 2 months of age 2. Children more than 5 years of age 3. Children with renal disorders 4. Children with associated CNS infections 5. Children with gastroenteritis 6. Children with chromosomal or genetic disorder 7. Children on drugs which can cause electrolyte imbalance such as diuretics, anticonvulsants etc.

Children with tachypnea (infants from 2 months to 1 year), respiratory rate more than equal to 50 breaths/minutes and children 1 to 5 years, respiratory rate more than equal to 40 breaths/min and any one or more of the following criteria were included in the study. Infants from 2 months to 1 year, chest recession, nasal flaring, cyanosis, intermittentapnea, grunting respiration, not feeding, and capillary refill me more than 2 secs, oxygen saturation less than 92%. Children 1 to 5 years: chest recession, nasal flaring, cyanosis, grunting respiration, capillary refill me more than 2 secs, oxygen saturation less than 92%. At the time of enrollment an informed written consent was obtained from the parents. Detailed history was taken from parents/guardians with relevance to the case. Detailed clinical examination was done. Chest x-ray was taken. All children were screened for dyselectrolytemia on admission. Other investigations were done whenever required. Collected data were analyzed by frequencies, percentages, mean, and standarddeviationby Chi-square testusing SPSS 16.0.

Results

A total of 60 children of age ranging from 2 months to 5 years who were admitted with clinical or radiological diagnosis of pneumonia were enrolled in the study. The mean age of children was 2.2 ± 1.9 years. Maximum number of children belonged to age group between 2 months to 24 months. There was a male preponderance a male to female ratio of 2.3:1. Clinical assessment was done prior to investigations.

Clinical profiles along with the clinical parameters that distinguished the grading of pneumonia were done and is presented in table 1.Respiratory rate was increased in all the children. The range of respiratory rate for children aged 2 months to 12 months was 52 to 80 per minute and for those above 12 months was 46 to 76 per minute.

Leukocytosis was seen in 44 out of 60 children while leucopenia in 12 out of 60 children. Acute phase reactants CRP were positive in majority of the children. Hyponatremia was revealed in 86.7% of the children with pneumonia.Meansodiumlevelwas126.6±8.1rangingfrom 110 to 142meq/L. Figure 1 shows grading of hyponatremia.

Table 1: Table showing various clinical presentations of the patients

Clinical presentation	Number (%)
Cough	44 (73.3%)
Fever	58 (96.7%)
Chest pain	6 (10%)
Nasal congestion	21 (35%)
Abdominal pain	19 (31.7%)

