ORIGINAL ARTICLE
Frequency of Hyponatremia in Children with Bronchiolitis

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ABSTRACT
Background: Bronchiolitis is predominant among infants and mostly caused by respiratory syncytial virus (RSV). Respiratory illnesses are related to elevated anti-diuretic hormone which in turn leads to hyponatremia (<135 mmol/L).

Methods: From December 8, 2017 to June 8, 2018, researchers from the pediatrics department of Lahore General Hospital/Post Graduate Medical Institution conducted a cross-sectional study. All 246 cases meeting inclusion criteria were taken from the department of Pediatrics, Lahore General Hospital, Lahore. After taking informed consent all the basic information like age, sex, and contact detail was taken. Blood sample sent to hospital laboratory to evaluate serum sodium levels to find hyponatremia as per operational definition. Data input and analysis were carried out using SPSS version 20.

Results: With ages ranging from 2 to 24 months, the mean age was 13.29 ± 6.35 months. There were 124(50.4%) male and 122(49.6%) female cases with almost similar male to female ratio. There were 105(42.7%) cases who had disease since <5 days and 141(57.3%) cases had disease since ≥ 5 days. According to weight of baby there were 96(39%) cases who had low weight as per their age and 150(61%) cases had normal weight as per their age. The mean Na level in all cases was 130.86 ± 6.61 mEq/L with minimum and maximum value as 115 and 145 mEq/L respectively. A total of 192(78%) cases had hyponatremia while other 54(22%) cases had normal Na+ level.

Conclusion: According to findings of this study it was concluded that frequency of hyponatremia was too high in children with Bronchiolitis i.e. 78%. So when a child present with Bronchiolitis he must be evaluated for Na+ level, and if it is low then sodium levels should also be corrected along with the treatment of bronchiolitis.

Keywords: Bronchiolitis, Electrolyte imbalance, Hyponatremia, ICU, treatment prognosis.

INTRODUCTION
Bronchiolitis is diagnosed clinically in those children who present with breathing difficulties, cough, poor feeding, irritability and apnea which in combination with wheeze or crackles on auscultation make the diagnosis. The management and evaluation varies significantly and various tests like viral isolation, blood serology, and chest radiographs often are advised with negligible outcome. Hospitalization is more likely in those with chronic lung illness, congenital heart disease, immune deficiencies, and neuromuscular problems. Moreover, preterm are more vulnerable secondary to the impaired development of the lung and immunity. Though it is the most common lower respiratory tract infection across the world, there is no single pharmacological agent that is considered to be safe and reliable for its management.

Complications include central apnea, cyanosis, dehydration, seizures, fatigue, severe respiratory failure, focal neurological abnormalities and hyponatremia. Among all of these hyponatremia is the commonest association and occurs within 6 days of symptoms onset. According to a research, hyponatremia in 23 individuals (22%) was identified within 2 hours of arrival. Another research found that 90% of children who came within 6 days of the onset of symptoms had hyponatremia, which occurred in 45% of newborns and was present in 84 infants (80%) at the time of admission.

The rationale is to determine frequency of hyponatremia in bronchiolitis children. This study is mandatory to do as sudden drop in sodium levels can lead to significant neurologic findings with morbidity and mortality in severe cases. So through this study we can easily pick patients with low sodium levels and can manage the cases accordingly to reduce the related morbidity and mortality.

METHODS
All the patients who presented with bronchiolitis at the department of Pediatrics, Lahore General Hospital/Post Graduate Medical Institution, Lahore from December 8, 2017 to 8, June 2018 were included in that study. Ethical review committee’s approval for this study was taken. A complete physical examination involving chest auscultation, x-ray chest was done. After taking informed consent all the basic information like age, sex, and contact detail was taken. Blood sample sent to hospital laboratory to evaluate serum sodium levels to find hyponatremia as per operational definition. Data input and analysis were carried out using SPSS version 20.

