

An Assessment of Pneumonia in Children with Hyponatremia: Study in a District Hospital, Natore, Bangladesh

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Abstract

Original Research Article

Pneumonia is an infection in one or both lungs. Bacteria, viruses, and fungi cause it. The infection causes inflammation in the air sacs in your lungs, which are called alveoli. The alveoli fill with fluid or pus, making it difficult to breathe. The aim of our study was to assess Pneumonia in Children with Hyponatremia. The study was conducted in the department of Pediatrics, Natore District Hospital, Natore, Bangladesh during the period from January 2017 to December 2017. One hundred and twenty five (125) study subjects were selected purposively. At the time of admission, the patient's clinical history was recorded in prefixed preform. Venous blood sampling was obtained from each patient enrolled in the study and sent for estimation of serum electrolytes, glucose levels, X-Ray Chest. Data were analyzed by using SPSS version 21. The highest Serum Sodium level for Pneumonia ((mEq/L)) in (135-140) range was 58 (46.40%), higher (126-130) range was 32(35.60%), high (130-135) range was 25(20.00%) and lowest (120-125) range was 10(8%). Hyponatremia is quite common in community acquired pneumonia cases that needed hospitalization. Initial measurement of serum sodium is recommended in all hospitalized pneumonia patients. Regular follow up of serum sodium level during the period of hospital stay should be considered to pick up the high risk cases at an early stage. Based on the above findings it can be concluded that regular estimation of serum electrolyte concentration and 30% has been curtailed from the regular daily intake fluid volume to guide appropriate fluid and electrolyte management of children with severe pneumonia requiring hospitalization.

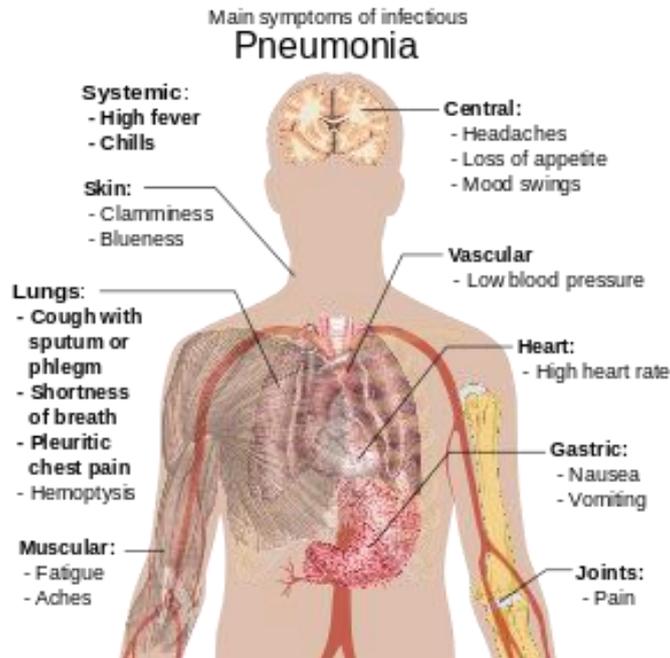
Keywords: Pneumonia, serum Sodium level, Hyponatremia.

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INTRODUCTION

Pneumonia is an infection in one or both lungs. Bacteria, viruses, and fungi cause it. The infection causes inflammation in the air sacs in your lungs, which are called alveoli. The alveoli fill with fluid or pus, making it difficult to breathe. The World Health Organization estimates that more than 160 million children around the world develop pneumonia each year, 20 million of whom are hospitalized and 2 million of whom die. Worldwide, pneumonia is the leading cause of death for children under the age of five. Sub-Saharan Africa is disproportionately affected, accounting for more than half of such cases. In developed countries, access to antibiotics and vaccines has mostly controlled incidents of childhood pneumonia. However, in developing countries, pneumonia takes the lives of more children than any other single cause each year, including any other single disease, war, or famine. Despite this terrible reality, programs to fight childhood pneumonia remain critically underfunded, with large amounts of resources

being devoted to HIV/AIDS and malaria. Estimates show that 1.3 million of childhood pneumonia deaths could be avoided if prevention and treatment efforts were implemented worldwide. After the germs reach the lungs, the lungs become inflamed and fill up with fluid. This causes breathing difficulties, which makes it difficult for enough oxygen to enter the bloodstream. The body's cells can't function as they normally would, and infection can't be flushed from the body. If untreated, the infection may continue to spread, leading to death. It is the leading cause of death among children in low income countries [1]. Many of these deaths occur in the newborn period. The World Health Organization estimates that one in three newborn infant deaths is due to pneumonia. Approximately half of these deaths can be prevented, as they are caused by the bacteria for which an effective vaccine is available. In 2011, pneumonia was the most common reason for admission to the hospital after an emergency department visit in the U.S. for infants and children [2].



