

Hyponatremia in Children with Acute Lower Respiratory Tract Infections: Overview

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Abstract: Lower respiratory tract infection (LRTI) is among the serious health problems specifically in less than 5 years of age needing hospitalisation and attributes to 30 % of deaths yearly worldwide especially due to pneumonia as the leading cause. LRTI is infection listed below the level of the throat and might be taken to include: Bronchiolitis, Bronchitis, Pneumonia and empyema. This review aims to evaluate the incident and effect of Hyponatremia among children with LRTI, and to highlight the more important aspect in this subject. We conducted a comprehensive review through electronic search among two databases which are; PubMed (MEDLINE), and EMBASE, for all studies evaluating hyponatremia in children with lower respiratory tract infection, we limited our search to English language articles, we use following terms in our identified search; lower respiratory tract infection, OR pneumonia, OR bronchiolitis OR acute respiratory syndrome, combined with Children, AND Neonatal. we excluded all studies that involving patients older than 17 years old. We concluded that hyponatremia is common amongst children hospitalized with lower breathing tract infections. Every year Acute respiratory infections in young kids is responsible for a quote 3.9 million deaths worldwide. Hyponatremia was typically due to Syndrome of Inappropriate Anti Diuretic Hormone secretion (SIADH). Presence of hyponatremia substantially increases the morbidity and mortality amongst kids with lower respiratory system infections.

Keywords: (MEDLINE), and EMBASE, Syndrome of Inappropriate Anti Diuretic Hormone secretion (SIADH).

1. INTRODUCTION

Lower respiratory tract infection (LRTI) is among the serious health problems specifically in less than 5 years of age needing hospitalisation and attributes to 30 % of deaths yearly worldwide ⁽¹⁾ especially due to pneumonia as the leading cause. LRTI is infection listed below the level of the throat and might be taken to include: Bronchiolitis, Bronchitis, Pneumonia and empyema. It is swelling of the airways/pulmonary tissue, due to viral or bacterial infection, below the level of the larynx. Pneumonia is the leading reason for major illness and death in children accounting for 20-25 % in under 5 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 virus (RSV) ^(1,2). 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 will need extensive care due to impending breathing failure ^(1,2,3).

Fluids and electrolytes are the primary pillars in the upkeep of body homeostasis. The most essential among electrolytes is salt which is the abundant cation of the extracellular fluid. Hyponatremia is the most common electrolyte irregularity seen in the intensive care unit (ICU), with an occurrence as high as 30% in some reports ^(3,4). Hyponatremia typically establishes in severe inflammatory diseases such as meningitis, breathing tract infections, febrile convulsions, and Kawasaki disease in children ^(5,6,7,8). Patients with pneumonia and bronchiolitis, the most typical diseases come across in pediatric basic practice, are at particular danger of establishing hyponatremia due to antidiuretic hormonal agent (ADH) oversecretion ^(9,10,12). Hyponatremia related to paediatric pneumonia is most typically due to the syndrome of unsuitable antidiuretic hormone secretion (SIADH) ⁽¹³⁾.

Objectives:

Lower respiratory infections (LRIs), including acute lower respiratory tract infections (LRTI), pneumonia, atypical pneumonia, bronchitis, bronchiolitis, and severe acute respiratory syndrome (SARS), continue to threaten the health of children worldwide and especially in developing countries, therefore this review aims to evaluate the incident and effect of Hyponatremia among children with LRTI, and to highlight the more important aspect in this subject.

2. METHOD

We conducted a comprehensive review through electronic search among two databases which are; PubMed (MEDLINE), and EMBASE, for all studies evaluating hyponatremia in children with lower respiratory tract infection, we limited our search to English language articles, we use following terms in our identified search; lower respiratory tract infection, OR pneumonia, OR bronchiolitis Or acute respiratory syndrome, combined with Children, AND Neonatal. we excluded all studies that involving patients older than 17 years old.

Role of Hyponatremia as defined as a sodium level of < 135 mmol/l in serum^(14,15). The severity of HN was determined by the reports of Ellison and Berl⁽¹⁶⁾. Serum concentration of 131–135 mmol/l means mild HN, 126–130 mmol/l means moderate HN, and ≤ 125 mmol/l means severe HN⁽¹⁷⁾. Hyponatremia was defined as a serum sodium concentration > 145 mmol/l⁽¹⁷⁾.

3. RESULTS AND DISCUSSION

Electrolyte disturbances have been described in a wide variety of acute infections including pneumonia⁽¹⁸⁾, which complicate the management and prognosis. Most of the studies have shown hyponatremia due to Syndrome of Inappropriate Antidiuretic Hormone secretion (SIADH) as the most common electrolyte abnormality^(19,20). This syndrome is characterized by Hyponatremia and hypoosmolality and results from the inappropriate and continued secretion and/or action of antidiuretic hormone despite normal or increased plasma volume⁽²²⁾. Hyperinflation of the lungs, a hallmark of the bronchiolitis, wheezing, asthma, reduces blood flow to the right atrium and stimulates the release of AVP from the posterior pituitary^(5,10). Arginine vasopressin release is triggered by os-motic stimuli such as hyperglycemia or uremia, and by nonosmotic stimuli such as hypovolemia, hypercapnia, pain, and anxiety⁽²³⁾. Sources of free water intake in this population include hypotonic intravenous fluids, gavage tube feeds, and humidified air in the ventilator circuit^(23,24). These factors are common in children admitted to the ICU with respiratory diseases. Acute hyponatremia poses an immediate danger to the central nervous system. The rapid shift of fluids associated with this condition frequently results in brain edema. Administration of hypotonic maintenance fluids may worsen this edema⁽²¹⁾.