RESULTS
The minimum and maximum ages were 2 and 24 months, and the mean age was 13.29 ± 6.35 months. There were 111(45.1%) cases who were 2-12 months old and 135(54.9%) cases were 13-24 months old. There were 124(50.4%) male and 122(49.6%) female cases. There were 105(42.7%) cases who had disease since <5 days and 141(57.3%) cases had disease since ≥ 5 days. According to weight of baby there were 96(39%) cases who had low weight as per their age and 150(61%) cases had normal weight as per their age. The mean Na level in all cases was 130.86 ± 6.61 mEq/L with minimum and maximum value as 115 and 145 mEq/L respectively. A total of 192(78%) cases had hyponatremia while other 54(22%) cases had normal Na+ level. The management of bronchiolitis is to determine frequency of hyponatremia in bronchiolitis children.

CONCLUSION
According to findings of this study it was concluded that frequency of hyponatremia was too high in children with Bronchiolitis i.e. 78%. So when a child present with Bronchiolitis he must be evaluated for Na+ level, and if it is low then sodium levels should also be corrected along with the treatment of bronchiolitis.

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Table A: - Na+ level descriptive statistics (mEq/L)

<table>
<thead>
<tr>
<th>Na+ level mEq/L</th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>130.86</td>
<td>6.61</td>
<td>90.0</td>
<td>115.00</td>
</tr>
</tbody>
</table>

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The incidence of hyponatremia in ventilator time (8.41 ± 2.4 days) was higher in babies (45%, 95% CI 38-52) than in those aged two who were admitted with bronchiolitis to a teaching center (45%, 95% CI 38-52). The findings demonstrated that only 23 individuals (22%) of the 102 children included in the trial (n=102; age = 10.7 ± 6.7 months) had hyponatraemia (serum sodium 135 mmol l(-1)). Among these, 22% had hyponatremia (P = 0.005)46. Hyponatremia was shown to occur more often in the current study (78% of cases). Another research was conducted to seek for these differences, and a previous study concluded that 22% of children had hyponatremia (P = 0.005)46. Hyponatremia was shown to occur more often in the current study (78% of cases).

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Table B: Comparison of hyponatremia with respect to age group

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Hyponatremia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>2-12 months</td>
<td>89(46.4%)</td>
<td>22(40.7%)</td>
</tr>
<tr>
<td>13-24 months</td>
<td>103(53.6%)</td>
<td>32(59.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>192(100.0%)</td>
<td>54(100.0%)</td>
</tr>
</tbody>
</table>

Chi-square test result: 0.536%, p-value: 0.464%

Table C: Comparison of hyponatremia with respect to duration of disease

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Hyponatremia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 days</td>
<td>87(45.3%)</td>
<td>105(42.7%)</td>
</tr>
<tr>
<td>≥5 days</td>
<td>105(54.7%)</td>
<td>141(57.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>192(100.0%)</td>
<td>246(100.0%)</td>
</tr>
</tbody>
</table>

Chi-square test = 2.4, p-value = 0.116

DISCUSSION

Lower respiratory tract infection (LRTI), along with pneumonia, is one of the major infections in school-age children that requires hospitalisation and contributes to 30% of global mortality each year. Bronchitis, bronchitis, pneumonia, and empyema are all included in LRTI, which is an infection below the larynx.

The respiratory syncytial virus, which predominates in babies and is a major cause of bronchiolitis (RSV), 10-15% of the affected children may need critical care owing to approaching respiratory failure, and 1% of them will need hospitalisation due to dehydration, poor oral intake, or respiratory insufficiency. The factors affecting a person’s homeostasis are fluids and electrolytes, with sodium being the most significant and prevalent cation in extracellular fluid. With a 30% frequency, hyponatremia is the most typical electrolyte imbalance encountered in the intensive care unit (ICU)46. It manifests in acute inflammatory illnesses such as Kawasaki disease, febrile convulsions, respiratory tract infections, and meningitis17. Anti-diuretic hormone (ADH) over secretion in an infant with respiratory syncytial virus bronchiolitis. Clin Pediatr 2014;3(2):153-60.46. The syndrome of inappropriate antidiuretic hormone secretion (SIADH)13 causes hyponatremia in pediatric pulmonary infection.


In conclusion, the study was authorized by the Post Graduate Medical Institute's ethical review committee in Lahore, Pakistan. Authors' contribution: AR: study design, statistical & critical analysis., MWA: data collection, statistical design, SS: manuscript writing and KA: data collection. Conflict of interest: Nil

REFERENCES