Source: Google

Bacteria, viruses, or fungi that live in your nose, mouth, sinuses, or the surrounding environment can enter your lungs and create infections, including pneumonia. You can get the bacteria or viruses from people who are infected with them, whether they show symptoms or not. The leading cause of severe pneumonia in children in developing countries is *Streptococcus pneumoniae* bacteria or pneumococcus. Another leading cause is *Haemophilus influenzae* type b or Hib. Other causes of pneumonia include influenza, staph infections, human respiratory syncytial virus, rhinovirus, herpes simplex virus, and severe acute respiratory syndrome (SARS). Less common types of pneumonia can be acquired. Through the inhalation of food, liquids, gases, dust, and certain fungi. *Pneumocystis carinii* (now renamed *Pneumocystis jiroveci*) pneumonia (PCP) is a fungal infection that can affect people with weakened immune systems, including those with HIV/AIDS. Practicing good hygiene and health habits help prevent pneumonia. Thorough and frequent hand cleaning, coughing or sneezing into an elbow or sleeve instead of hands, avoiding interaction with those who are sick, receiving proper nutrition, and getting adequate rest are all things you and your children can do to ward off the bacteria and viruses that can cause pneumonia. Avoiding tobacco smoke and other pollutants help prevent pneumonia. Increasing access to immunization, reducing indoor and outdoor air pollution, and becoming knowledgeable about warning signs to identify infection, specifically a cough, fast breathing, and/or difficulty breathing will help prevent infection. Breastfeeding during the first six months is critical in preventing pneumonia. Breast milk contains ample supply of nutrients, antioxidants, hormones and antibodies needed for growth and development of a child. The literature findings suggest that the lower

respiratory infections (LRIs), pneumonia, atypical pneumonia, bronchitis, bronchiolitis, and severe acute respiratory syndrome (SARS), continue to threaten the health of children worldwide and especially in developing countries, where poor nutrition prevails and access to health care are scarce. Hence the current study was planned to evaluate the prevalence of the pneumonia in the children's and assess the levels of serum sodium in affected children's.

OBJECTIVES

a) General objective:

- To assess pneumonia in children with hyponatremia.

b) Specific objectives:

- To observe the scenario of pneumonia in children, Bangladesh.

MATERIALS & METHODS

The study was conducted in the department of Pediatrics, Natore District Hospital, Natore, Bangladesh during the period from January 2017 To December 2017. One hundred and twenty five (125) children diagnosed with pneumonia selected as a study sample. At the time of admission, the patient's clinical history was recorded in prefixed proforma. Venous blood sampling was obtained from each patient enrolled in the study and sent for estimation of serum electrolytes, glucose levels, X-Ray Chest. Normal values of serum sodium ranges from 136-145 m mol/L or mEq/L. Hyponatremia is usually defined as a serum sodium concentration of less than 135 mEq/L. Following was the inclusion and exclusion criteria of the present study. A pre-designed questionnaire had been used to collect all the necessary data from the participants. Program

MS-Excel was used in collecting data, SPSS version 21 was used in analyzing data. On the other hand several tables were used to disseminate data.

Inclusion Criteria

- Children with pneumonia aged 1-6 years

Exclusion Criteria

- Children with severe malnutrition, Diarrhea, Congestive heart failure, Meningitis, Nephrotic syndrome and Acute Glomerularnephritis.

RESULTS

One hundred and twenty five (125) children diagnosed with the pneumonia were selected as a study participants. We found that majority of participants were in 1-2 years of age group 105(84%) and then 2-4 years of age group 13(10.40%) and the lowest age group were in 4-6 years 5 (5.6%) (Table-1). The highest acute respiratory infection (Severe Pneumonia) was found 80 (64%), Pneumonia was 40 (32%) and very Severe Pneumonia was 5 (4%). The severity of pneumonia there are two groups with hyponatremia were 50 (40%) and without hyponatremia were 75(60%). In 1st group (with hyponatremia), severe pneumonia was found 33 (26.40%), pneumonia was 15 (12.00%) and Very severe pneumonia was 2 (1.60%). In 2nd group (without hyponatremia) where severe pneumonia was found 47(37.60%), pneumonia was 25(20.00%) and very severe pneumonia was 3(2.40%). Serum Sodium (mEq/L) level of the participants ranging from 135—140 were in 58(46.40%), 131—135 were in 25(20.00%), 126—130 were in 32(25.60%) and 120—125 were in 10(8.00%) respectively.