Causes of hyponatremia in LRTI:

Hyponatraemia might arise from a salt deficit, or surplus of water. Primary illness, impaired water excretion, improper release of vasopressin, use of hypotonic fluids, redistribution of sodium and water, ill cell syndrome, and numerous drugs might add to hyponatraemia⁽¹⁸⁾. In different studies hyponatremia was the most frequent electrolyte irregularity in children hospitalized due to pneumonia^(20,21,25). and was related to a more serious disease and a poorer result⁽²⁶⁾. In one consisted of research study⁽²⁷⁾ by (46.7%) of kids had hyponatremia which is similar to the study done by Don et al⁽²⁸⁾ in which hyponatremia was discovered in 45.4% of children with community obtained pneumonia. The distribution of hyponatremia was not related to age and sex⁽²⁷⁾. In discussed study⁽²⁷⁾, of all the hyponatremia, 64.3% were secondary to SIADH. This observation is similar to the research study done by Prasad et al⁽²¹⁾ in which 64% of hyponatremia cases was because of SIADH. In another research study done by Singhi et al⁽²⁰⁾ SIADH was the cause in 68% of hyponatremia cases. Administration of sodium and frusemide is shown only if there are harmful neurological complications attributable to serious hypo-osmolality⁽²⁷⁾. Many patients are best treated by merely decreasing the intake of water⁽²⁵⁾. Morbidity, as figured out by period of medical facility stay, was considerably greater in patients with hyponatremia when compared with those with normonatremia⁽²⁷⁾.

Different finding of hyponatremia in LRTIs:

Recent research study⁽²⁹⁾ revealed that hyponatremia was a regular finding in kids with bronchopneumonia 28 (46.7%). In the majority of cases, hyponatremia was moderate i.e., 20 (71%), 6 (21.4%) had moderate and just 2 (7%) had serious hyponatremia. Patients with moderate hyponatremia are almost always asymptomatic. Lobar pneumonia which was next

typical respiratory infection in our study had hyponatremia in 6 cases (50%), from which 5 had mild and 1 had extreme hyponatremia. In one research study⁽³⁰⁾ it was discovered that nearly all cases with empyema had hyponatremia (100%), the cause of hyponatremia in these cases might be due to prolonged course of the disease, delayed treatment of the underlying pneumonia component which is now presented as empyema, due to prolonged result on ADH which even more leads to hyponatremia in these cases. Bronchiolitis and wheeze associated LRTI reasonably had less occurrence of hyponatremia⁽³⁰⁾, only 1 case in each type. Almost all cases of moderate to severe hyponatremia had a longer period of Intensive care stay with average of 4.5 days. In the exact same research study⁽³⁰⁾, among 91 cases, mortality was 5, among which 3 experienced hyponatremias, but it itself a risk aspect or other aspects affecting the mortality were not generated.

We consisted of one cross sectional study⁽³¹⁾ which was carried out at the Department of Pediatrics, Assam Medical College and Hospital, Dibrugarh for a duration of one year from April 2012 to March 2013. to determine the frequency of hyponatremia in pneumonia in eastern part of India. Have revealed total incidence of hyponatremia in pneumonia patients (n=300) is around 26 % (78/300), an overall of 222 pneumonic patients among 300 studied (74%) escaped the vagaries of hyponatremia. This portion of 26% is rather high, and calls for a concerted approach. This could suggest that significance of hyponatremia occasions is indisputable and is worth trying to find. It likewise indicates that hyponatremia occurrence need to require a full-fledged treatment of the overall condition. It also requires a modification in the regular mindset of the attending specialist and radical modification of standard procedure vis a vis sodium status among pediatric pneumonia patients.

The most typical frequent electrolyte derangement identified among hospitalized patients, is associated with intensified results in patients with pneumonia, heart failure and other disorders⁽³²⁾. Hyponatremia prevails amongst hospitalized patients with pneumonia and is connected with gotten worse economic and medical results and suggests a poor prognosis^(29,33). A recent single-centre accomplice research study found the incidence of hyponatremia at hospital admission amongst community-acquired pneumonia patients to be 28%⁽³²⁾. It is necessary to stress that the presence of hyponatremia was related to not just prolongation of hospitalization (HLOS), but also with a boost in medical facility mortality⁽³³⁾. In one essential research study⁽¹⁸⁾, kids with hyponatremia at admission had longer hospitalization times and an extended duration of fever, although their final result agreed with, including cases that developed pleural effusion.

4. CONCLUSION

hyponatremia is common amongst kids hospitalized with lower breathing tract infections. Every year Acute respiratory infections in young kids is responsible for a quote 3.9 million deaths worldwide. Hyponatremia was typically due to Syndrome of Inappropriate Anti Diuretic Hormone secretion (SIADH). Presence of hyponatremia substantially increases the morbidity and mortality amongst kids with lower respiratory system infections. Hyponatremia in pneumonia significantly affects the result in regards to prolonged duration of hospitalization, and boost in death.

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