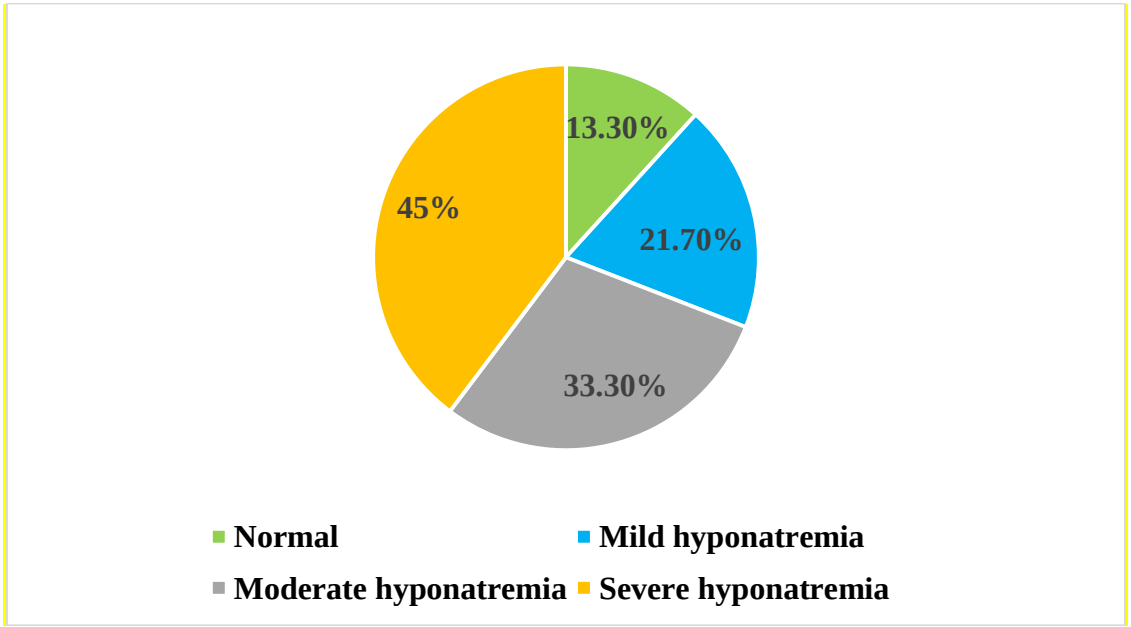

Figure 1: Distribution of study participants based on grading of hyponatremia

Analysis of hyponatremia in relation to various variables was done. The relation with age was not significant but majority of children with hyponatremia belonged to age group 2 months to 12 months while children in age group between 1 to 3 years 5.2% had severe hyponatremia and between 3 to 5 years of children 9.1% had severe hyponatremia. The association of total leukocyte count with sodium level was also not statistically significant. 38 out of 52 children with hyponatremia demonstrated leukocytosis.But association with CRP was statistically significant as more than one-third of the children with elevated CRP had hyponatremia. Table 2 showsthe associationof gradingofhyponatremiawith grading of pneumonia. The association of plasma sodium level with the grade of pneumonia was statistically significant as the severity increasing with decreasing plasma sodium level.

Table 2: Association of grading of hyponatremia with grading of pneumonia

Grade of pneumonia	Plasma sodium levels			
	Normal	Mild hyponatremia	Moderate hyponatremia	Severe hyponatremia
Pneumonia	6	8	2	1
Severe pneumonia	1	4	11	14
Very severe pneumonia	1	1	7	12

Discussion

The commonest dyselectrolytemia in hospitalized patients is hyponatremia. It complicates many conditions including respiratory, central nervous system, malignancies etc and it's a marker of severe illness resulting in high mortality and morbidity[26-29]. Electrolyte disturbances have been described in a wide variety of acute infections including pneumonia, which complicates the management and prognosis[30]. Most of the studies have shown hyponatremia due to Syndrome of Inappropriate Antidiuretic Hormone secretion (SIADH) as the most common electrolyte abnormality[31, 32]. The stimulus of ADH release in pulmonary disease is likely to be non-osmotic; in particular, lung hyperinflation and pulmonary infiltrates may stimulate ADH secretion by causing a false perception of hypovolemia by intrathoracic receptors[33].

The prevalence of hyponatremia was found to be 86.7% which is similar to the study done by Eunice et al[34] where the prevalence was 71.9%. Another study in India reported the prevalence of hyponatremia to be 27% which is lower than that found in the current study These findings could be attributed to the fact that hyponatremia was defined as sodium level of<130 mm/l in their study.Severe hyponatremia was found in 45% of the children and moderate hyponatremia in 33.3% while mild hyponatremia in 21.7% of the children. In a study done in Tamilnadu, mild hyponatremia was seen in 24.2% and moderate hyponatremia was seen in 16.7% of children which is comparable to our results. However, none of the cases had severe hyponatremia which is in contrast to our study.

There was no statistical significance between the age group of children or theirtotal leukocyte count with hyponatremia but the association between CRP and hyponatremia was statistically significant. The grading of severity of pneumonia was compared with grading of hyponatremia. In this study 20% of the children with severe hyponatremia hadvery severe pneumonia. Thedata is statistically significant. This finding is similar to a significant association between very severe pneumonia and hyponatremia that was observed in a previous study[34].

Conclusion

Hyponatremia is prevalent in children with pneumonia. The children admitted with pneumonia have higher morbidity when associated with hyponatremia. In our study too hyponatremia was detected in children with pneumonia that was statistically significant. Hence along with management of pneumonia, hyponatremia should also be cautiously addressed in these parents.

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