Table-3: Distribution of study subjects according to frequency of hyponatremia (N=125)

Severity of pneumonia	With hyponatremia		Without hyponatremia	
	N	%	N	%
Pneumonia	15	12.00	25	20.00
Severe Pneumonia	33	26.40	47	37.6
Very Severe Pneumonia	2	1.60	3	2.40
Total	50	40	75	60

Table-4: Distribution of pneumonia cases by their range of serum sodium (N=125)

Serum Sodium (mEq/L)	N	%
120—125	10	08.00
126—130	32	25.60
131—135	25	20.00
135—140	58	46.40
Total	125	100

DISCUSSION

Hyponatremia is the most common serum electrolyte abnormality. The etiology of hyponatremia in the critically ill child may reflect an endogenous state of sodium deregulation, iatrogenic causes, or both. Children admitted to the critical care study lies in the fact that this is the only study in pediatric age group

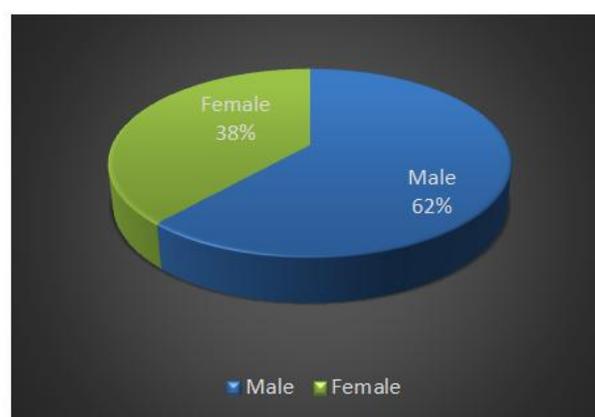


Fig-1: Gender distribution of Participants (N=125)

Table-1: Distribution of Study Subjects According To Age Group (N=125)

Age group (in years)	No. of Cases (N=125)	
	N	%
1-2	105	84
2-4	13	10.4
4-6	7	5.6
Total	125	100

Table-2: Distribution of study subjects according to WHO (World Health Organization) classification of acute respiratory infections (N=125)

Classification	No. of Cases (N=125)	
	N	%
Pneumonia	40	32
Severe Pneumonia	80	64
Very Severe Pneumonia	5	4
Total	125	100

where correlation of hospital-acquired and hospital-aggravated hyponatremia with morbidity and mortality in hospitalized pneumonia patients is sought for. Few studies exist concerning the correlation of hyponatremia and pneumonia in children. It was first described by Stormont and Waterhouse in 1962 [3]. Since then and during the past 35 years, only case reports and a few relevant studies on the association between

hyponatremia and pneumonia have been published, of which only three concern children [4, 5]. Community-acquired (CAP) and nosocomial pneumonias contribute substantially to morbidity and hospital resource utilization [6, 7]. Hyponatraemia, occurring in more than 1/4 of patients with CAP, is associated with greater disease severity and worsened outcomes. Hyponatraemia is usually mild in children with CAP [8]. It seems that high atrial natriuretic peptide levels (ANP) may play a role [9]. Atrial natriuretic peptide is a member of the family of natriuretic peptides, and regulates a variety of physiological parameters, such as diuresis and natriuresis, and reduces systemic blood pressure. It is synthesized and secreted from cardiac atria. Increased levels of ANP were found in diseases affecting the lungs. Over-secretion of ANP is correlated with hypoxia, which leads to pulmonary vasoconstriction, pulmonary hypertension, and right-heart overload [10, 11]. Hyponatremia occurring in children with pneumonia comprises part of the syndrome of inappropriate antidiuretic hormone secretion (SIADH). ADH is generally secreted by the pituitary gland in response to high plasma osmolality (high serum sodium concentration); however, in various clinical conditions, including fever, hypoxia, hypercarbia, pain, nausea, and vomiting, nonosmotic stimulation of ADH secretion can lead to hyponatremia. Also, the stimulus of ADH release in pulmonary disease is likely to be nonosmotic; in particular, lung hyperinflation and pulmonary infiltrates may stimulate ADH secretion by causing a false perception of hypovolemia by intrathoracic receptors [12].

LIMITATION OF THE STUDY

This was a single centered observatory study with a small sample size. So the findings of this study may not reflect the exact scenarios of whole country.

CONCLUSION AND RECOMMENDATIONS

Hyponatremia is quite common in community acquired pneumonia cases needed hospitalization. Initial measurement of serum sodium is recommended in all hospitalized pneumonia patients. Regular follow up of serum sodium level during the period of hospital stay should be considered to pick up the high risk cases at an early stage. Based on the above findings it can be concluded that regular estimation of serum electrolyte

concentration is necessary to guide appropriate fluid and electrolyte management of children with severe pneumonia hospitalization.

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